

## AN EMPIRICAL ANALYSIS OF FACTORS AFFECTING THE HOUSING PRICE IN SHANGHAI



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### ABSTRACT

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Being one of the most booming and prosperous cities of China, Shanghai is attracting more and more talents from all over the world. Although the development of real estate market contributes a lot to the economic take-off, the excessively high the housing price may cause big troubles. In order to find the main factors affecting the housing price in Shanghai, an econometric model is established and seven explanatory variables, per capita disposable income in Shanghai, land transaction price index, construction cost, urbanization rate, interest rate, CPI of residence and investment in real estate in Shanghai are taken into consideration based on the supply and demand theory. With the help of regression analysis, only interest rate is kicked out and the other six can all be a good explanatory variable for the housing price.

**Contribution/ Originality:** This study contributes in the existing literature by conducting a regression analysis to evaluate the contribution of every major influencing factor to the growth of housing prices in Shanghai in recent years.

## 1. INTRODUCTION

Shanghai is the largest city in China by population. It is one of the four direct-controlled municipalities of the People's Republic of China, with a population of more than 24 million as of 2013. It is a global financial center, and a transport hub with one of the world's busiest container ports. In the last two decades Shanghai has been one of the fastest developing cities in the world. Since 1992 Shanghai has recorded double-digit growth almost every year except during the global recession of 2008 and 2009. In 2011, Shanghai's total GDP grew to 1.92 trillion yuan (US\$297 billion) with GDP per capita of 82,560 yuan (US \$12,784). The three largest service industries are financial services, retail, and real estate. The manufacturing and agricultural sectors accounted for 39.9 percent and 0.7 percent of the total output respectively. Average annual disposable income of Shanghai residents, based on the first three quarters of 2009, was 21,871 RMB.

Study on housing prices in Shanghai is necessary both theoretically and practically. It gives help not only to the operation of companies but to security investments as well as industrial investments.

In an empirical analysis, econometric model is built to study a certain economic phenomenon. And in an econometric model, the real world is reasonably simplified to make the economic problem easy to study. There

might be quite a lot of elements that may influence the housing prices in Shanghai. However, due to the constraints on resources, not all the data are accessible. Thus only the major ones are studied, and those that are with less impact, difficult to quantify are considered negligible and omitted in order to conduct a systematical research on housing prices. And following the principles of feasibility, interdependency and simplicity, seven factors are picked out to study in this paper.

Studies conducted abroad on property prices are mainly based on the Law of Supply and Demand. Scholars generally accepted that the excessively high prices of real property can be owed mainly to the imbalance between supply and demand. Nellis and Longbottom (1981) studied the housing prices in British and found that income, loan rate, loan balance and stock market are the main factors of property prices<sup>[1]</sup>. Grebler stepped further and pointed out that vacancy rate, income of residents and CPI are the main factors of property prices. Quigley (1999) thought that macroeconomic factors did not have a significant impact on housing prices in the short term while in long term, significance did exist<sup>[2]</sup>. Based on these studied, many scholars afterwards conducted lots of empirical researches on housing prices with the help of econometrics.

The development of property market started relatively late in China. But the excessively high prices of houses attracted many scholars to look into this realm and conducted sufficient researches. And in summary, primary viewpoints of domestic scholars are as follows. Firstly, urban per capita disposable income is an important incentive of the climbing prices. Hao Wu, in 2006, pointed out that a major factor pushing up the housing prices is the growth in urban PCDI and the transformation in consumption structure in China. Secondly, urbanization plays an important role. Guobo Han, in 2004, studied the process of urbanization and found that the expansion of outskirts of cities had a great impact on housing prices. Kaiming Cheng and Qing Xia, in 2007, thought that urbanization could influence the supply and demand in housing market and thus influence the price of housing. Thirdly, housing prices is to some extent related to the price of land transactions. Xiaowu Yue and Xiaoying Wang, in 2006, pointed out that the proportion of land usage right transference fee in housing price is higher in cities of tier one than in cities of tier two. Moreover, population is also an important element in determining housing prices. Jianhao Xie, in 2007, studied the quantity and structure of population in China and reached the conclusion that when the speed of population growth exceeded the speed of housing supply, the imbalance of demand and supply emerged and the housing price would be pushed up.

