

The Macroeconomic Effect of Housing Price Fluctuation

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Abstract—The real estate industry is a pillar industry concerning the national economy and people's livelihood. A stable and healthy real estate market will benefit all residents, enterprises and government organs, and make the macroeconomic development better and the country stronger. Based on the data collected from China Economic Information Network and National Bureau of Statistics from March 2009 to March 2019, this paper studies the macroeconomic effect of housing price fluctuation by using ARDL model. The conclusions show that the housing price fluctuation has significant wealth effect and inflationary effect in the short run, while it has no significant impact on consumption, investment and inflation in the long run. Accordingly, we suggest that when formulating macroeconomic policies, attention should be paid to the impact of housing price fluctuation on macroeconomic variables. Moreover, the healthy development of the real estate market should also be taken into consideration.

Keywords—housing price; wealth effect; inflationary effect; ARDL model

I. INTRODUCTION

The State Council announced the complete cessation of housing distribution in kind and the monetization of housing distribution in 1998. Since then, the real estate market in China has experienced rapid development. On one hand, the real estate industry involves building materials industry, construction equipment industry, metallurgy, chemical industry and other industries. On the other hand, it is also connected with decoration industry, home appliances, transportation industry, commerce and other industries. The real estate industry has significant impact on these upstream and downstream industries. Moreover, it also contributes to the creation of employment and the promotion of national economic development. At the same time, it is also an indispensable asset in everyone's life. Therefore, it has gradually developed into a pillar industry of our national economy.

However, there is also a huge potential crisis behind the rapid development of the real estate industry. With the increasing of household income, the demand for housing grows quickly. In addition, as real estate is one of the most important properties for most families, some of them usually invest in it for the purpose of saving value, thus driving up housing price. The rise of housing price has led to the

prevalence of real estate speculation. In turn, this speculation has further pushed up the housing price. The vicious circle of higher housing price and more speculation makes the real estate price to break away from the basic law of supply and demand, creating a real estate bubble. This bubble is very dangerous. The most typical case is the global financial crisis in 2008. This crisis originated in the U.S. real estate market bubble burst and quickly spread to the global financial market. The global economy was plunged into depression, even some countries still failed to be fully out of the crisis. In order to avoid the great potential harm caused by the housing bubble, many scholars have focused on the real estate industry, and made extensive and in-depth research on its fluctuation rule and influence. They believe that there is a significant bubble in the housing price in China. Our government also issued many policies to control housing price, hoping to remove the bubble in the real estate market and put the house back into use.

Stable real estate market and reasonable housing price not only provide basic guarantee for people's happy life, but also play a key role in the stability of a country's macroeconomic and political situation. Therefore, it is of great significance to study the impact of real estate price fluctuations on macroeconomy and put forward some reasonable policy recommendations based on various impacts.

II. LITERATURE REVIEW

The analysis in this paper focuses on the relationship between housing price volatility and macroeconomic changes. A few researchers study the effect of a fall in house price on macro economy. Sterk (2015) found that a decline in house price in the U.S. would reduce geographical mobility, thus distorting the labor market. Gustafsson et al. (2016) showed that a drop in housing prices in Sweden would lead to a recession-like impact on household consumption and unemployment. The impact would be even worse if falling housing prices coincided with a global economic downturn. From the perspective of global economy, Cesa-Bianchi (2013) investigated the international spillovers of housing demand shocks on real economic activity. The results showed that the U.S. housing demand shock would create strong international spillovers to advanced economies, while the response of some major emerging economies is not significant. A growing number of studies also discuss the effect of house price on consumption. Berger et al. (2017) found that the consumption

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response to house price movements would be large in the U.S.. The size of the response depends on the economy's joint distribution of housing and debt. De Bonis & Silvestrini (2012) showed that real wealth had a positive effect on consumption in OECD countries. Dynan (2012) found that highly leveraged homeowners had large declines in consumption between 2007 and 2009 than other homeowners, suggesting that the leverage weighed on consumption is above that predicted by wealth effects alone. Mian et al. (2013) showed that debt and the geographic distribution of wealth shocks would explain the large and unequal decline in consumption from 2006 to 2009 in the U.S.. Cristini & Sevilla (2014) found that both rises in house prices and consumption are driven by common factors in the U.K..

