China's Real Estate Control Policies and Housing Price Fluctuations

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Abstract. This paper constructs a VAR model, empirically analyzes the main factors affecting China's real estate prices, and focuses on the impact of monetary policy and credit policy on real estate prices by China's housing price data from 2000 to 2017. The results show that in the short term, the positive impact of inflation rate, deposit reserve ratio and personal housing loan interest rate will lead to rising house prices, and its long-term positive impact will lead to a decline in house price. Among them, the inflation rate and the deposit reserve ratio have relatively little explanatory power on real estate price fluctuations. However, the personal housing loan interest rate has become the main factor affecting China's real estate prices, and it is also the most effective control policy tool.

Keywords: house value; real estate control policy; inflation rate; deposit reserve ratio; personal housing loan interest rate.

1. Introduction

Since 2000, China's commodity housing market has developed rapidly. Nationally, real estate prices are showing a general trend of rising steadily. Among them, from 2005 to 2007, national housing prices rose rapidly, with an annual growth rate of about 13%. In 2007, the state introduced a series of policies to curb housing prices. For example, after the State Administration of Taxation liquidated the land value-added tax, the Central Bank raised interest rates six times a year, and raised the deposit reserve ratio 10 times, the national housing prices fell. However, after 2008, China's housing prices continued to rise steadily. The housing price growth slowed down in 2013, when the national housing price was 1.92 times that of 2000. However, since 2014, China's real estate prices have continued to rise rapidly, with an annual growth rate of about 6%.

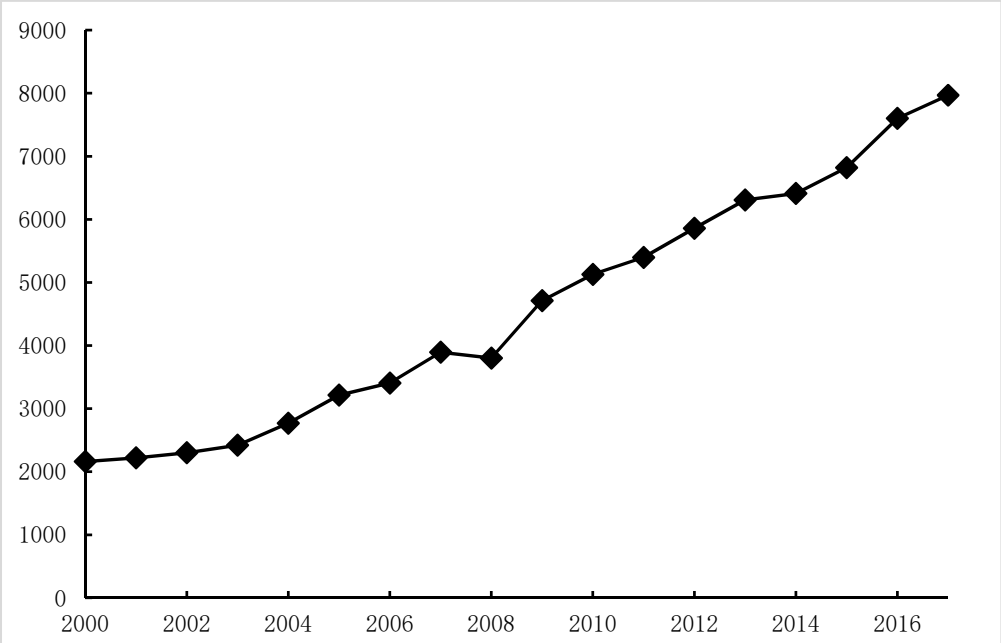

Figure 1. Average Sales Price of Commercial Housing in China from 2000 to 2017 (yuan/square meter)

In China's first-tier cities (Beijing, Shanghai, Guangzhou and Shenzhen), the annual growth rate of real estate prices was low from 2000 to 2005, about 6%. But from 2007 to now, real estate prices have been rising rapidly. Despite the housing price being suppressed in 2010 and 2013, the overall annual growth rate of housing prices remains at about 33%.