And in this paper, all the major elements mentioned above will be taken into consideration. And with the help of statistics, empirical research will be conducted to evaluate the contribution of every major element to the growth of housing prices in recent years.

## 2. THE HOUSING PRICE IN SHANGHAI

With the rapid development of economy, Shanghai has become the economic center of China. Talents in China congregate and collaborate here to pursue their dream, which makes the high amazingly price of property a hot topic in Shanghai. Then emerges the question that how high the housing price in Shanghai is. To answer the question, the real estate price index, the average per capita housing space, housing price-income ratio as well as the sell and rental ratio will be discussed below as barometers of property prices in Shanghai.

Aside from the slight pullback in 2008 and 2012, the housing price in Shanghai kept a rising trend. During the past ten years from 2003 to 2013, the housing price rose to 4.61 times of the original.

The average per capita housing space can be divided into average per capita floor housing space and the per capita floor living space. The average per capita floor housing space in Shanghai has climbed from 21.7 sq. m. per capita to 34.4 sq. m. per capita in the past 14 years. Not only the absolute value is small, but the growth is not large

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<sup>[1]</sup>Nellis and Longbottom (1981).

<sup>[2]</sup> Quigley (1999).

enough. Furthermore, this index, average per capita floor housing space, is widely questioned when working as a barometer of living standard. Mainly because that the area of gardens, lawns and swimming pool, etc. are included when calculating which cannot meet the basic needs of people on housing. And thus it can be regarded as a biased parameter of living standard.

A corresponding index is the per capita floor living space in Shanghai from 2000 to 2013, and it reflects the living standard of residents more accurately. The per capita floor living space in Shanghai is 13.8 sq. m. per capita while in 2013 the parameter has merely climbed to 17.5 sq. m. per capita. According to the statistical yearbook by Shanghai Bureau of Statistics, the permanent population of Shanghai is 17.6584 million in 2003 and it rose to 24.1514 million until the end of year 2013. The permanent population has grown by 36.77% in the past ten years. And the rapid growth in population raised the demand of housing which made it more difficult for per capita floor living space to grow and led to the growth of housing prices.

According to the definition of United Nations Conference on Human Settlements (Habitat) center, Housing Price-Income Ratio refers to the ratio of the median price of a dwelling unit to the median of family income<sup>[1]</sup>. And according to the State Council Document No.23 in 1998, Housing Price-Income Ratio is defined as the ratio of price of a 60 sq. m. economical housing to the total annual income of a two-income household.

Since it is difficult to get the median of the annual two-income household income and the median of price of house of 60 sq. m. and there is no authoritative statistics, we use revenue of residence, area of residence sold and PCDI in the statistical yearbook of Shanghai Bureau of Statistics to figure out the Housing Price-Income Ratio in Shanghai.

Housing Price-Income Ratio= Total price of residence in a household/ the annual income of household

Total price of residence in a household= per capita living area\* average number of people in a family\* average price of a unit floor-space of residence

Total annual income of a household= average number of people in a family\* per capita annual income

Generally speaking, reasonable Housing Price-Income Ratio is supposed to be between 4 and 6 according to what world's banking experts put in 1990s when he looked into China's reform on housing system. If the calculated ratio surpasses 6, the housing price can be considered high and bubbles may exist. And the more it surpasses 6 the more possible bubbles in real estate market exist. The Housing Price-Income Ratio in Shanghai is 8.5 in 2003 and 12.7 in 2013, which are both far above the reasonable upper limit, 6. And from the trend of changes in Housing Price-Income Ratio, we can see people's decreasing affordability of housing in Shanghai.

### 3. PRICING MECHANISM AND SELECTION OF EXPLANATORY VARIABLES

According to the theory of price in western economics, in a perfectly competitive market condition, the demand and the supply determines the price of a commodity. The demand and supply Economic theory asserts that in a free market economy the market price reflects interaction between supply and demand: the equilibrium price is set so as to equate the quantity being supplied and that being demanded. In turn these quantities are determined by the marginal utility of the asset to different buyers and to different sellers.

When residence is considered as a commodity, its demand curve can be simplified as  $D=a+bP$ ; its supply curve can be simplified as  $S=c+dP$ . And the static equilibrium model can be established by solving the equations.

