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Heterogeneous Impact of Monetary Policy on China's Real Estate Market

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Abstract: ***This paper examines whether the broad money supply (M2) and the interest rate as two monetary policy tools will have different effects on housing prices. A sample of 10 listed real estate companies was analysed using panel vector autoregression (PVAR) models, using data from 2007 to 2020. The empirical results show that there is a correlation between housing prices and M2 in the short term, which is even more obvious in the medium term. Overall, M2 has a positive impact on house prices. On the other hand, the three-year loan rate has no significant impact on housing prices in the short term, but has a negative impact on housing prices in the long term. After the pulse response analysis, the money supply has a more significant impact than the interest rate on the real estate price, and has a better effect in controlling the housing price. The research results contribute to the scientific formulation of monetary policy and the reasonable control of the market.***

Keywords: Real Estate Market; Money Supply; Interest Rate.

1. INTRODUCTION

Scholars have long studied monetary policy on housing prices and the impact on the economy (Torre, 2016). The asset boom that leads to bubbles is often followed by bubbles bursting, which has a serious economic impact (Bordo and Landon-Lane, 2013). The global financial crisis has had a devastating impact on the real estate boom and collapse (Williams, 2016). Bauer (2017) emphasized the importance of the real estate market as a source and transmission channel of financial instability. Williams (2016) said that although the impact of monetary policy on housing prices may be an important channel affecting financial stability. Torre (2016) believes that a tighter monetary policy will have a negative impact on housing prices, while an expansionary monetary policy will raise housing prices. Cheng and Jin (2013) found that a 0.5% rise in nominal interest rates would lead to a 40% drop in US house prices. Taylor (2007) claims that the bubble in US house prices was due to loose monetary policy. However, Wadud (2012) argues that tighter monetary policy will raise house prices in the short term, but will have the opposite effect in the long term. Because of the close relationship between the housing market and financial stability and the business cycle, the government usually adopts monetary policy to influence the housing market. Establishing the impact of monetary policy on housing prices is crucial for the central bank to intervene or not in the housing bubble (Tsai, 2013).

Since the reform of the housing system in 1998, the housing industry has been identified as the strategic focus of China's economic development. The fluctuation of housing prices not only affects the stable and healthy development of a country's economy, but also is an important factor causing the outbreak of the financial crisis (Deng, 2016). With rapid economic growth and advancing urbanization, house prices surged by 250% from 1998 to 2015. House prices are rising far faster than their incomes, and for most residents and families, buying houses has become unbearable. The regulation of the housing market has become the focus of social attention. The government frequently introduced interest rate adjustment, credit management and other monetary policies as a means to control housing prices. The market reacted to these measures, and housing prices did fluctuate. However, from the long cycle of housing price regulation in the past 10 years, it shows that the more regulation, the more the price rise. So, we raised some questions: is there an effective way to control housing prices? How far does monetary policy affect it? Is it the same effect for different monetary policies? It is based on these existing studies that this paper discusses whether the monetary policy makes the housing price rise or fall, so as to explore the development and reform direction of China's monetary policy. A systematic study of these issues can not only find out the reasons for the rapid rise in housing prices, but also help the government and the central bank to formulate timely policies to control housing prices.

2. LITERATURE REVIEW

Some existing literature suggests that there is a close link between monetary policy and the housing market. McDonald (2013) found that the Fed's interest rate policy was a reason for the US housing price bubble. Eickmeier

(2013) found that monetary policy had a significant impact on housing prices, and loose monetary policy boosted the housing boom between 2004-2005. Robstad (2017) confirmed that monetary policy has significantly affected real estate prices. Other studies suggest that monetary policy has a limited impact on house prices. Gouteron (2005) found that the results did not support the transmission from monetary policy to housing prices. Del Negro (2007) shows that in the US, the impact of expansionary monetary policy shocks on house prices seems to be small. Some literature has investigated the asymmetry effects. Tsai (2013) reported that expansionary monetary policy tends to push up house prices, but it does not rise at all under Britain's tightening policy. Chowdhury (2014) points out that in an expansion state, lower interest rates raise house prices, which has little impact in a recession.

