

Econometric Analysis on Influencing Factors of Residential House Price Change

-- a Case Study of Hefei City in Anhui

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Abstract

In view of the influencing factors of the change of residential house price, this paper uses the relevant statistical data of Hefei City, Anhui Province from 2006 to 2017, extracts the indicators from the four aspects of urban house purchase demand, scientific and technological development, economic development scale and residential house construction cost, and makes a regression analysis on the residential house price combined with the method of principal component analysis. The results show that the scale of economic development and the level of higher education are the key factors affecting the change of house prices in Hefei. The level of scientific and technological development has relatively little impact. On this basis, combined with the relevant policies of Hefei municipal government, the change trend of house prices in the future is expected. It is found that although the house prices have fluctuated and increased in recent years, it is expected that the growth rate of residential house prices in Hefei will be further narrowed in the short term. However, even if house prices fall in some cities, there is less room for house prices to fall, and the potential upward pressure will be relatively large. According to the actual results, some suggestions are put forward for the change of house prices in Hefei.

Keywords

Residential house price; Principal component analysis; Real estate policy.

1. Introduction

In 2019, China first finance and economics graded Chinese cities according to the comprehensive aspects of China's urban construction area, cultural and environmental quality, urban GDP, economy and tourism, including 30 second tier cities. Over the past five years, there has been a marked differentiation in the rise of urban house prices in China. The house prices in the first tier cities are generally stable, with little change during this period. Most of the third and fourth tier cities have little increase, and the urban house prices lack growth power. In sharp contrast, the second tier cities have increased significantly in recent years, leading the country, and several of them have increased on a large scale. House prices are related to people's daily life, investors' investment and the trend of China's economy. Therefore, the growth of house prices in China has always attracted the attention of all sectors of society.

This paper aims at the rise of house prices in China's second tier cities, analyzes the reasons for the rise of house prices in second tier cities, and analyzes all the factors behind the phenomenon. Moreover, taking Hefei City, Anhui Province as a typical case for econometric analysis, it is finally concluded that the house price in second tier cities shows an increasing trend for a long time, but the growth rate even drops slightly, which is related to government regulation, and puts forward corresponding opinions and suggestions.

2. Index Selection and Data Source

2.1. Index selection

Due to the representativeness and operability of the data, the average sales price y (yuan / m^2) of commercial housing is selected as the explanatory variable, and the explanatory variable indicators affecting the change of residential house prices in Hefei are selected from four aspects: urban house purchase demand, scientific and technological development, economic development scale and residential housing construction cost.

In terms of urban economic development, urban and regional GDP can directly reflect the macro-economic development level and current development status of the region. The impact of urban economic development on the change of house prices is mainly reflected in two aspects: first, real estate is a special product in the socialist market economy, which has many characteristics, including ownership attribute, demand elasticity Trend and expectation, and its own multiple and multifaceted characteristics determine that the price of real estate products must be higher than that of ordinary bulk products. It is precisely because of its high value level that the demand for capital in the real estate industry is more necessary. It is a capital intensive industry. Second, economic development accelerates the sustainable driving force of urbanization and provides a broader development vision for real estate. With the increase of economic development and flow, low interest rates and loose loan conditions make the opportunities and amount of real estate development units' loans to banks more changeable [1]. Therefore, the regional GDP (100 million yuan) is selected as the index to measure the economic development of Hefei.