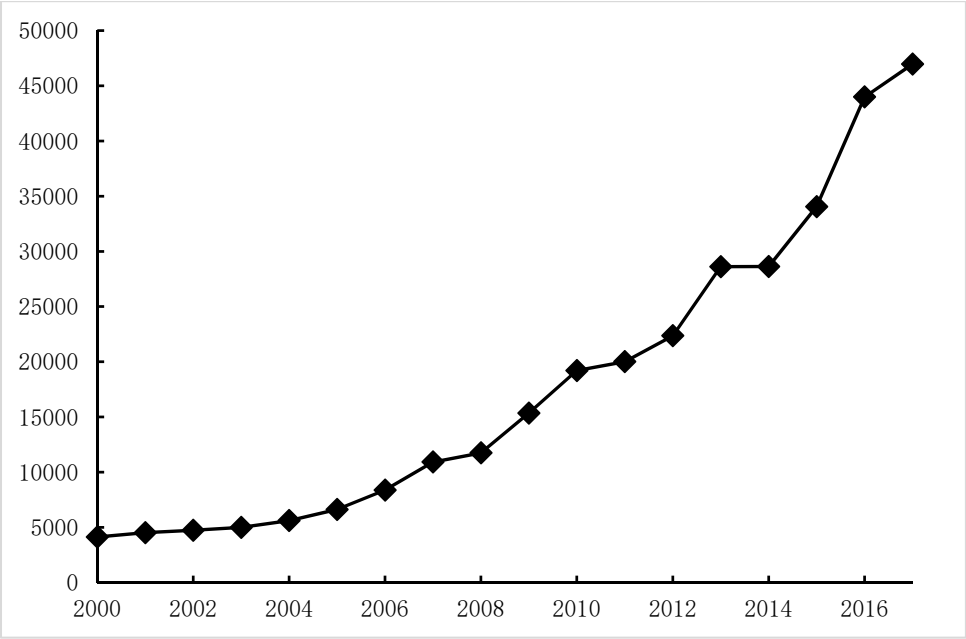

Figure 2. Average Sales Price of Commercial Housing in First-tier Cities (Beijing, Shanghai, Guangzhou and Shenzhen) in China from 2000 to 2017 (yuan/square meter)

For more than a decade, the proportion of the real estate industry in the national economy has gradually increased, and it has now become an important pillar industry of China's national economy. However, with the rapid development of the real estate industry, the price of commercial housing in China has soared rapidly, and urban residents are overwhelmed by the purchase of housing. Although the government adopted strict control measures on the real estate market from 2006 to 2007, the prices of commercial housing in China have continued to increase, with annual growth rates of 6% and 14% respectively. The growth rate of first-tier cities (Beijing, Shanghai, Guangzhou and Shenzhen) reached 26% and 30%. Even in 2010, the most severe "Control Year" in history, the average selling price of commercial housing still rose by 8%. Therefore, in order to avoid the vicious rise in housing prices and the potential harm to domestic macroeconomic stability, the government's control policies on the real estate market are quite necessary. So, to study the relationship between China's real estate control policies and housing price fluctuations and to analyze mutual effect between control policies and housing prices, this paper focuses on empirical analysis of the impact of monetary and credit policies on China's housing price fluctuations. Based on this, this paper puts forward guiding suggestions on the selection of tools for China's control policies.

2. Literature Review

This paper mainly reviews the studies of domestic and foreign scholars on the relationship between real estate control policies and real estate prices, and reviews those on the impact of inflation rate, deposit reserve ratio and personal housing loan interest rate in monetary policy and credit policy on real estate prices.

Literature on the impact of monetary policy and credit policy on real estate prices mainly includes loan interest rate, deposit reserve ratio, real estate credit, inflation rate and other factors. Most of the studies by domestic and foreign scholars have concluded that monetary policy and credit policy can affect the real estate price. After empirical study, Larsen(2018)[1], Eickmeier(2013)[2], Robstad(2018)[3], Reichel[4] et al. (2016), Hou Chengqi et al. (2014)[5], Chen Shiyi et al. (2016) [6]

and Xu Shuyi et al. (2015)[7] all indicate that monetary policy has a significant impact on the real estate market and is an important tool for real estate price control. After Belke (2010) [8] established the ARDL model research for housing price data and credit policies in western and southern Germany, he found that credit policies should be responsible for housing price rise. The empirical results of domestic scholars Deng Hongqian et al. (2012) [9], Cui Guangcan (2008) [10], Ren Zhe et al. (2012) [11] and Huang Ziwei et al. (2014) [12] also show that credit policies can affect real estate prices.

