Examination of the Impact of Guidance Price Policy on the Secondary Market in China

Mengyu Xie[1, †], Yiqi Xu[2, *, †]

[1] *Tianfu School, Chengdu, Sichuan Province, 611100, China*
[2] *School of PPLS, the University of Edinburgh, Edinburgh, EH8 9YL, the United Kingdom*
Corresponding author. Email: s1793361@ed.ac.uk
[†]*These authors contributed equally.*

ABSTRACT

This research examines the effect of the latest regulation policy for the second-handed housing market in Shenzhen, China, which announces a series of references for the prices of secondary houses. These price references serves as important guidance for housing transaction prices and mortgages. The research investigates how the secondary housing market in Shenzhen responds to the policy in terms of its supply, transaction volume and housing price. Therefore, readers can know to what extent the guidance price policy reduces the speculation of the local secondary housing market. Based on maximum likelihood time series analysis, this research finds that the guidance price policy has effectively decreased the local secondary housing market's supply, transaction volume, and housing price, and estimates the policy's effects quantitatively. The research also analysizes this policy qualitatively, and proposes that the guidance price policy affects the secondary housing market by restricting mortgage supply of the credit market. Consequently, in the short run, the regulation policy successfully reduces real estate speculation and places restrictions on the growth rate of housing price in Shenzhen. The case of Shenzhen's secondary housing market can be further studied for constructing a better real estate speculation regulation policy.

Keywords: secondary housing market, policy, housing price, maximum likelihood estimation, negative binomial regression.

1. INTRODUCTION

In November 2020, according to data released by the National Bureau of Statistics, second-hand housing prices in Shenzhen rose by 0.6% from a month earlier and by 14.6% year-on-year. Data from the Bureau of Statistics also shows that compared with December 2019, the prices of second-hand homes in first-tier cities rose by 8.6% in December 2020, which is 6.4% and 7.2% percentage points higher than those in second-tier and third-tier cities, respectively [1]. This is mainly due to the latest release of the Guangdong-Hong Kong-Macao Greater Bay Area concept, which has led to a continued increase in the input of foreign population in the Shenzhen area. It probably means that some people think that the rising trend of housing prices in Shenzhen has to be the same as that of Hong Kong the same. There are also several reasons for this. First, there is a large portion of irrational house buying in the market, such as multiple neighborhood owners working together to raise prices for profit. Also, because of the epidemic, investors have

shifted their targets from various financial products to the real estate industry, which is much less risky. At the same time, based on the current hot real estate market, people predict that housing prices will increase in the future, and their demand for homeownership at the moment will not drop. This has led to a serious oversupply and a large number of young people with unmet needs for basic housing.

Haughwout *et al.* study the effect of leverage on housing prices. They argue that the rising housing price may lead to an "irrational exuberance" in the real estate market [2]. In normal times, optimistic buyers want to buy additional homes but cannot do so because of binding constraints on cash flow or down payment. However, during the early stages of the housing boom, as home prices perform strongly and default rates are low, lenders may reduce the down payment percentage on new mortgages and begin to relax other underwriting criteria. These actions enabled optimistic buyers to purchase additional homes. As a result, the increasing leverage

allowed in the market is beginning to shift the composition of new purchase transactions in the market to more optimistic buyers who are willing to purchase homes at higher prices. This is an additional channel through which higher leverage can amplify upward pressure on home prices. Increased leverage also affects prices by changing the composition of buyers, and this additional amplification mechanism may then mean that the observed changes in leverage can explain more of the acceleration in home prices. Investors will want to take advantage of as much leverage as possible that lenders will allow. This situation is similar to the factors that continue to increase house prices in Shenzhen. In addition to that, Zhang Xiaodu analyzed the reasons why the government shifted from incentive to cooling on real estate regulation policies [3]. The simultaneous impact of rigid demand and investment demand led to the creation of a real estate bubble. Nevertheless, consumers have too high expectations for the market's future and simply do not want to believe that a real estate bubble will occur in the future. So subjective regulation from consumers will be difficult to effective. Therefore, the government must cool the market.