In terms of house purchase demand, according to the annual data of the National Bureau of statistics in 2018, the national house price index changes, the first tier and second tier cities show obvious differentiation, the real estate price index of the second tier cities to be developed continues to grow, and the house price increase of the first tier and second tier cities shows obvious differentiation. In 2018, the "talent war" in second tier cities continued to affect talent flow. All localities have introduced talent settlement policies to attract talents to settle locally. Second tier cities attract a large number of talents because of their relatively developed economy and good development prospects. On the one hand, talent accumulation plays a role in the rise of house prices. As the representative of high-quality groups, this flow intensifies the competition among talents in the region, increases the work pressure in the region, and greatly increases the housing demand, resulting in the imbalance between supply and demand and the rise of house prices. On the other hand, the externality of talents has an impact on regional house prices. A large number of talents flow into second tier cities, which improves the level of talent capital and makes them have stronger innovation potential and high-quality knowledge reserves. The value brought by talents will accelerate the improvement of urban social productivity and drive urban economic development. As an important part of urban economic development, the real estate industry will develop relying on the development of the city. The economic development of the city will also improve the overall wage level and consumption capacity of the city, so as to promote the rise of house prices. The housing prices in second tier cities have been promoted by the talent policy, and a large number of talents have poured in all over the country, which may bring rapid economic development and lead to rapid growth of housing prices. In terms of education, Hefei not only has world-famous colleges and universities, but also has intensive distribution of Applied Technology Colleges and universities, and the population with work needs must have considerable demand for housing. Therefore, the number of employed population (thousands) and the number of college students (thousands) are selected as indicators to measure the house purchase demand in Hefei.

In terms of sales cost, due to the continuous increase of urban land price and the increase of land sales price, the development cost of real estate developers has increased. In addition, the

rising cost of building materials and a series of transportation costs in recent years have led to the continuous rise of real estate construction costs. Due to the high level of economic development in the second tier cities, the wage level is higher than that in the third and fourth tier cities, and the labor cost during real estate development is higher than that in the third and fourth tier cities. Therefore, the investment in real estate development (100 million yuan) is selected as a representative factor of comprehensive costs, including construction and sales costs [2].

In terms of science and technology development, as Hefei is one of the three science and technology cities in China, the impact of its science and technology development level can not be underestimated. Famous universities, scientific research institutions and large-scale experimental sites such as University of science and technology of China, Chinese Academy of Sciences and Science Island have all landed in Hefei, focusing on the idea of house price prediction in the future, The factors that can quantify the level of scientific and Technological Development in Hefei should be taken into account. Because it is difficult to obtain the data of annual scientific research funds, the acceptance volume (items) of patent applications is selected to measure the impact of scientific and Technological Development on house prices in Hefei.

Table 1. Framework of influencing index factors of price change of residential housing

Explained variable	Primary index	Secondary index
Average selling price of residential housing Y	Economic development	Regional GDP
	House purchase demand	Number of employed population
	Cost of sales	Number of students in Colleges and Universities
	Scientific and Technological Development	Investment in real estate development
		Acceptance of patent applications

2.2. Data source and data processing

The data selected in this paper comes from Anhui city and county data statistical database of EPS global statistical data platform. The sample spans the time interval from 2006 to 2017, with a total of 12 groups of data. See Table 2 for the original data. Before directly using the data in the table, the data shall be standardized to make the data comparable [3]. The specific standardized processing methods are as follows:

$$X_i = (x_i - \mu_i) / \sqrt{\sigma_i}$$

Where: μ_i is the sample mean and σ_i is the sample variance.

Table2. Original data of house prices and influencing factors in Hefei from 2006 to 2017

	Y	X1	X2	X3	X4	X5
2006	3131	1073.76	2705	352.188	275.705	7834
2007	3326	1334.2	2865	508.977	300.2	8345
2008	3592	1776.86	3014	710.791	320.497	10928
2009	4228	2102.13	3070	851.751	352.091	11823
2010	5904	2961.67	3445	1046.75	372.576	14459
2011	6326	3636.62	4762	1130.5	409.507	11478

2012	6156	4164.32	4894	1182.44	425.137	15142
2013	6283	4684	5044	1399.19	443.401	19425
2014	7157	5180.56	5139	1497.98	462.614	25393
2015	7695	5660.27	5237	1731.58	489.179	32364
2016	9369	6274.38	5303	1700.52	499.515	50792
2017	10751	7003	5381	1846.08	502.943	61340

3. Empirical Analysis

In this paper, Eviews is used to analyze the main indexes of the causes of house price fluctuation in Hefei, so as to obtain the principal component framework affecting house price change in Hefei. Then, on the basis of the principal components of the impact of house prices in Hefei, the linear regression analysis is carried out between the house prices in Hefei and the components of the captured principal components, and the regression model affecting the change of house prices in Hefei is further obtained. After observing the impact of various explanatory variables on the fluctuation of house prices in Hefei, Finally, combined with the relevant government regulation policies and curve trend, this paper forecasts the house price in Hefei in the future, so as to put forward reasonable suggestions to regulate the house price fluctuation in Hefei.

