Research on Influencing Factors of Average Sales Price of Residential Commercial Housing in Major Cities of China

Yu Bai 1,a

1 School of Economics and Management, Beijing Jiaotong University, Beijing, China

a email: 14241209@bjtu.edu.cn

Abstract. Housing prices are closely related to a country's social stability, political economy, etc., and its fluctuations will also be affected by many factors. This paper collects relevant data from 35 major cities in China over the past ten years to study the effects of changes in different factors on housing prices. It mainly uses multiple regression analysis and panel regression analysis to guide residential sales prices more scientifically and effectively. It is of certain significance to promote the healthy and orderly development of the real estate market.

1. Introduction

In recent years, the rapid development of my country's real estate industry has largely driven the overall economic development. But on the other hand, housing prices are also rising steadily.

Zhang Ke (2019) believed that housing price was an important livelihood issue that affected social stability. It would be affected by many macro and micro factors, including political laws, financial institutions, and household disposable income. Ren Murong (2009) believed that population structure and changes also affected housing prices. Zhang Jiarui and Chen Shaogang (2020) conducted a study on the fluctuation of housing prices in Chengdu on this basis, and found that the increase in the price of their residential commercial housing will promote the economic development of Chengdu, and the reason for the increase in housing prices is the influx of a large number of people. Yi Ying and Liu Meiling (2019) conducted a research on panel data from 31 provinces in my country and pointed out that housing prices will be affected by per capita income and population. Liu Cong (2019) found that Beijing's housing price changes and per capita disposable income and GDP change in the same direction through principal component analysis.

According to classic economic theory, the price of ordinary commodities is determined by the supply and demand of commodities. However, since real estate has the dual attributes of ordinary consumer goods and investment goods, and the real estate supply and demand sides will also be affected by various national macro policies, the factors and mechanisms affecting real estate prices are more complicated. Based on the relevant data of 35 major cities in my country, this paper studies the impact of changes in influencing factors on the housing prices, and then analyzes some of the reasons that promote the continuous rise of housing prices in my country.

Studying the influencing factors of residential commercial housing sales prices and the correlation between time and space has certain significance for guiding residential sales prices more scientifically and effectively and promoting the healthy and orderly development of the real estate market. In addition, understanding the characteristics of the real estate market in different time and space can also guide the formulation of market investment strategies.
2. Variable Settings and Data Selection

2.1. Setting and Preliminary Analysis of Variables
The price of residential commercial housing may be affected by many factors. The average annual sales price of residential commercial housing is selected as the explained variable. The total population at the end of the year, GDP, the average wage of the workers on the job, environmental noise, the sales area of residential commercial housing and the amount of real estate development residential investment are selected as the explanatory variable.

The sales area of residential commercial housing represents the quantity of housing supply. The more sales area and supply, the competition will be less and the general housing sales price will be reduced. On the other hand, the greater the amount of investment in real estate development represents the higher valuation and return expectations of the house, which may lead to higher house prices.

The impact of environmental noise on housing prices is not very clear. It may have a positive correlation with the sale price of residential housing.

Table 1. Definition of factor variables for the average sale price of residential commercial housing.

| Type of Variable | Variable Conforms | Meaning of variable                              |
|------------------|-------------------|-------------------------------------------------|
| Explained Variable | price             | Average sales price of residential commercial housing (per yuan square meters) |
|                   | number            | Total population at the end of the year (per ten thousand people) |
|                   | wage              | Average wages of on-the-job workers (yuan)       |
| Explanatory Variable | area             | Residential commercial housing sales area (per ten thousand square meters) |
|                   | noise             | Ambient noise (dBA)                              |
|                   | gdp               | Gross domestic product (per billion yuan)        |
|                   | invest            | Real estate development residential investment (per billion yuan) |

2.2 Data Collection
According to the variable setting, the report selects data for 35 major cities in China including Beijing, Tianjin, Shijiazhuang, Taiyuan, Hohhot, Shenyang, Dalian, Changchun, Harbin, Shanghai, Nanjing, Hangzhou, Ningbo, Hefei, Fuzhou, Xiamen, Nanchang, Jinan, Qingdao, Zhengzhou, Wuhan, Changsha, Guangzhou, Shenzhen, Nanjing, Haikou, Chongqing, Chengdu, Guiyang, Kunming, Xi'an, Lanzhou, Xining, Yinchuan and Urumqi during the ten years from 2008 to 2017. The data comes from the website of the National Bureau of Statistics.

2.3 Descriptive Analysis
Firstly, a basic descriptive statistical analysis of the data was performed. The analysis results are shown in Table 2.