Rahman provides the factors that have contributed to the continued rise in Australian house prices [4]. These factors include interest rates, investment demand and the current economic environment. Lower interest rates mean lower mortgage repayments for any given price level, which allows borrowers to borrow more for any given repayment income ratio. All else being equal, this leads to an increase in housing demand and housing prices. On the other hand, once interest rates rise, housing demand will ease, and prices will remain stable or rise moderately, or even fall (depending on the collective impact of other factors). Housing investment has increased since 1995. As a result, investor landlords have become an important driver of house price increases in Australia. At the same time, 2000 saw a significant downward correction in equity markets worldwide; this led to a shift of capital from equities to other assets such as bonds and real estate. So it led to a significant increase in demand for housing for investment purposes. At the same time, Guo suggested that with the deepening of economic integration in the Guangdong-Hong Kong-Macao Greater Bay Area, the spillover effect of high property prices in Hong Kong and Macau will inevitably affect the cities with which they have frequent economic and trade exchanges or are geographically close to, thus exacerbating the contagion effect of property price fluctuations in the cities [5]. Gerlach and Peng argue that the elasticity of credit to property prices declined in the early 1990s as banks raised their credit standards [6]. This move reflected some extent the problem of banks reducing their risk in the face of strong credit demand and an overheated market. At the same time, the authors argue that excessive bank lending was not the underlying cause of the boom or bust that determined the Hong Kong real estate market. A more plausible hypothesis is that changes in house buyers' perceptions of the future economic outlook led to structural changes in the economy. Moreover, these properties for investment and other purposes have contributed to the large fluctuations in house prices. Regarding the relationship between home prices and leverage, research by Bailey *et al*. shows that more pessimistic house buyers reduce their down payments and choose higher leverage, especially in areas where default costs are relatively low and in periods when home prices are expected to fall on average during periods when home prices are expected to fall on average [7]. This just explains the policy context of this article; Shenzhen also has a large number of over-leveraged house buyers, and one of the objectives of the policies studied in this paper is to reduce leverage. Crowe *et al*. also demonstrate the relationship between leverage and whether the real estate market is overheated, and argue that the highly leveraged real estate market plays an important role [8].

Because lending slowed sharply, borrowers' ability to repay their loans became increasingly dependent on the continued climb in prices. When home prices began to fall, speculative buyers and owner-occupiers who were unwilling or unable to repay their mortgages were unable to roll them over or sell their properties and began to default. As uncertainty about the quality of the underlying loans increased, the value of mortgage-backed securities began to decline. Investors holding these securities and their issuers (both often highly leveraged themselves) found it increasingly difficult to raise capital, and some were forced out of the market. This, in turn, reduced the funds available for mortgage financing and began a downward spiral. So the size of the house price boom and the level of leverage at the end of the boom are interrelated, and the rise in mortgage delinquencies is more pronounced in areas with higher leverage in areas of similar boom size. Also, in response to this real estate overheating in Shenzhen, China, and Canada recently, the government has made policies similar to the ones mentioned in this article. In fact, since the Great Recession (2007-2009), Canadian and provincial governments have implemented a number of policies to prevent a housing bubble [9]. These policies have focused on tightening mortgage eligibility criteria to improve the quantity and quality of mortgages. For example, on October 3, 2016, mortgage insurance rules for high-ratio mortgages (i.e., mortgages with loan-to-value ratios greater than 80%) were amended to include an expanded stress test to verify that high-ratio borrowers would still be able to pay when interest rates rise. This also fully reflects whether the change in interest rates have a direct impact on regulating real estate overheating [10]. At the same time, the European market is overheating for similar reasons as the U.S. and Shenzhen, China. Despite the global recession triggered by the pandemic, housing prices are still rising in many

European countries. The likely reason is that extremely low interest rates coupled with government support limited the loss of income for households affected by the pandemic, which supported high demand for housing. Second, bubbles migrated between these real estate markets, and among the many policies, measures focused on controlling interest rates have shown their efficacy in reducing house prices [10].

2. DATA AND METHOD

2.1. Data

The research target is Shenzhen's secondary housing market. The time span of all data is from September 2019 to August 2021. Three types of data are collected. The first type of data is the monthly transaction volume of Shenzhen's secondary market, collected from the Shenzhen municipal government data platform. The second one is the monthly average secondary housing price in Shenzhen, which is from Xitai Database. The last one is the monthly supply of secondary houses in Shenzhen, and the source of this data is also Xitai Database. This research investigates how the regulation policy affects the secondary housing market in terms of its supply, transaction volume and housing price. Because these data are non-normalized time series, the interrupted time series design based on maximum likelihood event count time series analysis is adopted for our research.

2.2. Method

Maximum likelihood event count time series analysis is to model a time series by maximum likelihood estimation (henceforth MLE). This means estimating a time series by a set of given data and choosing the estimators that maximize the probability of drawing these data from the population [11].

The overdispersion test is conducted to decide which count data model is suitable for these time series. For each time series (that is, the time series of housing price, transaction volume and supply), the null hypothesis is rejected at a 1% significance level, which indicates that the data are overdispersed. Based on these results, negative binomial regression is adopted.