3.1. Modeling

The multiple regression model for OLS (ordinary least squares estimation) estimation of Y with Eviews is as follows:

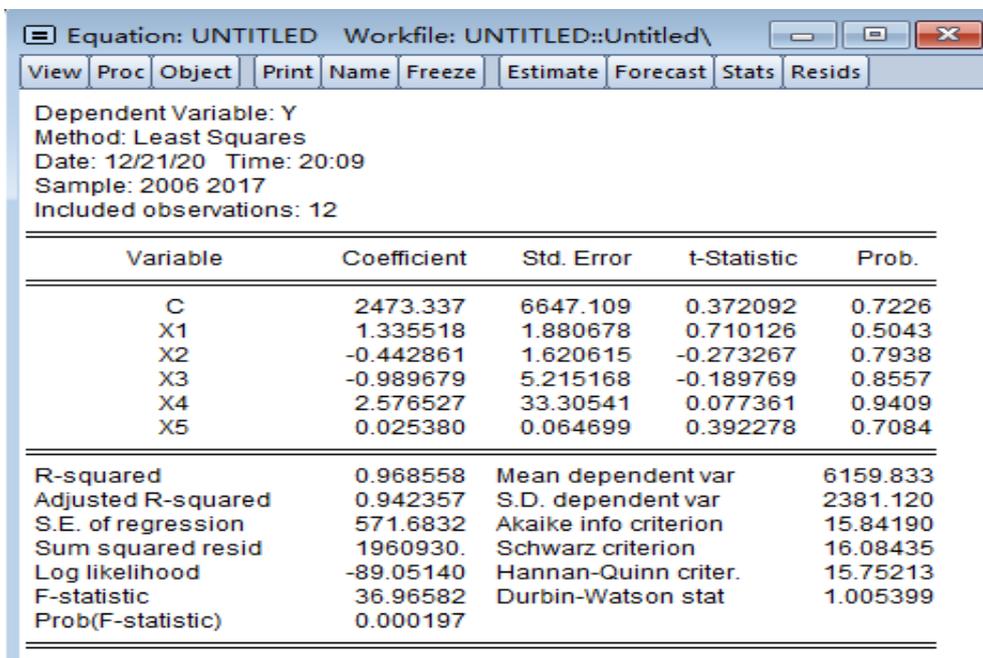


Figure 1. Sample interval regression results

The regression result is:

$$Y = 2473.3370 + 1.3355X_1 - 0.4429X_2 - 0.9897X_3 + 2.5765X_4 + 0.0254X_5$$

The t-test values are 0.7101 -0.2732 -0.1898, 0.077 and 0.3922 respectively, and the determination coefficients are $R^2 = 0.9686$, $F = 36.9658$, $S.E = 571.6832$ and $D.W = 1.0054$.

The model $R^2 = 0.9686$, and the decision coefficient is very high, indicating that the model fits well. The F test value is 36.9658, which is significantly higher than the critical value $F(5, 66)$. However, the economic significance of x_2 and X_3 failed to pass the test, so they are deleted in the following Eviews modified multicollinearity analysis.

