

Empirical Testing of Influencing Factors of China's Housing Prices - Evidence From Provincial Panel Data

Yajie Bai¹ & Min Tan¹

¹ SHU-UTS SILC Business School, Shanghai University, Shanghai, China

Correspondence: Min Tan, SHU-UTS SILC Business School, Shanghai University, 20 Chengzhong Road, Jiading District, Shanghai 201899, China.

Received: January 5, 2018

Accepted: January 15, 2018

Online Published: March 15, 2018

doi:10.5430/rwe.v9n1p9

URL: <https://doi.org/10.5430/rwe.v9n1p9>

Abstract

This paper empirically tests influencing factors of China's housing prices utilizing provincial panel data. Empirical results find that unemployment rate, aging rate, and elderly dependency ratio have a negative relation with average selling price. Completed real estate area, year-end population, population growth rate, GDP, and disposable income of urban residents are positively related with average selling price. This paper divides China into East, West, and Centre. Influencing factors of housing prices are tested in three regions, respectively. Among all influencing factors, completed real estate area, elderly dependency ratio, and year-end population have significant impact on housing prices in the East, while have little impact on housing prices in the Center and the West.

Keywords: housing prices, real estate market, panel data

1. Introduction

This paper empirically tests influencing factors of China's housing prices by utilizing a panel data of 31 provinces spanning from 1999 to 2015. In the past 50 years, considerable changes have taken place in China's real estate market. There is a tremendous increase in the size of China's real estate market, especially in some areas. Market investment and leased area have attained a growth rate of 85% in the past 17 years. The housing price also experienced a drastic increase. From 1999 to 2015, the housing price almost tripled across the country, and in some major cities such as Beijing, Shanghai, Guangzhou, Shenzhen *etc.*, the housing price increased nearly twenty times. People find it increasingly difficult to afford a property.

The real estate market is closely related to people's livelihood. As a complicated market with a large number of different participants and various interests associated with complex areas, housing price fluctuates due to a variety of factors, including macroeconomic environment, consumption structure, demand and supply changes *etc.*. In a competitive market, equilibrium price is determined by the demand and supply, *i.e.*, the housing price is determined by consumers and real estate developers. Housing prices do not only depend on the stability and development of the national economy, but also reply on vital interests of the public.

2. Related Literature

A great deal of previous literature pertains to influencing factors of housing prices. Only a partial selection of previous literature is discussed here. Wang (2013) proposes that although theoretically market demand and market supply jointly determine the equilibrium price, China's current consumption and investment demand are experiencing a strong growth. Real estate market is almost equivalent to the seller's market. Therefore, the housing price in China is determined by macroeconomic policy and the supply of the real estate market. Cao (2005) argues that finance determines the demand of the real estate market, and land determines the supply of the real estate, so the market tools to adjust the housing price are finance and land. Land price is one of the major concerns of real estate developers, while consumers need to consider construction area of housing in certain area. Tang (2016) proposes that the housing price is positively related to construction area, while negatively related to sales area based on modern asset pricing and demand and supply theory. Besides, housing prices have significant impact on second-tier cities. Song (2016) constructs a housing market equilibrium model using commercial housing market data from 2001 to 2014 analyzing the effect of demand, supply, and real estate tax on housing prices. It argues that supply and increase in housing construction cost decrease the housing price, while the demand of real estate raises housing price. So the

government should consider all of the factors to adjust commercial housing prices.

From the perspective of equilibrium of demand and supply, Song (2009) divides the demand of real estate into “rigid demand” and “investment demand”. By analyzing different demand, peculiarity of the short-term equilibrium and the process of the adjustment of real estate market, it points out that the natural adjustment of housing price would be a substantially fluctuation. Therefore, the government has to enhance monitoring the real estate market. Factors that influence “rigid demand” include population, aging of population, and ratio of newborn. Zheng (2016) explores the reason for the rise of housing price from the perspective of population structure. It states that human are the consumption subject and living demand is the basic demand for human, so the alteration of population determines the effective demand of real estate. Based on interprovincial panel data from 2001 to 2004, it analyzes how the housing price is affected by changes in marriage registration. Besides, on account of China’s population status, it makes predictions and policy recommendations on housing price. In addition to population, people’s pecuniary condition is also a key point of the real estate market demand. Abraham and Hendershott (1966) establish a pricing model of commercial residential buildings on the basis of considering the lag process. It finds that residents’ income, employment rate, and construction cost have relation with the housing price. The level of urban economic development, employment status in cities, and household income also positively affect housing price significantly.