In the model, D and S stand for the demand and supply of residence respectively. P represents the housing price.  $b<0$  means that when housing price increases the demand of residence declines and vice versa.  $d>0$  means that when housing price increases the supply of residence increases accordingly and vice versa.  $D=S$  means that at the equilibrium the amount of supply is equal to the amount of demand. And the equilibrium price can be figured out as  $P_e = (a-c) / (b-d)$  when  $Q = a+bP_e = c+dP_e$  which is the equilibrium amount.

<sup>[1]</sup>Shisong and Hongmei (2009).

If the income of people is lifted generally, the demand of housing will increase in short term and curve D will move to D' and the price will climb to P'. Then the increase in housing price may lead to the investment of real estate. If the supply curve is of infinite elasticity in long term as S'', the supply of residence will climb to q'', and the price will return to Pe.

If the supply curve is of limited elasticity in long term as S, the supply of residence will climb to q', and the price will return to P' which is higher than the original price. In a word, the equilibrium housing price can be impacted by the supply and demand of housing as well as the elasticity of supply in real estate market<sup>[1]</sup>.

Thus, in order to look into the factors that influence the housing price, both supply and demand in housing market should be taken into consideration.

Generally speaking, factors influencing demand curve are prices of related goods (alternatives and complements), income, preference, expectation and number of consumers etc. The essence of supply curve is a function reflecting the relation between price and many variables of cost. So the factors that may influence the supply of commodities are prices of related goods, production cost, technology, expectation and number of producers etc.

When it comes to China, due to the large population, special national conditions and the huge regional differences in mainland China together with the immaturity in real estate market, the structure of China's housing market is quite unique and the housing price cannot be totally determined theoretically.

Income level is an important index that reflects demand capacity. When income increases, the demand of commodities will increase and therefore causes the income effect. Income level and has close relations with housing price. The increase of income level may improve buyer's paying ability and therefore increases the demand of real estate products as well as the housing price. When income level rises continuously, it will push the housing price to increase further.

Real estate can be treated as both consumer goods and investment goods. The increase of income level will push up consumer demand and speculative demand of real estate at the same time. The consumer demand of housing is a kind of rigid demand. And whether the rigid demand can be met rests largely on the income level. If the income level improves, the consumption capacity of urban residents will improve; the willing of buying house will strengthen; and the consumer housing demand will improve remarkably. For the house purchasers with speculative demand, when housing price and the expected housing price keeps rising, residents with relatively higher income will naturally make use of the feature of inflation-proofing and appreciation of real estate to make profits. Some residents will even buy more than one houses for investment, which will greatly increase the demand of real estate and push up the price.

It must be emphasized that GDP in Shanghai—the important index which reflects the economic development level in Shanghai also has close relation with the housing price in Shanghai. However, as shown in the figure, no matter from the perspective of trend or the change of growth rate, the per capita disposable income in Shanghai is closely related to GDP. Therefore, in order to avoid co-linearity of independent variables when making regression analysis only the index of “per capita disposable income in Shanghai” will be taken into consideration, which not only reflects people's income level, but also reflects the development of economic level in Shanghai.

As the basis of real estate, land is indispensable to the development of real estate market. Land supply can be classified as natural supply and economic supply. Due to the inherent scarcity of land resource and the strict protection on farmland, the supply of land in cities is relatively limited, and urban housing market mainly depends on the economic supply of land.

The area of land in Shanghai is only 0.07% the area of land across the country. Among the megalopolises in China, the area of land in Shanghai only is only 37.7% the area of land in Beijing and 56% the area of land in

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<sup>[1]</sup>Guoping (2007).

Tianjin. The utilization of land is at a quite high level. With the development and opening of Pudong, urban construction will make the demand of land rise continuously. And since the intertidal zone is difficult to reclaim and needs huge investment, the growth of natural supply of land is limited. As a conclusion the conflict between supply and demand of land resource in Shanghai will be prominent day by day.

Therefore, in this paper the land transaction price index in Shanghai is selected as the explanatory variable to analyze the change of housing price in Shanghai.

The price of a commodity depends mainly on market demand, production cost and producer's anticipated profit. Many developers directly use expected profit rate method to decide the unit housing price. The expected profit method is that the total housing price is equal to "construction cost $\times$  (1+ expected profit rate)", so the cost of construction directly influences the housing price<sup>[1]</sup>. In recent years, due to the increasingly high price of land, building materials, administrative charge and service charge, the construction cost of commercial housing increases continuously.