3.2. Model inspection

(1) Test of Multicollinearity

Calculate the correlation coefficient of each explanatory variable and establish the auxiliary regression equation at one time to obtain the correlation coefficient matrix of each explanatory variable and as follows [4]:

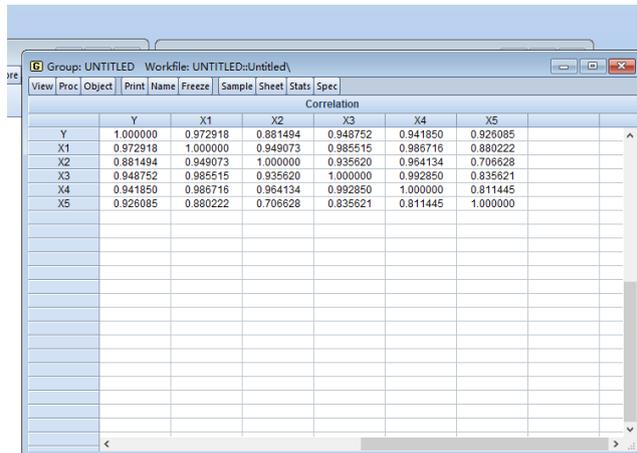


Figure 2. Correlation coefficient matrix

It can be seen from the correlation matrix that the correlation coefficient between the explanatory variables is high, which proves that there is a certain multicollinearity.

The stepwise regression method is used to modify the multicollinearity and establish the univariate regression model. According to the correlation coefficient test, the correlation of regional GDP X_1 is the strongest. The output data corrected by stepwise regression method is as follows:

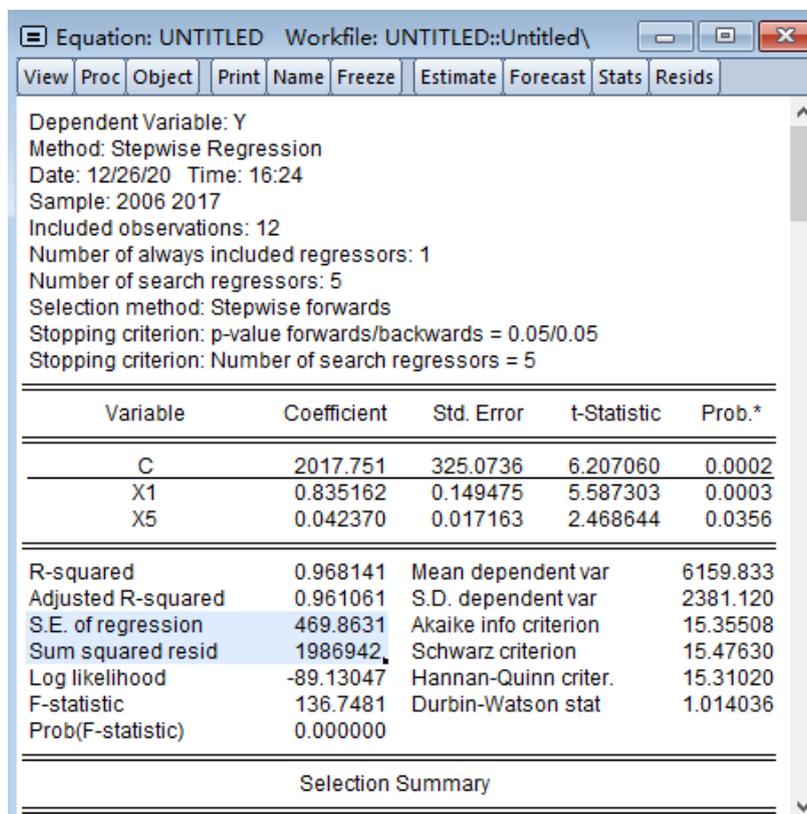


Figure 3. Results of stepwise regression analysis

After the above gradual introduction of the test process, it is finally determined that the influencing factor function of Hefei house price is $Y = 2017.751 + 0.8352X_1 + 0.0424X_5$, and the judgment coefficient $R^2 = 0.9681$, which is close to 1, indicating that the model has a high degree of fit to the sample data, and the p value of F test is significantly less than 0.05, indicating that the combination of X_5 and X_1 has a significant impact on Hefei house price. At the same time, the t-test of X_1 and X_2 coefficients passed, indicating that the explanatory variables alone have a significant impact on Y

(2) Heteroscedasticity test

In this paper, white test is selected to test the heteroscedasticity of the model. The test results are as follows:

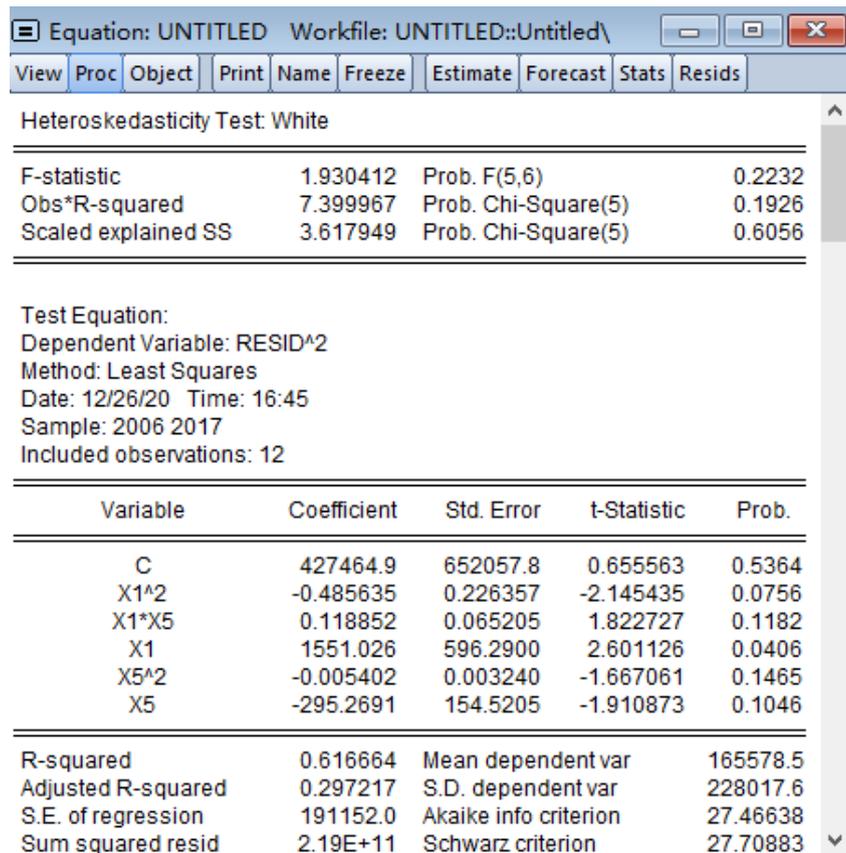


Figure 4. White test results

As can be seen from the above figure, the p value of NR^2 is 0.193, which is significantly greater than 0.1, indicating that there is no Heteroscedasticity in the model.

(3) Autocorrelation test

According to figure 1, the DW value is 1.0140. Looking up the table at the significance level of 0.05, it can be seen that $DL = 0.658$ and $Du = 1.864$. According to the calculation, DW falls in the uncertain interval, so LM Test is adopted. The LM test results are as follows:

According to LM analysis, the p value of NR^2 is significantly not 0, so there is high-order autocorrelation.

According to the regression equation, the above factors can promote the house price in Hefei. According to the standard coefficient, the impact on the house price in Hefei can be obtained: for every relative unit of economic development, the average real estate price in Hefei will rise by 0.8352 (yuan/m²). Comprehensively, the most important factor of house price fluctuation in Hefei is economic development. The level of patent application, that is, the development of science and technology, has less impact on the change of house prices [5].