At the macroeconomic and national policy level, Zhang (2001) utilizes data of Beijing and finds that GDP and construction cost are the main factors which influence the changes of housing price in Beijing. Xi (2004) proposes that residents’ disposable income and bank interest are the major influencing factors of Tianjin’s real estate market. In light of British commodity housing data, Nollis and Long (1981) point out that the master sheet of the changes of housing price is residents’ income and other influencing factors including capital stock of the mortgage and the lending rate in the community. Shang (2004) lists the major macroeconomic indicators which influence housing price: per capita income, unemployment rate, mortgage rate, construction investment, and industrial output. The price trend of the real estate market cannot be separated from the macroeconomic environment and investors’ confidence.

3. Data and Model Selection

This paper chooses the annual data of 31 provinces and autonomous cities, excluding Hong Kong, Macao and Taiwan, from 1999 to 2015. The panel data set consists of 496 observations. Influencing factors of housing prices are analyzed from the perspective of demand and supply, and as the situation varies from region to region, East China, West China, and Central China are analyzed, respectively. The data are gathered from the Statistical Yearbooks and the National Bureau of Statistics.

According to the illustration mentioned before, this paper selects eleven variables as explanatory variables, including real estate construction area, real estate completion area, real estate sales area, per capita disposable income of urban residents, unemployment rate, total year-end population, population growth rate, aging rate, child care ratio, old age ratio and gross domestic product. Among them, real estate construction area and completed real estate area proxy the factors of real estate supply market, while real estate sales area, unemployment rate, total year-end population, population growth rate, aging rate, child care ratio, old age ratio proxy the factors of real estate demand market. GDP and urban residents’ disposable income per capita proxy the macroeconomic environment. Since the stability of housing price, real estate construction area, completed real estate area, real estate sales area, per capita disposable income of urban residents, total annual population, and GDP are spread out in a large range, logarithm is taken to smooth these factors.

All variables are found to be stationary. First of all, the basic model of panel date is selected, among Random Effect Model, OLS Model, and Fixed Effect Model. To compare the OLS Model and Random Effect Model, Random Effect Model is built first. Breusch-Pagan Lagrange Multiplier test finds that random effect model is better than OLS. F test finds that fixed effect model is better than OLS. Hausman test finds that Fixed Effect Model is better than Random Effect Model. Considering the correlation among different cross-sections, Friedman method is used to test the cross-sectional correlation. The Friedman test shows that P value is 0.1897, which is greater than 0.05, so do not refuse the null hypothesis. The panel data do not have cross-sectional correlation. Wald test finds strong presence of heteroskedasticity.

The regression equation is as follows.

$$\ln price = \alpha + \beta_1 con + \beta_2 com + \beta_3 sal + \beta_4 lninc + \beta_5 une + \beta_6 lnpop + \beta_7 gro + \beta_8 age + \beta_9 kid + \beta_{10} old + \beta_{11} lngdp + \mu,$$

where α is the intercept, β ($i=1,2,3,4,5,6,7,8,9,10,11$) is the coefficient, μ is a random error term. Regression results and robustness check results are shown in Table 1 and Table 2.