Studies on the impact of China's monetary policy on housing prices can also be divided into three categories. First, China's monetary policy has had a significant impact on housing prices. Huayan (2019) stressed that monetary policy behavior is the main reason for affecting housing prices. Shen Guoxu (2018) revealed that only in the short term can interest rates have a negative impact on the housing price, and the long-term impact of monetary policy on the housing price is stable. Second, some studies have confirmed that monetary policy can have a certain impact on housing prices, but this impact is not obvious. Ding Hua (2018) found that bank lending rates were not the root cause of rising housing prices, but people's forecast of the future economic outlook, which affected the housing decisions. Yu Huanjie (2017) found that the policy did affect the housing price to some extent, but in the long term, the main determinant is still the supply and demand factor that essentially affects the housing price. Thirdly, some people believe that the adjustment of monetary policy on the housing price is asymmetric. Due to the different market development and market environment in each region, the influence ability of monetary policy on the housing price is also different. Ma and Liu (2015) reveals that monetary policy shows an asymmetric effect on the housing market, and there are three asymmetric forms: economic cycle, transmission channel and policy orientation.

As mentioned above, real estate enterprises are influenced by macroeconomic policies, especially monetary policies, and monetary policy has a certain role in regulating the housing price. In addition, the impact of monetary policy on real estate enterprises is also heterogeneous through different transmission routes. The innovation of this paper is to use the panel vector autoregressive model, we study the relationship between money supply, interest rate and real estate price from multiple methods, and analyze the heterogeneity influence of money supply and interest rate on housing price.

3. THEORETICAL MECHANISM

3.1 The Influence Effect of Interest Rate on Real Estate Enterprises

If lending rates are regulated by industry, to what extent does this affect microbusinesses such as real estate companies? Theoretically speaking, on the one hand, because the change of the nominal interest rate will affect the cost of capital of the real estate companies, the higher financing cost makes the real estate companies unwilling to develop, leading to the shortage of supply in the real estate market. On the other hand, higher nominal lending rates increase the financing costs of real estate companies, which reduce their rate of return and hinder development investment. This in turn suppresses overinvestment in the housing market. At present, China's real estate demand far exceeds the supply, and the higher financing costs will not lower the profit margin of real estate development companies, nor will it prevent the development of real estate companies. In addition, due to the increase in nominal interest rates, the increase in bank lending rates will not have a significant impact on the financing of real estate companies, but will increase housing prices. By implementing the expansionary monetary policy, the increase of money supply will reduce the real interest rate, reduce the loan cost of real estate companies, the credit demand will increase, the construction investment of real estate companies will increase, and the housing supply will increase. Housing demand is partially released, and the housing market is heating up again. This will lead to a large amount of capital flowing into the real estate industry, and the outflow of capital from other industries, causing adverse consequences for China's economic development, so we must firmly control the housing price.

In general, the adjustment of nominal interest rate affects the business activities of Chinese real estate companies: the nominal loan interest rate of 1-3 years directly affects the financing costs of Chinese real estate companies, while the actual loan interest rate does not affect individual real estate companies. However, there is a lag in the adjustment of nominal lending rates, and they cannot be adjusted frequently, because the interest rate will affect the stability of the entire economic market.

3.2 The Impact Effect of the Money Supply on Housing Prices

Theoretically speaking, the supply and demand of the real estate market are the main reasons that determine the price of the real estate market. On the demand side, the increase in the money supply allows people to spend more money, turn the desire to buy into real demand. Since many buyers are unable to pay the full payment when they buy, they spend most of their savings on the down payment, which is part of the sales revenue for developers. It should be noted that this part of the money supply mainly refers to the actual money actually paid by buyers, rather than commercial loans issued by banks.

On the supply side, money continues to flow into the real estate sector, a capital-intensive industry that attracts a lot of public money, most of which comes from financing or bank loans. During this period, regardless of the speculative motivation, the demand curve of new house buyers is basically not elastic. The mismatch between the limited housing supply and the high housing demand is the main reason for the soaring prices.

4. EMPIRICAL ANALYSIS

4.1 Sample Selection

In this paper, the top 10 real estate companies in the market value of Shanghai and Shenzhen in the sample period from the second quarter of 2007 to the fourth quarter of 2020 were selected, and A total of 550 observed values were selected when the data was determined. The sample includes 10 real estate companies: Vanke Real Estate, Wanda Real Estate, Evergrande Real Estate, Greenland Real Estate, Poly Real Estate, China Overseas Real Estate, Country Garden, China Resources Land, Longfor Real Estate and R & F Real Estate. Data were obtained from government Yearbook, People's Bank of China and wind database. Model variables were selected as follows.