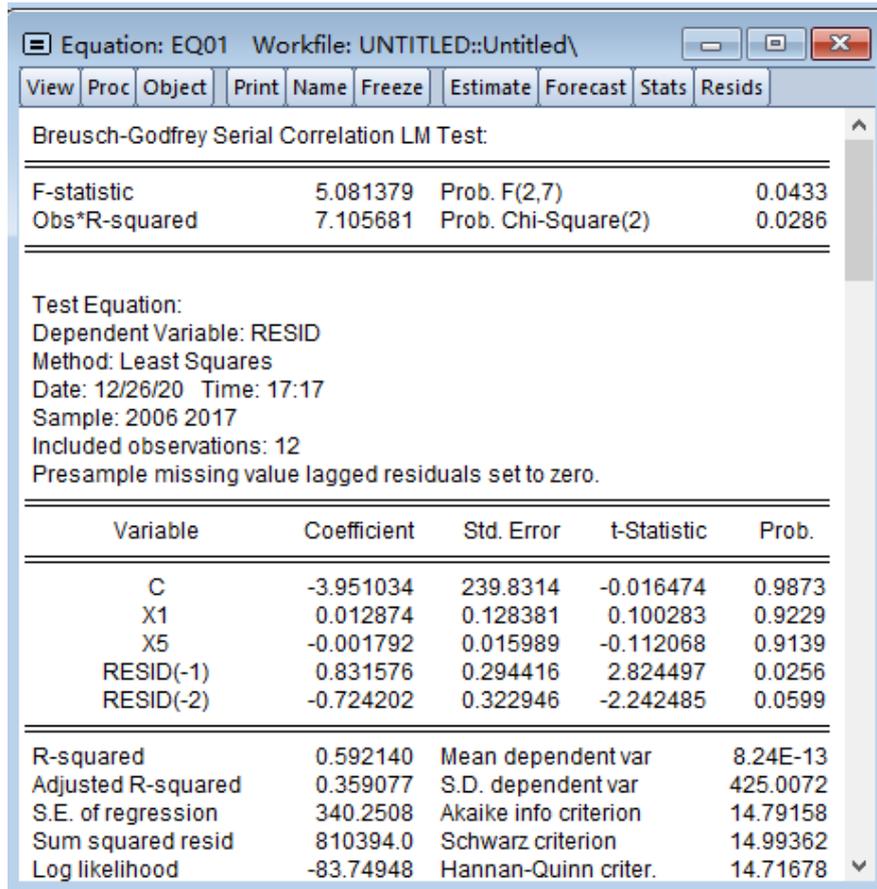


Figure 5. LM Test Results

Economy: the rise of house prices in recent years is mainly due to the increase of speculative demand. At present, some buyers of real estate are used for building houses after buying land. Buying a house is for living. These people can be called real productive and living consumers. Others buy land to sell at a higher price, and buy houses to sell at a higher price. They regard real estate as an investment or speculation. Because they use bank loans, such investment or speculation has the nature of financial products. Therefore, some countries directly integrate real estate into the financial market.

Today's Hefei housing market situation is somewhat similar to the characteristics of Jifen goods, that is, a commodity, when the price rises, the demand should have decreased, but increased. In the stage of soaring house prices, people's demand for houses has increased. On the one hand, it is due to the rapid development of economy, science and technology in Hefei, on the other hand, it is also the speculative psychology of buyers. They believe that house prices will continue to rise in the later period. Whether it is to buy at a lower price in the current period or sell at a higher price in the later period, it will increase the demand for houses. This is related to the impact of supply and demand.

Educational resources: educational resources are mainly the study of school districts in primary and secondary schools. The results show that school districts have a significant impact on the change of house prices, and the distribution of Hefei school districts affects the distribution of house prices in school districts. Among them, the influence of primary school district decreases from the southeast of the city to the north of Binhu New Area. Hefei is the main brand of science and education. The school district has always been an important consideration for buyers to choose houses. At the same time, the newly-built and relocated well-known primary schools are concentrated in the south of Binhu New Area. Due to the division of a single school and many real estate development around the school, the real estate in this area has always been the focus of the whole city. Secondary school districts drive the

growth of real estate prices, mainly in Shushan District, Luyang District and Yaohai district. These areas are evenly distributed with old brand high-quality secondary school resources and high-quality education opportunities, which have become the main factors affecting the change of real estate prices. The quality of secondary schools in other regions is relatively balanced, so the impact on the change of real estate prices is general [6].