Table 1. Nationwide Regression Results

Explanatory Variables	Explained Variable: Housing Price				
	Reg 1 Coefficient (Std. Err.)	Reg 2 Coefficient (Std. Err.)	Reg 3 Coefficient (Std. Err.)	Reg 4 Coefficient (Std. Err.)	Reg 5 Coefficient (Std. Err.)
Real Estate Construction Area	0.054553 (0.0533275)	-0.0041243 (0.0183478)	0.054553 (0.0778837)	-0.0041243 (0.011936)	0.054553 (0.0339711)
Completed Real Estate Area	0.0035405 (0.0518259)	0.0315338** (0.0156066)	0.0035405 (0.0672241)	0.0315338** (0.0137458)	0.0035405 (0.0479216)
Real Estate Sales Area	-0.0388429 (0.0515594)	-0.0480414 (0.0388783)	-0.0388429 (0.0307787)	-0.0480414 (0.0404481)	-0.0388429 (0.055425)
Per Capita Disposable Income of Urban Residents	0.5160097*** (0.1043181)	0.2427206*** (0.0839403)	0.5160097*** (0.16014)	0.2427206* (0.1225774)	0.5160097*** (0.0843238)
Unemployment Rate	-0.1053537*** (0.0198031)	-0.0201942*** (0.0068548)	-0.1053537*** (0.0358077)	-0.0201942*** (0.0068264)	-0.1053537*** (0.0218856)
Total Year-End Population	-0.3361139*** (0.0681116)	0.1380294*** (0.0341571)	-0.3361139*** (0.0997531)	0.1380294*** (0.0486604)	-0.3361139*** (0.0640244)
Population Growth Rate	0.0209065*** (0.0049669)	0.0045622*** (0.001455)	0.0209065*** (0.0059874)	0.0045622* (0.0026058)	0.0209065* (0.0117066)
Aging Rate	0.0042494 (0.0328786)	-0.0146411* (0.0087732)	0.0042494 (0.0329751)	-0.0146411* (0.0064115)	0.0042494 (0.0613445)
Child Care Ratio	-0.0036021 (0.0039774)	-0.0003123 (0.0048159)	-0.0036021 (0.0051606)	-0.0003123 (0.0024159)	-0.0036021 (0.0048864)
Old Age Ratio	0.0117687 (0.0213951)	0.0012707* (0.0006523)	0.0117687 (0.0200078)	0.0012707* (0.0006638)	0.0117687 (0.0397089)
Gross Domestic Product	0.2611855*** (0.0753516)	0.5419458*** (0.0972102)	0.2611855** (0.0975842)	0.5419458*** (0.0988239)	0.2611855*** (0.0722866)
_CONS	3.63186*** (0.7877718)	0.2160273** (0.109305)	3.63186*** (1.23673)	0.2160273** (0.109655)	3.63186*** (0.6810603)

Table 1 shows nationwide regression results. In Table 1, regression results 1-5 use OLS, Fixed Effect, Pooled OLS, asymptotic fixed effect and panel correction standard error (PCSE), respectively. According to the empirical results, regression 2 in Table 1 is used to do the following analysis. The results indicate that real estate construction area, real estate sales area, and child care ratio are insignificant. There is a positive correlation between the completed real estate area and average housing price, which is significant at 5% significance level, indicating that the expansion of the completed area in certain circumstances could promote housing price. The results also show a positive correlation between the per capita disposable income of urban residents in three regions and the average housing price nationwide, which is significant at 1% significance level. It can be observed that the per capita disposable income of urban residents has crucial effect on average housing price. When the level of per capita disposable income increases, it produces a thrust on housing price, and contributes to the ascent of the housing price. A negative correlation is found between average housing price and unemployment rate, and it is significant at 1% significance level. A reasonable explanation of this phenomenon is that employment is an essential source of income which is the basis of

real estate market. Unemployment means less income, which would lead to the decrease of demand in real estate market. As a consequence of that, the real estate market might suffer overstock and oversupply and then result in housing price falling down. High unemployment rate not only indicates the depression of overall economy, but also has an adverse impact on the entire real estate market, which affects the development of the national economy ultimately. Total annual population has a positive relation with average housing price, which is significant at 1% significance level. China has a large base of population, but available land resources are limited, which means that growing number of people would cause huge demand of housing. That would lead real estate market to seller's market and drive housing price to increase. There is a positive correlation between population growth rate and average housing price, which shows that the growth rate of population is closely related to the fluctuation of housing price. Aging rate and old age ratio both have negative relation with housing price. People over 65 years old either already have houses or are not going to buy houses. Therefore, there is little housing demand among them. GDP has a positive correlation with housing price and it is significant at 1% significance level. Development of national economy would promote the development of real estate market, and in prosperous economic environment, people would invest more money in this market.