Monetary policy indicators (M2): This indicator is chosen because the M2 broad money supply is representative.

Market Interest Rate Index (RATE): Generally speaking, the benchmark interest rate is the most authentic reflection of the development of financial markets. Since the long development and construction cycle of real estate projects is easy to be affected by the 1-3 year loan benchmark interest rate, this paper chooses the 1-3 year loan benchmark interest rate as the representative variable of the market interest rate.

Asset price channel (HP) index: From previous studies, the most important thing for residents to buy houses is the average housing price. In this paper, it is more appropriate to choose the actual average selling price of marketable housing to study the influence of housing price as the intermediary of monetary policy transmission.

In order to make the statistical results more scientific, due to the lack of data and uncertainty of data, it may lead to the problem of heteroscedasticity, so the money supply and house price were taken logarithmically to obtain lnM 2 and lnHP, and EViews software was used for regression analysis.

4.2 Stabilization Test

Before analyzing the relationship between monetary policy and real estate prices, it is necessary to conduct an ADF test to obtain the stability results of these three variables (see Table 1).

Table 1: Results of the unit root test

variable	ADF price	1% Critical	5% critical	Prob,*
LnHP	-6.053327	-4.992279	-3.875302	0.0024
LnM2	-4.698659	-4.057910	-3.119910	0.0034
Rate	-4.197311	-4.200056	-3.175352	0.0100

If the P value of all data is less than 5%, the data is stable, as shown in the table, the three data after ADF, the three data are stable. The panel vector autoregressive model assumes that all variables must be stationary, and, by treating each data, all variables fit the modeled stationarity assumption.

4.3 Co-Integration Test

Johansen Co-integration test is a method to study whether there is an equilibrium relationship between two unstable data. Ensure that all variables are stable at the same difference order, or the pseudo-regression will occur. The test results are shown in Table 2.

Table 2: Johansen Cointegration test results

Hypothesized No.of CE(s)	Eigenvalue	Trace Satisitic	0.05 Critical Value	Prob.**
None*	0.162723	48.87088	42.91925	0.0114
At most 1*	0.142007	27.55879	25.87211	0.0306
At most 2	0.073644	9.179620	12.51798	0.1696

According to Table 2, we can see that at least two co-integration relationships have P-values greater than 0.05, indicating that there are at least two co-integration relationships among these variables, so the choice of optimal lag order can be made.

4.4 Selection of the Lag Period

The determination of the lag period is a very important issue in the construction of VAR models. A large lag order can fully reflect the dynamic characteristics of the built model, but at the same time, more parameters need to be considered, which reduces the degree of freedom of the model and affects the effectiveness of the model parameter estimation. This is usually assessed using the Aki Information Guidelines (AIC), the Schwartz Code (SC), and the Hannan-Quinn Code (HQ), which have good values. As can be seen from the results in Table 3, four were significant in the second order, so the lag period chose 2 for the following test.

Table 3: Lag-order selection of the VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	10.2188	NA	5.41E-05	-1.312509	-1.312509	-1.380914
1	62.12597	66.06366	2.45E-08	-9.113812	-9.113812	-9.387431
2	102.7966	29.57866*	1.40e-10*	-14.87211*	-14.87211*	-15.35095*

4.5 Granger Causal Test

The Granger test is whether there is a causal relationship between the study variables. Test with EViews for lnM 2, lnHP and RATE. The first line said that the money supply is the Granger of the house price, and the house price is not the Granger of the money supply, the money supply unilaterally affects the real estate price. Interest rate is not the Granger reason of real estate price, indicating that the impact of interest rate on house prices is not significant.

Table 4: Granger test of causality

Null Hypothesis:	Obs F-Statistic		Prob.
LNM2 does not Granger Cause LNHP	12	1.77629	0.2377
LNHP does not Granger Cause LNM2		5.31837	0.0394
RATE does not Granger Cause LNHP	12	8.19053	0.0147
LNHP does not Granger Cause RATE		1.59128	0.2694
RATE does not Granger Cause LNM2	12	4.19823	0.0634
LNM2 does not Granger Cause RATE		20.2821	0.0012

4.6 Analysis of the Pulse Response Function

Then, the pulse response function analysis is conducted, and the housing price, money supply and interest rate respectively respond to the real estate price impact, and observe their impact on the housing price.(See Figure 1).