However, for the analysis of specific policy tools, there are major differences in the research results of domestic scholars. On the one hand, some domestic scholars have studied the optimal policy tools, but there are major differences in their conclusions. After Yu Huayi et al. (2015) [13] verified that housing prices and CPI in China's cities could be impacted by housing prices in individual cities and money supply, he concluded that the positive influence of housing price impact on CPI is relatively small. After Jia Junxue et al. (2014) [14] used GMM and MSVAR models to examine the role of fiscal and monetary policies in promoting real estate prices, he found that interest rates have become an important reason for the rapid rise in real estate prices. The empirical study by Song Bo et al. (2007) [15] and Zhang Jitong et al. (2007) [16] shows that interest rate is the primary measure for the government to control excessive rise of housing prices. However, Zheng Tingguo et al. (2018) [17] found that the short-term nominal interest rate did not peg the expected house price imbalance. Gu Haifeng et al (2014) [18] analyzed the correlation between monetary policy and real estate prices, and then concluded that interest rate has no significant regulating effect on real estate price while the deposit reserve ratio has a significant effect on the regulation of real estate prices. However, Zhou Jianjun et al. (2018) [19] studied PVAR model constructed by monthly panel data in China and found that the effect of deposit reserve ratio on China's housing price is not obvious, and there is a long-time lag and significant regional differences. On the other hand, some scholars have not analyzed effective policy tools, such as Cai Zhen et al. (2011) [20]. That paper constructs a theoretical model of housing prices and credits under the conditions of bank credit endogeny, and finds that the price policy of raising interest rates and the quantitative policy of raising the required reserve have not played a role in curbing the excessive rise in housing prices. The research of Xu Yan et al. (2015) [21] has shown that real estate prices have significantly affected the benchmark interest rates and money supply set by the Central Bank of China. However, what is the form of best monetary policy rules cannot be determined.

In summary, the previous research mainly focused on the comprehensive influence relationship between monetary policy and credit policy on real estate prices. As for the choice of specific policy tools, especially in the study of inflation rate, deposit reserve ratio and loan interest rate, there are little research and big differences about conclusions. There is not only a lack of comprehensive analysis and research on the combination of the three policy instruments, but also a lack of guiding suggestions for the use of specific policy instruments, so that it is impossible to comprehensively analyze the factors of real estate price fluctuations in China. Therefore, this paper adopts the data of the period from 2000 to 2017 when China's real estate market develops vigorously and the state adopts macro-control measures intensively. Besides, this paper builds a VAR model to comprehensively analyze the effect of three policy instruments (inflation rate, deposit reserve ratio and individual housing loan interest rate) on China's real estate price fluctuations in monetary policy and credit policy with a view to breaking through the limitations of the above research.

3. Theoretical Model Construction

The supply and demand of real estate determine the trend of real estate prices, and many factors affect the supply and demand of real estate, including economic fundamentals and non-economic macro-control factors. The change of real estate prices is formed under the combined influence of these factors. Based on certain research and analysis, this paper selects the inflation rate in the economic fundamentals. In the non-economic fundamentals, this paper selects the personal housing loan interest rate for the credit policy and selects the deposit reserve ratio the monetary policy. There

are four explanatory variables which construct the theoretical model of the real estate price change from the economic fundamentals.

According to the formula of equilibrium price of commodity price, the formula of real estate price change can be obtained as follows:

$$hpe=f(Qs,Qd) \tag{1}$$

Where HPe represents the equilibrium price of real estate, Qs stands for real estate supply and Qd stands for real estate demand.

Regarding the supply of real estate as a variable, the theoretical formula affecting the supply of real estate can be obtained:

$$Qs=S(ir) \tag{2}$$

Where ir stands for the rate of inflation.

Similarly, regarding the demand for real estate as two variables, the theoretical formula affecting the demand for real estate is obtained:

$$Qd=D(dr,lr) \tag{3}$$

Where Dr represents the deposit reserve ratio and Lr stands for individual housing loan interest rate.

Combining equations (1), (2) and (3), we can get the theoretical model of real estate price change:

$$hpe=P(ir,dr,lr) \tag{4}$$

4. Empirical Analysis

In the following part, four variables including inflation rate, deposit reserve ratio, individual housing loan interest rate and real estate price are selected to establish the VAR model to analyze the dynamic impact of various factors on the real estate price fluctuations.