In the context of China, Wu (2012) found that asset prices are increasingly closely related to the macro economy, and there is a mutual influence between them. Housing price have a strong impact on the real output and inflation, thus influencing the macro economy. Yang (2012) found that the macroeconomic volatility in the current period depends not only on the macroeconomic volatility in the lagged period, but also on the real estate price both in the current and lagged period. Specifically, the rising real estate price will reduce consumption, increase investment, and rapidly pull up GDP in the short run. Based on IS-Philips model, Ma & Liu (2014) showed that the impact of real estate price fluctuation on macro economy cannot be ignored. Therefore, monetary policies focusing on housing price fluctuation will be more effective. The specific operation is to construct a generalized price index including real estate price fluctuation. Zhou et al. (2017) believed that the interactive relationship between real estate price and macro economy is not stable, and it changed with time. Some macro variables and real estate price would even change fundamentally over time. In addition, the short-term time-varying impulse response has the highest volatility and heterogeneity, while the medium- and long-term response is more stable. Based on CGE model, Yuan & Wei (2012) found that the real estate price fluctuation has significant impact on various macroeconomic variables, specifically, it showed different impacts on urban residents within different income levels. Moreover, an increase in housing price would have a positive impact on economic growth, while a decline in housing price would negatively shock the economy.

III. DATA AND METHODOLOGY

Data

We collect data on housing price, total retail sales of consumer goods, investment in fixed assets and consumer price index from China Economic Information Network and National Bureau of Statistics. The data set used in this paper covers the period 2009-2019 during which housing price in China experienced remarkable increases. The effective sample begins in March 2009 and ends in March 2019, which yields a total of 121 observations.

Key measures and Variable Definitions

Housing price fluctuation: Based on the new commercial housing price index in 70 large and medium-sized cities, we

calculate the year-on-year growth rate to represent housing price fluctuation. Residential price index is a comprehensive reflection of the overall trend of housing price and the relative magnitude of the price change. Seventy large and medium-sized cities are all in high economic development level. The investment in real estate development in these cities accounts for a high proportion of the investment throughout the whole country. Therefore, the year-on-year growth rate of the new commercial housing price index in 70 large and medium-sized cities can be more representative of the housing price fluctuation.

Consumption fluctuation: We use the growth rate of total retail sales of consumer goods in the current period to measure consumption fluctuation. Total retail sales of consumer goods refer to the total amount of consumer goods sold directly to residents and enterprises in various industries throughout the country. Compared with other kinds of statistical indicators related to consumption, total retail sales of consumer goods is the most direct and commonly used indicator to show the level of national consumption demand.

Investment fluctuation: We use the year-on-year growth rate of the completed investment in fixed assets to measure the investment fluctuation. The completed investment in fixed assets refers to the amount of work done in the construction of fixed assets expressed in currency. This indicator is in line with the meaning of investment in macro-economy.

Inflation rate fluctuation: We use the year-on-year growth of consumer price index (CPI) to measure inflation rate fluctuation. Consumer price index is a macroeconomic index reflecting the change of the price level of goods and services generally purchased by households. CPI is one of the three most commonly used indicators to measure the degree of inflation.

Empirical Methodology

This paper mainly analyses the impact of housing price fluctuation on consumption, investment and inflation, respectively. In addition, there are also interactional relationships among consumption, investment and inflation.

We take the impact of housing price fluctuation on consumption as example. Firstly, the ARDL-ECM model is used to verify whether there is a co-integration relationship between the four variables. The co-integration equation is as follows:

$$\begin{aligned} \Delta Y_t = & \alpha + \sum_{i=1}^{p1} \theta_{1i} \Delta Y_{t-i} + \sum_{i=0}^{p2} \theta_{2i} \Delta HP_{t-i} + \sum_{i=0}^{p3} \theta_{3i} \Delta X1_{t-i} \\ & + \sum_{i=0}^{p4} \theta_{4i} \Delta X2_{t-i} + \delta_1 Y_{t-1} + \delta_2 HP_{t-1} + \delta_3 X1_{t-1} \\ & + \delta_4 X2_{t-1} + \mu_t \end{aligned} \quad (1)$$

In Equation (1), the dependent variable Y is consumption. HP indicates housing price. X1 and X2 represent investment and inflation, respectively. ΔY represents the first-order difference of consumption. ΔX represents the first-order difference of explanatory variables. P represents the largest lag

order, and μ_t is the error term. The co-integration relationship is tested based on the null hypothesis that θ and δ are both equal to zero. If the null hypothesis is rejected, it indicates that there is a co-integration relationship between variables.