Figure 1 is the impact of real estate prices on yourself. Property prices reached their maximum in the first period, then gradually declined, recovered slightly in the second, declined further in the third, reached a nadir in the sixth, and finally leveled off. This suggests that house prices are initially affected by the impact, then the impact slowly weakens and eventually disappears.

Figure 2 shows the impact of M2 on house prices. In the first period, house prices fell rapidly after being hit by the money supply, reached their lowest point in the second period, and then gradually rose. In the long run, the impact of money supply has a positive effect on real estate prices. The analysis shows that the real estate industry has high capital and investment needs in the early development stage of any project. The development and investment funds of real estate companies come from their own free cash and bank loans on the other hand. In other words, as the money supply increases and bank loans increase, real estate companies get more money to invest more, and when there are too many houses being supplied and demand is insufficient, property prices fall. In the long run, an increase in the money supply will lead to more money for consumers and investors, which will increase house prices.

Figure 3 is the impact of interest rates on house prices. When hit by interest rates, house prices reached their maximum in the fourth period and then began to fall. This suggests that lending rates have a negative impact on house prices in the long term. Higher interest rates can also increase the cost of home ownership, making homes harder to sell, ultimately leading to lower property prices.

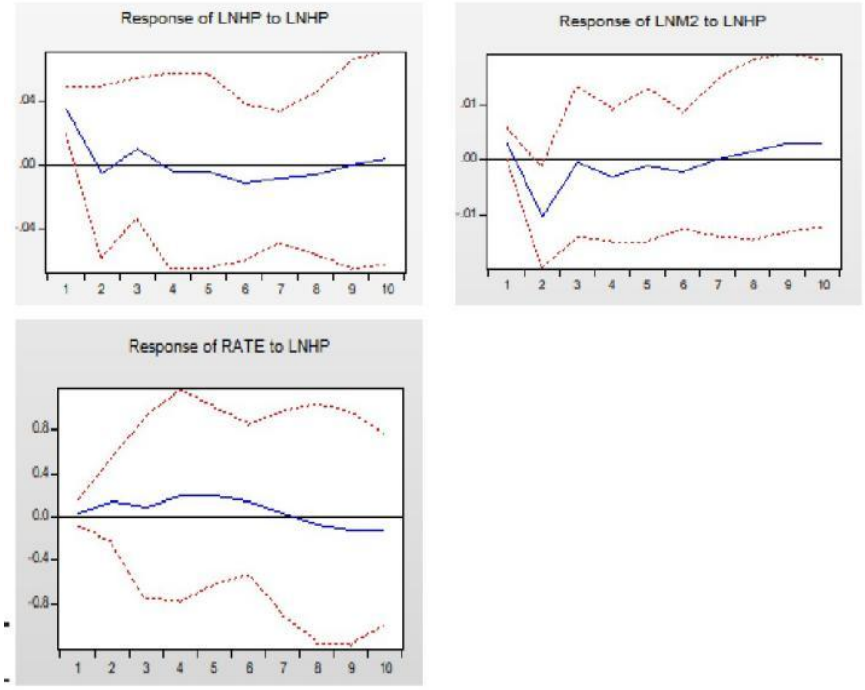

Figure 1: Pulse response function diagram in Fig

4.7 Variance Decomposition

Variance decomposition is a method to analyze the contribution of each structural shock to the endogenous variable changes (usually measured by variance) and to estimate the importance of different structural shocks. For example, let's construct a VAR model with three variables. To examine the effect of variable 1 on future changes, in addition to its own shock, variable 1 was affected by two other variables. Then we can rely on the method of the variance decomposition. Therefore, we decompose the variance of real estate prices, money supply, and lending rates (see Table 5).

Table 5: Results of the variance decomposition

Variance Decomposition of LNHP:				
Period	S.E.	LNHP	LNM2	**RATE**
	0.034552	100.0000	0.000000	0.000000
2	0.037160	88.02501	11.52213	0.452853
3	0.043463	70.10965	29.15649	0.733857
4	0.046480	62.19914	36.96083	0.840030
5	0.046945	61.77324	37.39175	0.835015
6	0.048523	63.13815	36.06507	0.796784
7	0.050415	61.28538	37.91889	0.795727
8	0.052041	58.64727	40.55182	0.800909
9	0.052816	56.94026	42.25533	0.804413
10	0.053137	56.75204	42.44996	0.798001

As shown in Table 5, in the first phase, the real estate price had a complete impact on me, and in the following phases, this impact capacity was gradually reduced to about 56%. The impact of money supply on real estate prices is gradually increasing, to the tenth period, the impact capacity accounted for 42%. Interest rates have little impact on real estate prices, indicating that the money supply has a more significant impact than interest rates on real estate prices.