Table 2. Regional Regression Results

Explanatory Variables	Explained Variable: Housing Price		
	East Coefficient (Std. Err.)	Centre Coefficient (Std. Err.)	West Coefficient (Std. Err.)
Real Estate Construction Area	-0.0133922 (0.0151112)	0.0748681 (0.0810208)	0.0693154 (0.077767)
Completed Real Estate Area	0.0797255* (0.0465766)	-0.0650999 (0.0347971)	-0.0308286 (0.047312)
Real Estate Sales Area	-0.0102933 (0.1049602)	-0.0127491 (0.0477619)	-0.0670512 (0.0303552)
Per capital Disposable Income of Urban Residents	0.2200056*** (0.0733765)	0.0720652*** (0.0237111)	0.2103349*** (0.0774704)
Unemployment Rate	-0.0045486*** (0.0013743)	-0.022078*** (0.0075803)	-0.0762234*** (0.0157856)
Total Annual Population	0.0131207** (0.0060328)	0.3054874* (0.1836262)	-0.9132381 (0.3315436)
Population Growth Rate	0.0058648* (0.0034271)	0.0030867* (0.0017661)	0.008021* (0.0044406)
Aging Rate	-0.0204838** (0.0103244)	-0.089373* (0.0538324)	-0.0381229* (0.0226319)
Child Care Ratio	0.0058078 (0.0033471)	-0.0081511 (0.0055128)	-0.0107298 (0.0049251)
Old Age Ratio	-0.0158299* (0.0135087)	0.0739919 (0.054114)	0.046345 (0.02049)
Gross Domestic Product	0.6009804*** (0.1167714)	0.5992214*** (0.131238)	0.4179889*** (0.0759796)
_CONS	0.4241305 (1.999899)	-0.7265003 (2.538274)	10.02435*** (2.597932)

Table 2 shows regional regression results. This paper divides China into East, Centre, and West. According to empirical results, real estate construction area, real estate sales area, and child care ratio are also insignificant as in Table 1. Completed real estate area and average housing price have positive relation in East China, which is significant at 10% significance level, while it is not significant in Central China and West China. It finds that the completion amount in real estate market in the East is higher than that of the center and west. The per capita disposable income of urban residents shows a positive correlation with the average housing price in the East, Center and West and it is significant at 1% significance level. The regression results show that the per capita disposable income has performed a more obvious effect in East and West than the Center. It may be speculated to be the progress of urbanization in the East and West, and urbanization drives the development of property market. A negative correlation is found between average housing price and unemployment rate in the East, Center and West, and it is significant at 1% significance level. It means that decreasing unemployment rate could promote healthy development of real estate market. There is a positive relation between total annual population and average housing price in the East and Center, while it is insignificant in the West. China's population is mainly concentrated on the East coast since the economic situation there is better and its demand for housing is larger. Old age ratio has negative correlation with average housing price in the East, while there is no evidence that shows the relation is present in the Center and the West. As for variables including population growth rate, aging rate, and GDP, their relation with average housing price in the East, Center, and West is exactly the same with nationwide results.

4. Conclusion

China's real estate market is still in the stage of vigorous development, and with the improvement of living standard and national economy, consumers' demand of housing is increasing continually. In recent years, housing price in many cities is stubbornly high, and also volatile, which results in difficulty of owning a house. The real estate market of China may affect the development of the whole society since housing price has become a serious livelihood problem. Investigating factors that affect housing price and promoting healthy development of real estate market are imperative. This paper constructs a panel data set of 31 provinces and autonomous cities from 1999 to 2015 and uses the controlled heteroskedasticity fixed effect model to analyze the relation between housing price and factors selected from demand and supply perspectives. The results of empirical analysis demonstrate that unemployment rate, aging rate, and the old age ratio have negative relation with average housing price. The completed real estate area, total annual population, population growth rate, GDP, and per capita disposable income of urban residents are positively related to the average housing price. Among these results, the completed real estate area, old age ratio and total annual population have more significant impact on East China's housing price than Central China and West China's housing price.