It can be seen clearly that construction and installation cost, labor cost, raw material cost, and machinery usage cost have risen sharply in 10 years. The highest increase is labor cost with an increase of 150.2%; the next is machinery usage cost with an increase of 58.1%. The rigid expenditure in the development of real estate will finally be transferred to property buyers in the form of housing price, so the increase of the construction cost is one of the most important factors that boost the housing price in Shanghai.

Urbanization refers to a change of people's way of life and social structure. With the development of social productivity, population moves from rural areas to cities gradually; agricultural population transforms gradually to nonagricultural population; the quantity of cities and towns continues to increase; cities keep expanding; people's way of life, way to live, and trip mode improves gradually; urban infrastructure gets more developed; urban culture prospers; and residents' conception develops continuously. Generally speaking, urbanization is the differentiation of population structure, the increase of nonagricultural population and thus the congregation of people from rural areas to cities. Urbanization pushes the original cities to expand and news cities emerge one after another.

The demand of real estate drove by urbanization is initially shown in the aspect of growing population's accommodation demand. Large numbers of people moves from suburbs to the center of cities in Shanghai and urban population increases a lot. With the rapid growing of urban population in the process of urbanization, the expanding of urban scale and the development of economy, the demands of housing, business buildings, and commercial housing in cities will increase sharply. Furthermore, demand on the improvement of living will emerge prominently with the speeding up of urbanization, which includes not only the improvement of per capita housing area, but also the improvement of hardware facility. Besides, high rate of urbanization will increase the proportion of floating population consisting of students, employees and migrant workers, which together with the other aspects push up the price of real estate in Shanghai.

Another variable closely related to housing price is interest rate. For most of the buyers, mortgage loan is the major way of purchasing. Therefore, the rate of interest for loan will directly influence people's demand to real estate. On the other side, developers need to raise funds to develop real estate from financial organizations in the form of loan. Thus, as the time cost of currency, the interest rate will influence housing price in the aspect of both supply and demand in real estate market.

Inflation will raise people's expectation of price, which will push residents to transfer deposit into objects (including real estate). Thus, inflation may lay influence on housing price. It is one of the factors influences the housing price.

The influence of inflation on real estate is realized mainly in the following ways. Firstly, inflation rate is positively related to housing price, i.e. when the price of commodities rises widely the price of housing will rise

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<sup>[1]</sup>Hongwu, Xiuling and Zhilian (2010).

accordingly. Another one is that the rising of price of commodities such as living cost and labor cost will raise the construction cost and finally enhance the housing price via price transmission mechanism. Furthermore, for the real estate with special function, the raising of commodity price will influence its price by changing the function itself. For example, when consumer price soars irrationally, currency will depreciates rapidly. When the inflation rate offsets the deposit rate, most of consumers will choose to hold the investment commodities with stable value (such as real estate) and give up currency asset. So the expanded demand will push the housing price to rise.

The general scale and booming degree of real estate market in a city is mainly reflected by the investment of real estate. The investment of real estate development may directly influence the supply of real estate. That is to say when the annual investment increases, the supply of real estate will increase correspondingly and vice versa. So the change in total investment of real estate will influence the change of housing price to some degree. The process is realized by the change of supply amount in real estate market. However, the effect is relative. On special occasions, the increase of investment does not necessarily cause the housing price to decline, for the increase part is not necessarily used in the construction of new commercial residential building completely, but it may be used to improve the housing quality, level, and environment. Under this situation, the increasing of housing price may attribute to the raising of total investment amount of real estate.

Generally, there is a positive correlation between total investment of real estate and housing price. If the total investment of real estate increases, the fund in real estate market will be sufficient and the construction quality of newly built commercial residential building will increase correspondingly. Theoretically, when supply surpasses demand, price of commodity will decline. However, it is not the whole story. In some particular cases, rising of housing price also exists. Certainly, if total investment of real estate declines, it will necessarily have great influence on the whole real estate market. So the investment of real estate will be selected as a variable in this paper.

On base of the discussion above, seven variables are selected in the paper. They are (1) per capita disposable income in Shanghai, (2) land transaction price index, (3) construction cost, (4) urbanization rate, (5) interest rate, (6) CPI of residence and (7) investment in real estate development.