4.1 Data Source and Empirical Test

This paper uses CPI year-on-year growth rate to reflect the inflation rate. The loan interest rate above 5 years reflects the individual housing loan interest rate. The average price of commercial housing sales reflects the real estate price and the average price of commercial housing sales is calculated by dividing the sales of commercial housing by the sales area. Inflation rates, individual housing loan interest rates and deposit reserve ratios do not require seasonal adjustments. The data in this paper comes from the statistics of China Economic and Trade Network as well as the People's Bank of China. This paper selects quarterly data and the time span is from 1st quarter of 2000 to 4th quarter of 2017.

4.1.1 Unit Root Test

In order to avoid the "pseudo-regression" to ensure the validity of the model, the DF-GLS test is performed on these four variables. The test results show that there are unit roots in the original order of these four variables, which indicates that the original order sequence is not stable. Then the first-order difference is made to the original sequence. The DF-GLS test shows that there is no unit root in the first-order difference sequence, indicating that the first-order difference sequence is stationary, that is, the four sequences are all first-order single-sequence I (1). Therefore, it is necessary to perform cointegration test on the variables contained in the model.

4.1.2 Cointegration Test

In this paper, Johanson cointegration test is used to test whether there is a long-term cointegration relationship between the variables of the model. The test results show that there is one cointegration relationship at the 5% significant level, that is, there is at least one cointegration relationship, indicating there is a long-term equilibrium relationship among variables so there is no need to consider establishing a differential VAR model.

Table 1. Johansen Multivariate Cointegration Test Results

Hypothesized No.of CE(s)	Trace Statistic	5%critical Value	Max Statitic	5%critical Value
None*	54.01	54.64	34.63	30.33
At most 1	19.37	34.55	12.73	23.78
At most 2	6.63	18.17	5.93	16.87
At most 3	0.69	3.74	0.69	3.74

4.2 Impulse Response Analysis

This paper uses the impulse response function to characterize the dynamic influence of the impact of various explanatory variables on real estate prices. The stationarity test of the VAR model in this paper shows that the model is stable and can perform impulse response analysis and variance decomposition.

4.2.1 The Impulse Response of Inflation Rate to Real Estate Prices

Figure 3 reflects the dynamic influence of inflation rate change impact on real estate prices. Under the positive impact of inflation, real estate prices rise rapidly in the short term, then slowly decline, and finally rebound slightly to a stable level. In the short term, the rise in inflation leads to an increase in the prices of raw materials for real estate development, an increase in the cost of real estate development, and a decrease in the supply of real estate. At the same time, inflation causes currency depreciation, promotes real estate investment, increases demand, and makes real estate prices rise sharply. In the long run, the government will adopt measures such as raising the loan interest rate and raising the loan threshold to curb inflation, resulting in a decrease in the currency circulation in the market, curbing investment and a slow decrease in real estate prices which finally tend to be stable.

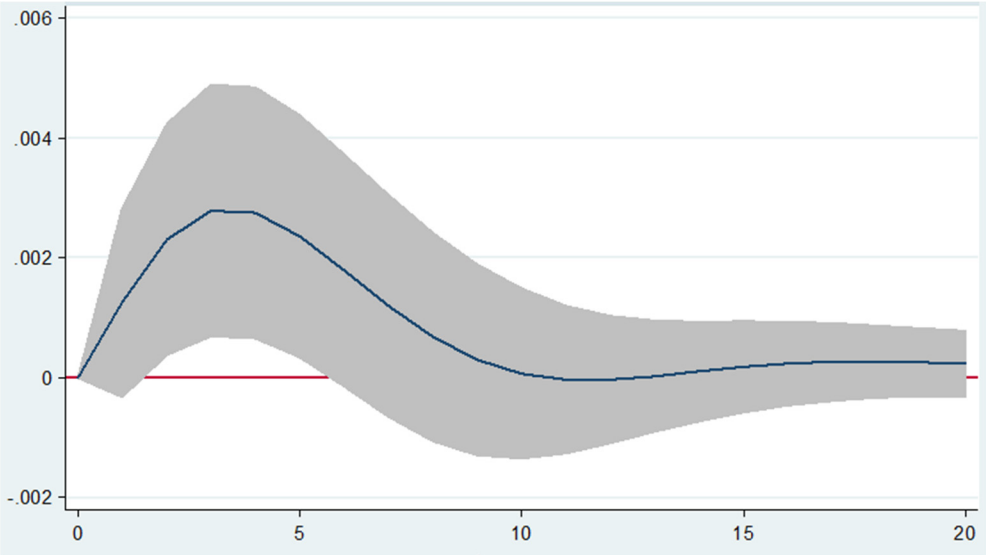

Figure 3. Impulse Response Diagram of Real Estate Price Fluctuation Caused by the Inflation Rate Change Impact