5. CONCLUSION

If the government wants to control house prices, it needs to tighten the money supply. In the long run, M2 money supply has a significant positive effect on the housing price. Increasing the money supply can increase the housing price, but the excessive money supply will lead to excess real estate capacity, making the housing price too high and creating a bubble economy. The central bank needs to control the money supply to control house prices.

Second, in order to quickly improve the long-term management mechanism of the real estate market, the People's Bank of China has regulated the lending rate for many times, but the interest rates regulated by the government are far lower than the market interest rate, which hinders the market performance. However, if the market interest rates, not only monetary policy will become more effective, the central government can redistribution resources, and in the market in the economic policy, more importantly, the real estate industry can respond to the market, effective feedback to the real estate industry, better control the real estate prices, because it will be able to play a controlling role.

We will realize interest rate liberalization. In order to quickly improve the long-term management mechanism of the real estate market, the central bank has regulated the loan interest rate for many times, but the interest rate regulated by the government is far lower than the market interest rate, reducing the productivity of the market. However, after the realization of interest rate liberalization, monetary policy will be more effective, the central government can relocate resources and regulate economic policies in the market. More importantly, the real estate industry can also provide effective feedback to the real estate industry through the response to the market, so that the real estate price can be better controlled.

Because of the city policy. Given the current state of China's property market, average house prices have risen rapidly over the past 20 years. After the implementation of the "Four trillion yuan Plan", the difference in housing prices in different regions has become more and more obvious. The housing prices in first-tier cities in Beijing, Shanghai, Guangzhou and Shenzhen far exceed the average level, and there are too many idle houses in third and fourth tier cities, so the national property market is very different. Therefore, each city must introduce its own measures.1. Second-tier cities need to introduce strict measures, such as purchase restrictions, to control housing prices, while third-and fourth-tier cities need more modest measures to reduce inventories. The coordinated development of real estate regions is an important prerequisite for the healthy and sustainable development of China's real estate market, and the healthy development of the real estate market is an important prerequisite for stabilizing China's macroeconomic expectations.

We will strengthen financial regulation. The development of the real estate industry is inseparable from the high level of liquidity, and the contribution to the real estate market also generates speculative demand. Therefore, in order to control the real estate prices, we must strengthen the financial supervision, strictly prohibit the illegal inflow into the real estate industry, prevent the real estate prices from soaring, and curb consumption. The region should strengthen the management of mortgage loans and investment and financing channels, and strictly prohibit loan fraud, illegal recruitment and disguised mortgage loans. For real estate enterprises and home buyers, financial institutions should strictly conduct loan evaluation, so that real estate enterprises do not invest excessively, home buyers buy houses rationally, do not speculate and borrowing, prevent the bubble of the real estate market, and ensure the healthy development of the real estate market and economic market.

We will expand the housing rental market. At present, the phenomenon of real estate speculation is still serious. The government should consider and introduce equal rights in financing, taxation, security funds, rental housing and house buying, and take appropriate measures to support the construction of a healthy, standardized and prosperous housing rental market to meet the needs of more people. Governments should consider and introduce supportive policies on financing, taxation, protection funds and equal rights to rent and purchase, and establish a healthy and standardized housing rental market to meet the housing needs of young people. Local governments must take appropriate measures to promote the housing rental market as soon as possible to ensure the development of the housing rental market. We should strengthen the supervision of market transactions and speed up the establishment of a credit system. Local governments should introduce measures to promote the leasing market as soon as possible to ensure the development of the rental market. Formulate a regulatory system for market transactions, establish a leasing credit system, and protect the rights and interests of both parties in the leasing market. Increase the supply of leased space and encourage developers to invest in leasing projects. We will encourage people not to speculate on real estate and give surplus housing to rental companies, so as to expand and improve the rental market. The housing rental market should also be expanded and developed to encourage the

public to abandon housing speculation and leave the remaining housing to rental companies.

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