#### 4. REGRESSION ANALYSIS

The econometric model is established as follows:

Price = f(Urban, PCDI, LTPI, Interest, Investment, Cost, CPI)

In the model, Price stands for housing price in Shanghai; Urban stands for urbanization rate in Shanghai; PCDI stands for per capita disposable income in Shanghai; LTPI stands for land transaction price index in Shanghai; Interest stands for interest rate index of one-year loan in China (Data from Bank of China); Investment stands for investment in real estate development; Cost stands for construction cost in Shanghai; CPI stands for CPI of residence in Shanghai.

Table-1. Single Regression of Each Variable

	B	t Value	Significance	R sq
Urbanization Rate	14.328	6.062	0.000	0.770
PCDI	1.382	12.280	0.000	0.932
LTPI	1.699	10.520	0.000	0.910
Interest Index	6.649	1.730	0.112	0.214
Investment	1.040	9.640	0.000	0.894
Construction Cost	6.515	9.824	0.000	0.898
CPI-Residence	10.287	7.732	0.000	0.945

Then in the multiple regression, the explanatory variable Interest is kicked out for its low level of significance.

Table-2. Multiple Regression-F test

R sq.	Adjusted R sq.	F-value	Significance
0.982	0.965	55.439	0.000

Table-3. Multiple Regression-t test

o o	Beta	Std Err	t-value	Significance	VIF
Urbanization Rate	0.030	4.275	0.114	0.913	23.198
PCDI	0.766	2.021	0.543	0.607	674.823
LTPI	-0.242	2.176	-0.198	0.849	505.276
Investment	0.878	0.941	1.026	0.344	247.853
Construction Cost	1.046	7.021	1.025	0.345	352.979
CPI-Residence	-1.494	5.000	-3.345	0.016	67.579

As shown in Table 2, the multiple-regression model of six variables can explain most of the dependent variable and its significance of F-test is quite high, which is below 0.1%.

However, it can be seen from table 3 that the significance level of t-test of each explanatory variable is quite low when all the six explanatory variables are taken into the multiple-regression model. And with the help of Variance Inflation Factor Test, the reason can be found that there is severe co-linearity among the six explanatory variables.

In accordance with the process of stepwise regression, a multiple-regression model in which 5% significance of t-test can be meet is finally found as shown in tables below:

Table-4. Multiple Regression-F test

R sq.	Adjusted R sq.	F-value	Significance
0.980	0.974	149.347	0.000

Table-5. Multiple Regression-t test

o o	Beta	Std Err	t-value	Significance
Investment	1.080	.195	6.081	0.000
Construction Cost	1.465	1.614	6.238	0.000
CPI-Residence	-1.554	3.571	-4.871	0.001

As shown in Table 4, in the multiple-regression model of three variables, Adjusted R sq. is 0.974, which surpasses the 0.965 in the multiple-regression model of six variables. It means that the latter one shows more ability of explanation on housing price than former one. And from Table 3-6, the significance level of t-test on each explanatory variable is far below 5%, which means the model is significant at the significance level of 5%.

Thus the construction cost, CPI of residence together with investment in real estate development can be a good set of independent variables to explain the housing price in Shanghai.

## 5. CONCLUSIONS

In the past few years, realty industry was treated as a pillar industry in China. As the engine of China's economy, it did contribute a lot to China's development. However, realty industry has close relation with people's livelihood. The continuously growing housing price will be a hidden trouble of China. If people spend too much on residence, the daily consumption of people will be crowd out. And it will also cause inequality in distribution of

wealth, the outflow of talent, widen the gap between the wealthy, hinder the process of urbanization<sup>[1]</sup> and the poor and deprive the sense of security from people.

Since supply and demand determine the high housing price in Shanghai together, countermoves of high housing price may also be found from the angle of supply and demand in real estate market. Furthermore, with the development of economy, the rise of people's living standard and the deepening of urbanization are both inevitable<sup>[2]</sup>. So the key point of countermoves should lie in the aspect of supply instead of demand. For instance, improve and perfect the indemnificatory housing system; eliminate local government's reliance on land trading; optimize the structure of housing supply; raise the utility of land resources and establish the inheritance taxes.

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<sup>[1]</sup>Dongsheng and Zhong (2010).

<sup>[2]</sup>Hua (2008).