Completed real estate area would cause increase in housing price. Therefore, in areas where housing prices continue to fall, such as some cities in West China, authority could encourage real estate developers to increase the completed real estate area to stimulate the development of real estate market. In areas where housing prices are too high, government should impose restrictions on large-scale development behavior to curb the housing prices' increase. Development of economy, increase of population, together with the addition in disposable income present the addition of consumer demand and promote the rise in housing price. The differences between East China and West China justify that the income gap between regions is considerably high. Thus, in the premise of ensuring the stability of employment and economy, the state should promulgate policies to consummate housing restrictions, narrow income gap between individuals and increase the construction of indemnificatory housing, as well as satisfy most citizens' basic living need and restrain the investment demand. In addition, in order to balancing the real estate demand, the state needs to consummate the social security system and ascertain the subsidy for elderly people, especially in East China, where the aging problem is the most serious.

Combined with the empirical results, this paper can help deepen the understanding of influencing factors of the real estate market from the perspectives of demand and supply. On the one hand, the addition in income and the process of urbanization stimulate the housing demand, but the lag of supply causes the inflation of the housing price. At the same time, restricted consumption demand and expanding investment demand lead to the continually increase in housing price. On the other hand, when the housing price is falling down, the investment demand which forms during the period of rising housing price is transformed into a huge supply, and the subsequent sell-off phenomenon leads to the disappearance of investment demand. Since the supply is higher than demand, many properties remaindered and cause the sustained falling situation. While the ultimate goal of investors is to sell it at highest point to make profit rather than satisfying the living demand, the investment demand may push the housing price to a higher level. However, when the housing price starts to fall, the investment demand already saturated and investors are eager to sell to gain profit. Then, the supply will increase and cause the decline of housing price.

It can be observed that investment demand plays an essential role in the development of property market. Continuous increase of housing price would touch off the bubble in real estate market, and once the bubble shattered, housing price would show a sustained decline, which would be a grievous blow to normal operation of property market and may lead to a disaster to economy. Therefore, as a pillar industry of the national economy, the government needs to prevent the emergence of the real estate market bubble and the continuing decline of property market.

Per capita disposable income and GDP both have positive impact on housing price. However, the large gap of income is still a problem in China, and this problem will cause part of the citizens' consumption needs not to be satisfied. To alleviate the problem, a more reasonable tax system and wage system need to be proposed, and the employment rate also needs to be promoted, especially in Central China and West China, for the sake of reducing inequality in income. Furthermore, the state can commence with restraining investment demand and increasing the mortgage rate and decrease payment ratio to reduce the liquidity of real estate market and mitigate the real estate bubble.

References

- Abraham, J.M., & Hendershott, P. (1996). Bubbles in metropolitan housing marketing. *Journal of Housing Research*.
- Duan, Y., & Cao, Z. (2005). The Key to Regulating Commercial Housing Prices: Land and Finance. *Contemporary Economics*, (2).
- Nellis, J., & Longbottom, J. (1981). An empirical analysis of the determination of house prices in the United Kingdom. *Urban Studies*, (17), 9-21. <https://doi.org/10.1080/00420988120080021>
- Nin, H., & Song, Q. (2016). Research on Real Estate Tax, Supply and Demand and Housing Price. *Chinese Market*, (21), 178-180.
- Shang, M. (2004). Macroeconomic Factors Affecting the Price of Construction Products. *Northern Economy*, (4), 39-40.
- Song, J. (2009). Dynamic Model Analysis of Real Estate Price Fluctuation. *Market Modernization*, (7).
- Tang, W. (2016). Empirical Analysis on Influencing Factors of Real Estate Price in China. *Price Theory and Practice*, (1), 119-121.
- Wang, Q. (2013). Comparison and Analysis of the Factors Influencing the Rising House Price in Different Levels in Large and Medium-sized Cities in China: Based on Panel Data Analysis of 35 Large and Medium-sized Cities. *Reform and Strategy*, (8), 52-56.
- Xi, Q. (2004). Confirmatory Analysis on the Price Changes of Commercial Residential Houses in Tianjin. *Economist*, (7).
- Zhang, H., & Li, W. (2001). Empirical Analysis on the Change of Commodity Housing Price in Beijing. *China Real Estate Finance*, (3), 3-7.
- Zheng, J., Ni, Z., & Sun, W. (2016). The Impact of Population Structure on Housing Price: An Analysis Based on Panel Data. *JAC Forum*, (5), 22-27.