Policy: during the implementation of the new deal, Hefei restricted the purchase of housing in the four old urban areas, including Shushan, Baohe, Luyang and Yaohai, but not in other areas. The main content of the purchase restriction is that Hefei local accounts are limited to two sets and three sets are prohibited. Foreign accounts can buy houses by providing one-year social security or tax certificate. From the perspective of the new deal, the purchase restriction is more like a balance of real estate in Hefei, introducing more groups ready to buy houses in the urban area into newly developed areas. Reflecting on the implementation effect of strict "purchase restriction" and "loan restriction" policies, while cracking down on investment and speculative demand, it has greatly harmed rigid and improving demand. Just a few weeks after the introduction of the new deal, the sales volume of Hefei real estate market fell by nearly 62%, and the decline rate in the next few weeks was as high as 329% compared with the first week. However, while the trading volume plummeted, the price did not decline as expected, and recovered a year later .

4. Conclusions and Recommendations

4.1. Conclusion

As a pillar industry and an important basic industry, the real estate industry has a direct impact on the development of the national economy and the security of the macro-economic system such as the financial market. Therefore, to avoid the sharp rise and fall of house prices and ensure the healthy and stable development of the real estate market is the top priority at this stage.

Over the past five years, house prices in Hefei have been growing continuously. According to this research and the analysis of various reasons, the driving force behind the sustained growth of house prices in Hefei can be summarized into two parts: on the one hand, under China's overall economic situation, the overall house prices show an upward trend caused by monetary policy, and the introduction of a series of policies by the state brings more development opportunities and rising house prices to second tier cities. The research object: the rise of house prices in Hefei, Anhui Province includes scientific and technological factors, educational background factors and other reasons. In other aspects, the rising factors of house prices also include employment factors, cultural factors, geographical factors and other multiple reasons. The improvement of house prices in areas relatively far from the urban center by rail transit is more obvious. Only by analyzing the reasons for the formation of house prices according to local conditions can we more effectively optimize the spatial structure of house prices in urban construction.

Based on the above factors, it is expected that the overall increase rate of house prices in Hefei may be further narrowed in the future. House prices in urban areas will be further differentiated. Some regions still maintain a high growth rate, but the real estate momentum in other cities is weakened, and the growth rate of house prices will slow down or even decline slightly. Generally speaking, the house prices in the districts of Hefei are still rising, but the invisible pressure of increase may be greater than that in other cities. In the context of China's urbanization, Hefei, as a new Star City, an innovation highland, whether it is the inflow of population or the preferred area for high-end industrial agglomeration, the contradiction between supply and demand of residential housing types will continue to show. Therefore, stabilizing the fluctuation of house prices in Hefei as soon as possible and ensuring the stable

development of the real estate industry is of great significance to the overall economic development of Hefei.

4.2. Recommendations

From the perspective of horizontal comparison with other developed countries and vertical comparison with the development history of other countries, the real estate industry has indeed made great contributions to the economic development of these countries. Of course, everything has its opposite. For example, the reason why Japan's economic recession for ten consecutive years is the decline of the real estate bubble and the financial flooding that swept the world in recent years is also caused by the double vortex of American real estate enterprises and banks. So, combined with the growth of the domestic second tier cities such as Hefei City, is there a bubble in the domestic real estate industry?

At present, the construction and purchase of houses in Hefei are hot, and the house price is basically in the situation of sky high price or moderate and steady rise. The moderate rise is also due to the dual regulation of the government and the market. For the house price and market depression in the third and fourth tier cities, or the high vacancy rate of houses, the real estate development in Hefei mentioned in this paper seems to be unbalanced and normal.

In view of this situation, Hefei municipal government should take a set of implementable measures and methods to promulgate different regional laws and regulations of cities and counties, so as to promote the healthy development of the real estate industry in the future: Reasonably determine the local house price control objectives; the construction width and strength of affordable housing projects should be expanded; Improve relevant tax policies and strengthen tax collection and management; Strengthen differentiated housing credit policies; all cities and non urban central areas in Hefei need to increase the effective supply of land and meet the requirements of affordable basic housing; the provincial capital city registered residence third family stop buying, second non registered residence households stopped buying; revise and improve the interview and accountability mechanism for housing security and stabilizing house prices; adhere to and strengthen the guidance of public opinion.

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