4.2.2 Impulse Response of Deposit Reserve Ratio to Real Estate Prices

Figure 4 reflects the dynamic influence of the deposit reserve ratio change impact on real estate prices. Under the positive impact of deposit reserve, real estate prices continue to rise in the short term, and then continue to decline slowly. Housing prices are always at a high level. In the short term, the increase in the deposit reserve ratio has led to an increase in the financing costs of real estate developers, a decrease in real estate supply and an increase in housing prices. In the long run, the positive impact of the deposit reserve ratio indicates that the country adopts a tight monetary policy which will reduce market liquidity under the effect of the currency multiplier and reduce investment overall, thus making housing prices continue to decline slowly.

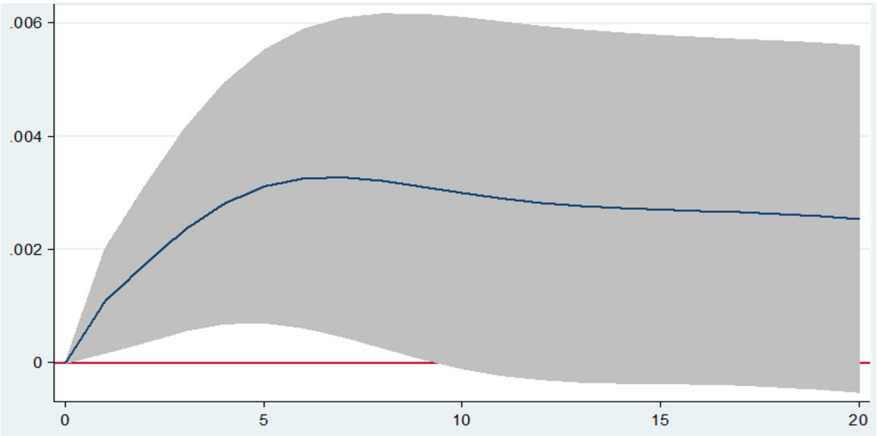

Figure 4. Impulse Response Diagram of Real Estate Price Fluctuation Caused by the Deposit Reserve Ratio Change Impulse

4.2.3 The Dynamic Influence of Change Impact in Individual Housing Loan Interest Rates on Real Estate Prices

Figure 5 reflects the dynamic influence of change impact in individual housing loan interest rates on real estate prices. Under the positive impact of the individual housing loan interest rate, real estate prices will continue to rise in the short term, and then gradually decline. Housing prices will remain low for a long time. In the short term, although the rise in the individual housing loan interest rates has led to cost increase in housing loans, the supply and demand relationship of rigid demand investors in the market is not easily affected. After the profitability investors have the expectation that prices will rise further, they will increase investments, leading to increased demand and rising housing prices. In the long run, the increase in the cost of housing loans has prompted investors to seek other investment products, resulting in a decrease in real estate demand, a continuous decline in housing prices which eventually remain low for a long time.

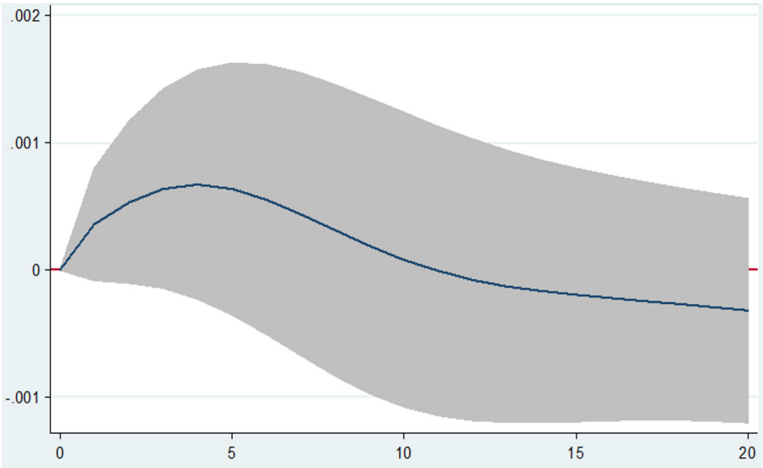

Figure 5. Impulse Response Diagram of Real Estate Price Fluctuations Caused by the Change Impact of Individual Housing Loan Interest Rate

4.3 Variance Decomposition

The method of variance decomposition can be used to analyze the contribution rate of each explanatory variable to real estate price fluctuations, so as to evaluate the importance degree of each explanatory variable, further providing guidance for the government to choose policy of controlling the real estate price. The table below reflects the contribution rate of real estate prices and the three explanatory variables to real estate price fluctuations.