Secondly, if there is a co-integration relationship, we can use ARDL model to test whether there is a long-term relationship between housing price and the other three macroeconomic variables. The ARDL model is as follows:

$$Y_t = C + \sum_{i=1}^n \varphi_{1i} Y_{t-i} + \sum_{i=0}^{m1} \varphi_{2i} HP_{t-i} + \sum_{i=0}^{m2} \varphi_{3i} X1_{t-i} + \sum_{i=0}^{m3} \varphi_{4i} X2_{t-i} + \varepsilon_t \quad (2)$$

In Equation (2), φ_{1i} represents the effect of the dependent variable lagged one period on the dependent variable in current period. φ_{2i} , φ_{3i} , and φ_{4i} represent the long-term effect of independent variables on the dependent variable, respectively. n and m represent the optimal lag order which is determined by AIC criterion. ε_t is the error term.

Lastly, a short-term error correction model (ECM) is established to test the short-term dynamic relationship between variables. The equation is as follows:

$$\Delta Y_t = \omega + \sum_{i=1}^n \beta_{1i} \Delta Y_{t-i} + \sum_{i=0}^{m1} \beta_{2i} \Delta HP_{t-i} + \sum_{i=0}^{m2} \beta_{3i} \Delta X1_{t-i} + \sum_{i=0}^{m3} \beta_{4i} \Delta X2_{t-i} + \gamma ECM_{t-1} + \tau_t \quad (3)$$

In Equation (3), β_{1i} represents the short-term effect of the lagged dependent variable on the dependent variable in current period. β_{2i} , β_{3i} , and β_{4i} represent the short-term effect of independent variables in lagged and current period on the dependent variable in current period. ECM is the lag error correction term, which reflects the speed of dependent variable corrects and returns to the long-term equilibrium level in the fluctuation. γ is the coefficient of the short-term correction speed. τ_t is the error term.

IV. RESULTS

Stationary Test

Table I shows the unit root test results obtained by ADF test. We can see that the comparative growth rate of house price (HP) and investment (IFA) are stable at the significant level of 1%, the original series of consumption growth rate (TRS) is stable at the significant level of 5%, and the inflation growth rate (CPI) is integrated of order at the significant level of 1%. In this case, the ARDL model is the most suitable method when the single integral order is different and the maximum single integer order is 1.

TABLE I UNITE ROOT TEST RESULTS

Variable	Sequence	ADF Statistical Value	Conclusion
HP	Primitive sequence	-5.7417***	Stable
TRS	Primitive sequence	-3.5067**	Stable
IFA	Primitive sequence	-13.6711***	Stable
CPI	Primitive sequence	-2.7221	Unstable
	First order difference sequence	-13.0536***	Stable

Note: ** p<0.05; *** p<0.01.

Cointegration Test

The above unit root test results show that the single integer orders of four variables are no more than one, so ARDL-ECM model can be used to test whether there is a co-integration relationship among these variables. The results are shown in Table II. It indicates that when the variables TRS, IFA and CPI are interpreted as dependent variables, there is a long-term co-integration relationship among them at the significance level of 1%. Therefore, we can further analyze how the variables interact with each other and whether the short-term variations are different from the long-term variations.

TABLE II COINTEGRATION TEST RESULTS

Dependent Variables	Lagged Differences	F Statistics	Cointegration or not
TRS	ARDL (2,2,0,0)	15.2547***	YES
IFA	ARDL (1,0,11,2)	10.6085***	YES
CPI	ARDL (11,12,10,12)	3.7896***	YES

Notes: *** p<0.01.

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1) *Wealth effect*: The wealth effect of housing price fluctuation is shown in Table III. The results indicate that the housing price fluctuation lagged four and five periods will have significant impact on consumption in the short run, that is, there is wealth effect. While in the long run, the impact of housing price on consumption is not significant.

TABLE III THE WEALTH EFFECT OF HOUSING PRICE FLUCTUATION

Short-term Relationship		
Variable	Coefficient	P value
ΔTRS_{t-1}	-0.3426***	0.0007
ΔHP_{t-4}	-42.0391*	0.0808
ΔHP_{t-5}	39.5469**	0.0166
ΔHP_{t-6}	-14.0133	0.1558
ΔIFA	0.0165	0.1381
ΔCPI	1.0763***	0.0048
ECM_{t-1}	-0.6628***	0.0000
Long-term Relationship		
HP	67.2665	0.5472
IFA	0.2604	0.5472
CPI	0.0073	0.9946
C	0.5053	0.4865

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

2) *Investment effect*: The investment effect of housing price fluctuation is shown in Table IV. The results indicate that the housing price fluctuation do not have any significant impact on investment in the long run or in the short run. The most important factor affecting investment is interest rate. Because there is no direct relationship between housing price fluctuation and interest rate fluctuation, the housing price fluctuation may not have a direct impact on investment.