In all models, policy intervention is introduced into the models as one independent variable. The policy intervention is set as a binary variable, with '1' meaning observations being after policy intervention and '0' meaning before policy intervention.

The impact of the policy intervention on transaction volume, housing price and housing supply is measured by the corresponding negative binomial regression

coefficient of policy intervention. The regression coefficient means that if the independent variable changes for one unit, the difference in the logs of the dependent variable's expected count is expected to change by the corresponding regression coefficient. In contrast, other independent variables in the model are kept constant. Based on this understanding, the percentage impact of the policy on these factors is equal to the exponent of the corresponding regression coefficient based on Euler number minus 1 (= exp (coef.) - 1).

3. RESULTS AND DISCUSSION

3.1. Transaction volume

Table 1 summarizes the results of negative binary regression models for the secondary market's transaction volume. Model 1 is a baseline model with no controls of seasonality or trend. As the baseline model shows, the regression coefficient of policy intervention is -0.5395, and it is statistically significant at a 1% level. Therefore, according to the baseline model, the intervention of guidance price policy has negatively affected the transaction volume of second-handed houses. The regression coefficient of -0.5395 indicates that the guidance price policy has lowered down the transaction volume of second-handed houses in Shenzhen by around 41.7% (= exp (-0.5395) - 1).

The seasonality is controlled in model 2. In this model, policy intervention's regression coefficient (-0.4560) is also significant at a 1% level. Similar to the intuition illustrated by the baseline model, the results in the model indicates that the guidance price policy has a negative effect on the transaction volume, and it reduces the secondary housing transaction volume by around 36.6%.

In model 3, both seasonality and trend are controlled. However, the regression coefficient in this model is still significant at the 1% level. Nevertheless, after the trend is controlled, the regression coefficient becomes even lower, which is -0.6724. This indicates that while both the seasonality and trend are controlled, policy intervention leads transaction volume in the secondary housing market to decrease by approximately 48.9%. As the log pseudolikelihood indicates, model 3 provides the closest estimate to the real transaction volume among these three models. Fig.1 demonstrates the actual transaction volume and model 3's prediction.

All three models support that the intervention of the guidance price policy exerts a negative influence on the transaction volume of the secondary housing market, and the guidance price policy results in a decrease in transaction volume by around 36.6% to 48.9%.

Table 1. Negative Binomial Regression of Policy on Transaction

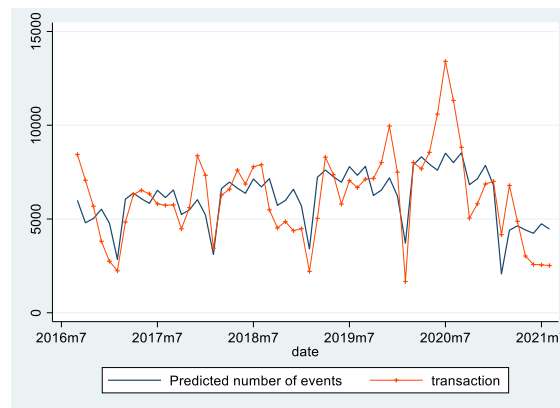| Dependent variable: Transaction	Model 1	Model 2	Model 3
Policy	-0.5395***	-0.4560**	-0.6724***
	(0.1570)	(0.2087)	(0.2255)
Constant	8.7789***	8.6681***	8.4356***
	(0.0470)	(0.1461)	(0.1730)
Seasonality	No	Yes	Yes
Trend	No	No	0.0073***
			(0.0025)
Alpha	0.1328***	0.0933***	0.0826***
(Over-dispersion test)	(0.0295)	(0.1758)	(0.0151)
Observation	60	60	60
Log pseudolikelihood	-544.8212	-533.8731	-530.1055

Figure 1 Prediction on Transaction

3.2. Housing price

The red line in fig. 2 demonstrates the time series of secondary housing prices in Shenzhen, in which a strong upward trend is appearing in housing prices before the policy intervention.

Table 2 summarizes three models for the housing price in the secondary housing market. Similar to previous models, the baseline model does not control seasonality or trend, and model 2 does not control trend. As one can notice, in the baseline model and model 2, the regression coefficients of policy intervention are positive and significant at the 1% level. However, this does not mean that the guidance price policy, which aims to restrict housing prices, has increased housing prices. Recall that there is a strong upward trend in housing price, the positive signs of the regression coefficients of policy intervention are generated by the strong upward trend. Since the baseline model and model 2 does not control trend, this increase in housing price caused by trend is attributed to the policy intervention.

