The Relationship Between Housing Price and Income Inequality – A Case Study of Taipei City

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Abstract

It is now incredibly difficult to purchase a house in Taipei City because of the record-high house prices, but we can still see a lot of mansions under construction and been sold out quickly. This situation indicates two problems: high house prices and income inequality. The objective of this paper is to identify whether income inequality is the main drive of rising house prices. This paper uses panel regression to analyze the two-dimensional data. The study rejects the hypothesis of income inequality has relationship with house prices.

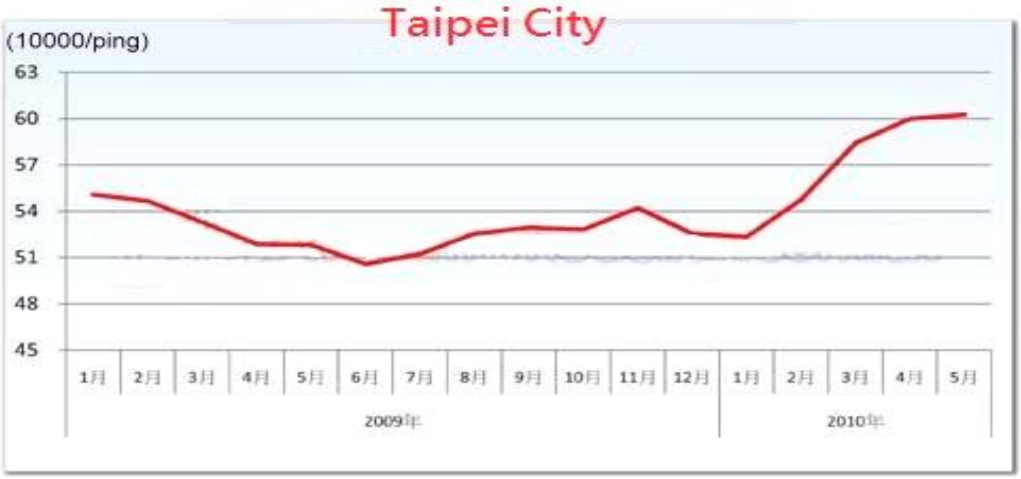
1. Motivation

Recently, the increasing record-high house prices have been a major issue of public concern and become the leading source of public dissatisfaction in Taiwan, particularly in Taipei City.

Because of the high house prices and unchanged income, it is now increasingly difficult for people to buy houses in Taipei. According to the statistics from real estate corporations, the average price of housing under construction in Taipei City has already reached NT$601,000 per ping. In some

upscale districts, such as Daan district, the price of pre-sold apartment has even reached almost NT$1,000,000 per ping.

Figure I



As mentioned, nowadays purchasing houses has become a huge expenditure for most citizens in Taipei. However, there are still a lot of mansions under construction, and each nearly costs more than NT$1,000,000 per ping. On the other hand, while normal people have to work almost half of their life to pay for a house, no matter new or old, rich people can easily afford a new and luxury mansion in downtown. This phenomenon indicates another issue – income inequality. Some critics said that it is rich people's demand that bids up the prices of housing under construction and also boosts the whole realty market.

We are curious whether there is a relationship between income inequality and high housing prices. In this paper, we will use statistical methods to measure it.

2. Methodology

2.1. The ratio of household income, 60% to 20% ratio

There are many ways to measure the distribution of income, such as Gini coefficient and 80/20 percentile ratio, and we choose the latter. However, in this paper, we have to modify this method, because we find that some of the data at the 80^{th} percentile are not accurate. The alternative method - "60/20 percentile ratio" illustrates the ratio of income at the 60th percentile to income at the 20th percentile. Higher ratio indicates less equal income distribution, while lower ratio indicates more equal income distribution.

2.2. Panel regression

Panel regression is a statistical method which deals with two-dimensional panel data. We use this method to evaluate the effects of data which are collected over time and over the same individuals, and then run a regression over these two dimensions.