TABLE IV THE INVESTMENT EFFECT OF HOUSING PRICE FLUCTUATION

Short-term Relationship		
Variable	Coefficient	P value
ΔIFA_{t-1}	0.0071	0.9325
ΔHP	42.5445	0.3999
ΔTRS_{t-3}	-2.7369***	0.0041
ΔTRS_{t-7}	-2.0985***	0.0018
ΔTRS_{t-11}	1.6110**	0.0325
ΔCPI_{t-2}	2.7602*	0.0547
ECM_{t-1}	-1.0340***	0.0000
Long-term Relationship		
HP	20.1426	0.2218
TRS	3.5072***	0.0000
CPI	-1.7228*	0.0700
C	-30.1737***	0.0000

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

3) *Inflationary effect*: The inflationary effect of housing price fluctuation is shown in Table V. The results indicate that housing price fluctuation will significantly affect inflation in the short run, that is, there is inflationary effect of housing price fluctuation. However, there is no significant relationship between housing price fluctuation and inflation in the long run.

The current housing price fluctuation has significant and positive impact on current inflation. The reason may be that rising housing price will increase residents' and enterprises' investment and consumption demand for real estate. However, this increasing demand will be difficult to satisfy in the short period. The situation of increasing demand but insufficient supply will lead to demand-driven inflation. On the other hand, the rising housing price will increase household wealth, improve household credit access, and raise the profits of the real estate industry, thus stimulating aggregate demand. As a result, it will also lead to the increase in demand-driven inflation. The currency multiplier effect will further magnifies the degree of inflation.

The housing price fluctuation lagged five periods has significant and negative impact on current inflation. The reason may be that housing supply gradually adjusted for the previous rise in housing demand in five months, possibly due to new housing supply created, or more households are willing to sell or rent their own houses as housing price went up. Therefore, the increasing housing supply would ease current inflation.

TABLE V THE INFLATIONARY EFFECT OF HOUSING PRICE FLUCTUATION

Short-term Relationship		
Variable	Coefficient	P value
ΔCPI_{t-4}	0.2215***	0.0094
ΔCPI_{t-12}	-0.3285***	0.0015
ΔHP	5.4714*	0.0696
ΔHP_{t-5}	-9.5271**	0.0302
ΔTRS_{t-6}	-0.1277**	0.0426
ΔTRS_{t-11}	-0.0534**	0.0363
ΔIFA_{t-1}	0.0119**	0.0471
ΔIFA_{t-2}	0.0057	0.1402
ECM_{t-1}	-0.1626***	0.0057
Long-term Relationship		
HP	7.2070	0.2104
TRS	0.4527***	0.0049
IFA	-0.0730	0.2029
C	-0.4603	0.1111

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

V. CONCLUSION

Since the reform of housing system in 1998 in China, the real estate market has developed rapidly. The rising housing price in some big cities made the problems related to housing price a hotspot. Based on the data on year-on-year growth rate of housing price, consumption, investment and CPI in China from March 2009 to March 2019, this paper uses ARDL model to investigate the co-integration, the long-term and the short-term relationship among these macroeconomic indicators. The results show that the housing price fluctuation has significant wealth effect and inflation effect in the short run, but it does not have any significant impact on consumption, investment and inflation in the long run.

Our main conclusions have important implications for the real estate market regulation in China. We should adhere to the general tone of "the house is for living, not for speculation", resolutely suppress speculation in real estate, so

that the house can return to the use function and the housing price can truly reflect the relationship between housing supply and demand. In recent years, local governments across the country have carried out policies such as "housing residence instead of vicious speculation", "deleveraging and debubbling" issued by the central government. The macro-control measures, such as pushing up the cost of purchasing house, and tenants have the same rights as home buyers, have achieved remarkable effects. In the future, relevant governmental departments should continue to implement housing price control policy, and innovate more appropriate and effective real estate market control tools, thus effectively solving the housing difficulties and strictly guarding against the systemic risks caused by the sharp housing price fluctuation.

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