In model 3, where the trend is controlled, policy intervention's regression coefficient changes from positive to negative. The regression coefficient of policy intervention is -0.1765, and it is significant at a 1% level. This means that when the trend and other factors are controlled, the intervention of guidance price policy has

effectively reduced the housing price level of the secondary market by approximately 16.2%. Compared with the baseline model and model 2, this model is more accurate in estimating the housing price in Shenzhen since its value of log pseudo likelihood is the largest one among these three models. The blue line in Fig. 2 demonstrates the prediction for the housing price by model 3.

3.3. Housing supply

The red line in fig. 3 shows the time series of housing supply in Shenzhen's secondary housing market. This figure demonstrates a clear trend in the time series, which means the time series is non-stationary.

Table 3 displays the modeling results for the secondary housing supply. According to the baseline model with no control on seasonality or trend, the policy intervention has a negative effect on the housing supply since its regression coefficient is significant at a 1% level. The -1.2502 regression coefficient means that the policy intervention reduces the secondary housing supply by around 71.4%. This is an extremely great effect, which means that the supply has fallen by more than half because of the policy intervention. However, the estimation for the baseline model is biased by the seasonality and trend to a great extent.

The housing supply is likely to be affected by seasonality. For example, the housing supply in spring tends to be lower than the yearly average level because there are important festivals in spring. The second model controls the seasonality of the data. In this model, policy intervention's regression coefficient (-1.3868) is still significant at the 1% level. According to this model, the guidance price policy decreases the secondary housing supply by around 75.0%, which is even lower than the baseline model's estimated result of 71.4%.

Model 3 controls both seasonality and trend. The regression coefficient for this model is -0.9723, and it is significant at a 1% level. In this sense, the guidance price policy reduces the housing supply by around 62.2%. Therefore, model 3 provides the closest estimation to the actual time series of secondary housing supply in Shenzhen, and its prediction is depicted in fig.3.

Table 2. Negative Binomial Regression of Policy on Housing Price

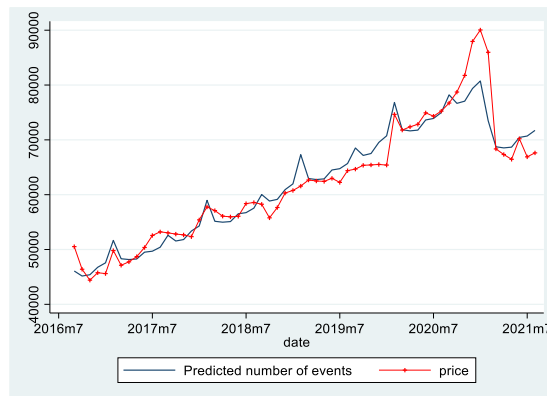| Dependent variable: Housing price	Model 1	Model 2	Model 3
Policy	0.1419***	0.1441**	-0.1765***
	(0.0427)	(0.0384)	(0.0301)
Constant	11.0201***	11.0580***	10.7148***
	(0.0246)	(0.1055)	(0.0269)
Seasonality	No	Yes	Yes
Trend	No	No	0.0110***
			(0.0004)
Alpha	0.0275***	0.0269***	0.0019***
(Over-dispersion test)	(0.0046)	(0.0043)	(0.0005)
Observation	60	60	60
Log pseudolikelihood	-638.9528	-638.3528	-559.7695

Figure 2 Prediction on Housing Price

Table 3. Negative Binomial Regression of Policy on Housing Supply

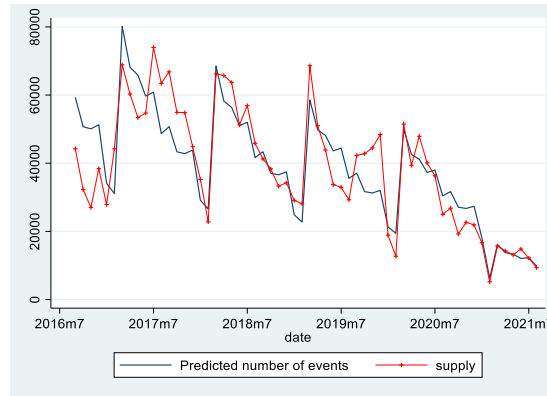|	Model 1	Model 2	Model 3
Policy	-1.2502***	-1.3868**	-0.9723***
	(0.1184)	(0.0677)	(0.0899)
Constant	10.6511***	10.1487***	10.5020***
	(0.0501)	(0.1211)	(0.1049)
Seasonality	No	Yes	Yes
Trend	No	No	-0.0131***
			(0.0024)
Alpha	0.1398***	0.0748***	0.0438***
(Over-dispersion test)	(0.0234)	(0.0125)	(0.0074)
Observation	60	60	60
Log pseudolikelihood	-653.5480	-634.1268	-617.7876

Figure 3 Prediction on Housing Supply

Since in all three models for housing supply, the policy intervention is significant at 1%, and all regression coefficients indicate the supply has dropped by more than half, the guidance price policy does have a great negative effect on the secondary housing supply in Shenzhen. According to these three models, the policy decreases housing supply by around 62.2% to 75.0%.