We assume that the house price is the dependent variable, and independent variables are as below: average total income, residential rate of self-own house, household, employed, earner, salary, imputed rent, the ratio of rental to income, the ratio of household income.

3. Literature Review

Alan K. Reichert (1990) focused on regional level in United States using a combination of macroeconomic and micro structural factors, which are interest rates, permanent income and employment. He then used an equilibrium model and homogeneity test. He found that 1% growth in permanent income leads to 3.78% rise in housing prices, and that there is enough evidence that these regions are significantly different. We are interested in this journal because it separates the US into different regions, just like we did research on the twelve districts of Taipei city. Furthermore, it gives a conclusion that income affects housing prices, which we want to attain.

While many researchers simply assume that house prices and fundamentals are cointegrated, Joshua Gallin (2003) had different opinions. He collected 27 years of national-level data of 95 cities in the US. He used the cointegration test and the panel test. He found that neither the cointegration test nor the panel test gives enough evidence for cointegration of house prices and various fundamentals. However, it only means that the level of house prices does not appear to be tied to the level of income. We are interested in this paper because it gives a different conclusion compared to what we have found.

Wensheng Peng, Dickson C. Tam and Matthew S. Yiu (2008) overcame the data-limitation problem and investigated the relationships between the macro economy and the property market in China in 1998 – 2004. They collected data of eleven categories relating to macro economy of six major cities and 25 provinces. General and dynamic panel models were conducted to determine the relationships between property price and macro economic variables. Last, to test the validity of homogeneity assumption, the heterogeneity test was conducted. They came to three conclusions. There may be a two-way linkage between property prices and GDP growth, bank credit expansion does not accelerate property price inflation, and in coastal areas, hosing and rental prices are negatively related.

In "Reasonable Housing Prices in Taipei -Demand Side Analysis"(2001), it shows that in Taipei city, the distribution of household income and housing prices are disadvantageous to lower income household. It shows that there is a relationship among housing prices, income inequality and the quantity of low-income household and that low housing prices cannot reach a balance. About the methodology, at first, Gini coefficient is used to measure price distribution and Sturges's Rule to measure quantity distribution. Then, the 80/20

percentile ratio data are used to analyze the reasonable housing prices between households of different income.

In “Income Inequality and the Distribution of Housing Consumption in Taiwan: Changes between 1980 and 2000” (2006), it analyzes the change in the distribution of family income and housing consumption between different tenures in the last two decades. This study uses the Gini-coefficient and Atkinson’s inequality index to measure inequality. Afterwards a comparison was made to determine whether the two indexes obtain a same conclusion. The results show that there has been an increase in income inequality over the past twenty years.

4. Data Source

First, housing prices of 12 districts in Taipei City from 2001 to 2008 are collected from Department of Land Administration, Ministry of the Interior. We remove the business housing prices, and only adopt the residential housing prices. Second, the resources of other variables, which are average total income、residential rate of self-own house、the number of household members、employed、earner、salary、imputed rent、the ratio of rental to income and the ratio of household income, are from Department of Budget Accounting & Statistics Taipei City Government. The attributes of the data are the same as the former.

5. Findings

We use the RATS statistics software to analyze panel data and we categorize our findings into nine parts- average total income in year, residential rate of self-own house, household members, the numbers of employed in a household, the numbers of earner in a household, the average salary in a household in year, imputed rent, the ratio of rental to income and the ratio of household income. Next, we respectively analyze the relationships between housing prices and variables mentioned above. The following table is our result of panel regression.

Variable	Coeff	Std Error	T-Stat	Signif
CONSTANT	0	0	0	0
YEAR	2.1551416	0.2113219	10.19838	0
INCOME_AVG	0.0000368	0.0000188	1.95868	0.05391835
OWN_HOUSE	0.0837509	0.1007403	0.83135	0.40844786
INEQ_4	-3.534402	2.0606276	-1.71521	0.09049219
HOUSEHOLD	8.8296318	2.9301257	3.0134	0.00353577
EMPLOYED	-10.3323376	7.1169031	-1.4518	0.15078319
EARNER	-0.2562675	7.9299097	-0.03232	0.9743066
SALARY	0.0000074	0.0000082	0.90516	0.36831672
IMPUTED_RENT	-0.0004106	0.0002408	-1.70515	0.09236212
RENTAL_INCOME	618.3165576	356.062977	1.73654	0.08663033

We define that the variable is significant if the significant value is less than 0.1. Since many variables become non-significant if significant value is 0.05, we adopt a looser significant value.