It can be seen from the table that the contribution rate to real estate fluctuations from large to small is the individual housing loan interest rate (lr), inflation rate (ir), deposit reserve ratio (dr).

The contribution rate of individual housing loan interest rate to real estate price fluctuations first rises and then declines, accounting for 15.5% in the 20th period, which is the largest contribution among the three explanatory variables, indicating that the individual housing loan interest rate determines the trend of future housing prices to a certain extent. Therefore, reasonable and effective control of housing loan interest rates should be the focus of China's current control of the real estate market.

The contribution rate of inflation rate to real estate price fluctuations is gradually increasing at about 5.6%. In the long run, inflation is an important means of stabilizing real estate prices. Therefore, the government needs to monitor the impact of inflation on the real estate market.

The deposit reserve ratio has the lowest contribution rate to real estate price fluctuations at about 1.7%, which is inconsistent with investors' expectations of the market. It may be due to the fact that China's real estate market is still in situation of short supply, causing that increasing investment costs does not substantially improve the relationship between supply and demand of real estate for both real estate developers and individual investors, thus having the least impact on house price fluctuations.

Table 2. Variance Decomposition Results of Real Estate Price Fluctuations (Unit: %)

	Variables			
Period	ir	lr	dr	hp
1	0.01	0.80	0.03	99.17
2	0.34	11.06	0.11	88.49
3	0.74	19.29	0.30	79.67
4	0.83	25.33	0.47	73.37
5	0.70	29.23	0.53	69.54
6	0.64	31.32	0.50	67.55
7	0.86	31.94	0.43	66.77
8	1.39	31.44	0.40	66.76
9	2.13	30.22	0.43	67.23
10	2.90	28.60	0.51	67.98
11	3.59	26.86	0.63	68.92
12	4.14	25.13	0.77	69.96
13	4.54	23.52	0.91	71.03
14	4.83	22.03	1.04	72.10
15	5.03	20.68	1.17	73.12
16	5.19	19.45	1.29	74.08
17	5.31	18.33	1.41	74.95
18	5.43	17.30	1.53	75.74
19	5.55	16.36	1.66	76.43
20	5.67	15.50	1.80	77.03

5. Conclusions and Suggestions

The conclusion of this paper indicates that the inflation rate and the deposit reserve ratio have less explanatory power on real estate price fluctuations, but the individual housing loan interest rate has become the main factor affecting real estate prices. On this basis, the following three policy suggestions are proposed for the current real estate market credit policy and monetary policy:

First, inflation rate. At present, China is in a period of low growth and high inflation, and the growth of inflation rate will lead to a rapid rise in real estate prices. Therefore, the government should maintain the monitoring of inflation and take measures such as raising the loan interest rate and the loan threshold, to curb the occurrence of hyperinflation, to stabilize market prices and to avoid the rapid growth of real estate investment caused by currency depreciation.

Second, deposit reserve ratio. In the past five years, the Central Bank has repeatedly reduced the deposit reserve ratio and stimulated the economic market, which also provides space to develop for the real estate market. Although reducing the deposit reserve ratio can lower real estate prices in the short term, it will promote investment in the real estate market in the long run, leading to a continuous rise in housing prices. Therefore, the Central Bank should not significantly reduce the deposit reserve ratio, but should raise the deposit reserve ratio to avoid the rise of housing prices caused by overheated investment market after a certain period of time.

Third, individual housing loan interest rate. In the current situation of real estate market imbalance between supply and demand, and rigid demand, the increase in individual housing loan interest rate in the short term not only does not inhibit the rise in housing prices, but stimulates housing prices. However, in the long run, real estate investment will be reduced so that housing prices continue to decline. Therefore, on the one hand, the government should raise the interest rate loan of individual housing to reduce housing prices in the long run. On the other hand, the government needs to adopt other means, such as reducing the deposit reserve ratio, in order to avoid a surge in housing prices in the short term. Both should be the main monetary policy tools for the government to control real estate prices.

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