Table 2. Descriptive statistics of all variables

| Variable | Mean  | Std. Dev. | Min  | Max   |
|----------|-------|-----------|------|-------|
| price    | 8273.874 | 5799.311  | 2511 | 48622 |
| number   | 725.2609 | 550.8902  | 152.27 | 3392.11 |
| wage     | 55416.73 | 19698.48  | 22432 | 134994 |
| area     | 1047.485 | 820.4908  | 103.64 | 5452.65 |
| noise    | 54.81629 | 1.527679  | 50.2  | 60 |
| gdp      | 6380.656 | 5507.309  | 422.19 | 30632.99 |
| invest   | 678.7431 | 519.4628  | 37.76 | 2632.88 |

3. Analysis and Test of Regression Results
Five models were set up for multiple regression analysis by using the 2017 data.

Model1  \[ \text{price} = \beta_0 + \beta_1 \text{number} + \beta_2 \text{wage} + \beta_3 \text{area} + \beta_4 \text{noise} + \beta_5 \text{gdp} + \beta_6 \text{invest} \]

Model2  \[ \text{price} = \beta_0 + \beta_1 \text{number} + \beta_2 \text{area} + \beta_3 \text{gdp} \]
In the regression of model 1, only the regression coefficient of GDP is significant at the level of 1%. The gross domestic product of each city has a significant positive impact on the price of residential commercial houses, and these explanatory variables explain 68.85% of the explained variables Fluctuations. After excluding some variables, only one independent variable, GDP, is still significant in Model 2, and it becomes impossible to reject the assumption that the linear form is correct at the 5% significance level.

Model 3 is a double logarithmic model. More variables become significant and R-squared and adjusted R-squared increase. Therefore, Model 3 is better than the first two models and can better explain price fluctuations. It can be seen from the regression results that the population of each city has a significant negative impact on the average selling price per square meter of residential commercial
houses. The larger the population of each city, the lower the selling price of residential commercial houses. This is in line with our previous hypothesis. Is inconsistent. The influence directions of other factors are consistent with the assumptions.

Model 4 added the bungalow item, the regression effect did not improve, but declined. Model 5 tried to add an interaction term, and the regression effect was second only to Model 3. It also got the conclusion that the population of each city has a significant negative impact on the price of residential commercial houses.

4. Panel Regression Analysis

Based on the above analysis, model three is selected for full-sample regression analysis. Regression of panel data was performed in four ways: never controlling any fixed effects, only controlling individual effects, controlling only time effects, and controlling individual and time effects at the same time. The regression results are integrated as shown in Table 4 below.

Table 4. Summary of different panel regression results.

| Dependent Variable: price |
|--------------------------|
| lnnumber                |
| -0.2915*                |
| (0.1125)                |
| lnwage                  |
| 0.3286**                |
| (0.1123)                |
| lnarea                  |
| -0.3330**               |
| (0.0656)                |
| noise                   |
| 0.0439*                 |
| (0.0186)                |
| lngdp                   |
| 0.5314**                |
| (0.0796)                |
| lnnvest                 |
| 0.1645*                 |
| (0.0765)                |
| constant                |
| 1.4863                  |
| (1.7687)                |

Note: Standard errors in parentheses. * p < 0.05, ** p < 0.01.

On the whole, the F-test of the four regressions is significant, but with the addition of time and individual effects, the coefficients of the explanatory variables gradually become more significant. It can be judged that the regression of adding time and individual effects at the same time is more appropriate. And as the urban population increases, the city’s housing prices will decrease accordingly, which is contrary to the preliminary analysis results of the variables; as the average salary of the urban working population increases, the city’s GDP increases, and the city’s environmental noise increases, the housing prices will decrease. Correspondingly, the decrease in sales area and the increase in investment will also cause house prices to rise, which are in line with the initial assumptions.

The city’s GDP, average salary of the population, environmental noise, and investment can all directly or indirectly show the city’s economic development level. These can all represent the city’s demand for housing from the side. The increase in demand will indeed bring about housing prices. In addition, the sales area represents the supply level of urban houses, and the increase in supply will lead to a decrease in housing prices. These can show the general commodity attributes of houses, and the price depends on demand and supply. However, the negative correlation between population review and housing, here is speculation that it may be due to the increase in population. The government tries to help more people buy houses through certain policies such as appropriate control of housing prices, thereby reducing housing prices.
5. Conclusion
In summary, the overall economic level of a city such as GDP and average wages of employees has a positive effect on the average sales price of residential commercial housing in the city. The amount of residential real estate investment and the city’s environmental noise will also have a positive effect on housing prices. However, the sales area of urban residential commercial houses and the urban population have a negative correlation with housing prices. This can show to a certain extent that, without causing economic recession and other problems, the growth of housing prices can be controlled by appropriately reducing the amount and intensity of residential real estate investment or introducing favorable policies for low-income groups related to the purchase of houses. And as my country develops to a certain stage, the decline in GDP growth will also slow down the growth of housing prices.

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