5.1. Average Total Income in Year

According to the result of panel regression, the significant value is 0.05, which is less than 0.1, it implies that the variable is significant. Furthermore, according to the positive coefficient value, it implies the average total income and the housing price are positively correlated. Reasonably, the high-income people can afford higher housing price.

5.2. Residential Rate of Self-own House

According to the result of panel regression, the coefficient value is positive, but the significant value is 0.408, which is greater than 0.1. It implies the variable is not significant. According to the department of budget accounting& statistics, the residential rate of self-own house barely changes through years. Therefore, it is obvious that it has only slight influence to housing price

5.3. Household Members

According to the panel regression, the significant value of household members is 0.00353577, which is less than 0.1, and therefore significant. Also, the coefficient value is 8.8296318, which is positive, and thus it implies that the household and the housing prices are positively correlated. However, we consider it not reasonable. Logically, the more the household

members, the higher burden they will have to afford. In consequence, higher housing prices cannot be afforded. Therefore, we suggest that the household and the housing prices be negatively correlated.

5.4. The Numbers of Employed in A Household

Employed means that the people who have a full-time job. According to the panel regression, the significant value of the numbers of employed in a household is 0.15078319, greater than 0.1, so the variable is not significant. In addition, its coefficient value is positive so it is positively correlated with housing prices. Obviously, the numbers of employed in a household does not influence housing price, because more employed people does not mean that they can have higher income. They are not related.

5.5. The Numbers of Earner in A Household

Earner means that the people who have income, including those with full-time jobs, part-time jobs and other investments income. Although it is negatively correlated with housing price, coefficient value -0.2562675, its significant value, which is 0.10.9743066, is greater than 0.1, and this not significant. The reason is similar to the former variable. The numbers of earner in a household do not affect housing prices, because the numbers of earner and total income in a household are not positively correlated. It

means that more earners can not necessarily afford higher housing prices and in contrary, fewer earners do not necessarily mean that they cannot afford higher housing prices.

5.6. The average salary in a household in year

Salary is defined by the income from only full-time job. Although it is positively related to housing prices, coefficient value 0.0000074, the significant value is 0.36831672, and thus not significant. To explain, most people who can afford higher housing prices are often not employed. They earn from other investments, such as stock markets or real estate. Therefore, it is reasonable that the average salary in a household in year and housing price are not related.

5.7. imputed rent

We explain imputed rent in an example. If someone lives in a property for free, then imputed rent is how much it would cost to rent an equivalent property. This helps the property owner to evaluate the real costs to do investment. It is a concept of opportunity costs of capital. Although it shows significant here, there is something queer. Since imputed rent is computed by market rent, it is unusual to see it with a negative relationship with housing price.

5.8. the ratio of rental to income

We use this variable because we assume the larger ratio that the rental income takes in someone's total income, the higher price he is willing to pay for a house. In consequence, house prices will be higher. The result is significant and positively related.

5.9. the ratio of household income

The ratio of household income a variable to evaluate the level of inequality is the last quarter of income to first quarter and it shows how much the rich are more wealth than the poor. This variable is the most important because our aim is to find whether there is a relationship between income inequality and house pricing. The result shows significance but negative relationship, which means housing prices get higher in an income equality country. In other words, if everybody has money to buy a house, then housing price will rise. Contrary to our expectation, housing price is not rising for investor's intention.

6. Conclusion

After all these analysis, we have an opposite result compared to what we hope to obtained at first. Income inequality has a negative relationship with housing prices. Contrary to our expectation, housing price is not rising for

investor’s intention and we cannot blame the rich for high housing prices anymore.

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