3.4. Policy analysis

Some homebuyers need to use high leverage to buy a home in cities with overheated real estate markets. The risk behind this high leverage is that a considerable part of the market demand for secondary houses is for investment and speculative purposes, rather than rigid demand. Moreover, some speculators ignore the traditional credit risk review process. In this sense, once people are too optimistic about the market and banks offer a lot of high loans to those who expect to get profit from real estate speculation nevertheless with low credit or no ability to repay the loans and interest, it will eventually lead to the situation that some borrowers cannot get enough profit from speculation. The banks can't collect the loans. The massive, risky lending by these institutions creates higher inflation in asset prices than other commodities.

The guidance price policy is designed to reduce these financial risks caused by the real estate market bubble. The guidance price policy has issued two important regulations. The first regulation is that all transactions in the secondary market should refer to the guidance price released by the Shenzhen Government, which is greatly lower than the previous second-hand housing price. The guidance price is generated according to several factors, such as the average housing prices sold over the past two years, the age of the house, the location, and so on. However, it should be noted that the guide price is not mandatory at the time of the second-hand house registration. In the actual transaction, the parties still need to negotiate the price according to the voluntary principle. In this sense, the guide price is not the direct reason for the decrease in transaction volume, housing price and supply.

The main reason for cooling down the secondary housing market is the second regulation, which announces that the guidance price should be one crucial reference for mortgage and banks' price assessment system. This is to say that the banks should issue mortgages referring to the guidance prices. Although the second regulation is also not mandatory, if a mortgage varies from the one formulated according to guidance price, the banks will be warned by the Banking Regulatory Commission. The guidance price policy has carried out a reasonable and effective control over the mortgages issued by banks, which enables banks to avoid the hidden danger of a future real estate bubble.

The second regulation directly results in the decrease in transaction volume of the secondary housing market. The intuition behind this is that the regulation on a mortgage reduces the demand for second-handed houses by reducing the mortgage supply in the credit market. Since most of all guidance prices issued by the government are significantly lower than the previous housing prices listed by home sellers, in the credit market, the supply of mortgage is lower, which leads to the equilibrium transaction volume of mortgage is lower. This results in that in the secondary housing market, the down payment for homebuyers will be higher if the housing price is still higher than the guidance prices. The higher down payment forces some homebuyers to withdraw from the secondary housing market. These homebuyers who have withdrawn from the market include those who want to make a profit from real estate speculation. Therefore, the housing demand is restrained by the policy, which contributes to the decrease in transaction volume of the secondary housing market.

Although our research does not quantitatively discuss how the policy influences demand second-handed houses, our findings indicate that the housing demand is lower. The demand reduction mainly causes the decrease in housing price. To begin with, it is crucial to notice that the decreases in housing price, transaction volume and supply are not caused by price ceiling since the guidance prices are not mandatory to follow. In this sense, if the demand after the policy is issued is not changed or even

higher, the decreases in supply are supposed to lead to higher housing prices, which contradicts our finding that the housing price is lowered down by policy intervention. This indicates that the drop in housing prices results from the reduction in demand for second-handed houses. As the market cools and slumps, some sellers give a looser price, which gives buyers some room to negotiate prices. Eventually, after negotiation between the two sides, the average second-handed housing price of the market lowers down in the feasible range.

Since the trend of soaring housing prices is suppressed, the real estate speculation in Shenzhen is restricted, which can be illustrated by the drop in supply for secondary houses. The reduction in supply is large because of the withdrawal of real estate speculators. On the one hand, after the policy intervention, the cost of real estate speculation is higher since a higher down payment is required to buy secondary houses in prosperous areas. On the other hand, the expected revenue of speculation is lowered because the policy decreases the housing price. For a long time to come, second-handed housing prices are expected to stabilize at the current level. Therefore, real estate speculation is not as profitable as before because of the policy intervention, and many speculators withdraw from the housing market. The withdrawals of speculators also mean that the demand for secondary houses lowers down to the feasible level, as the housing demand motivated by speculation is restricted. This is effective in cooling down and stabilizing the secondary housing market.

4. CONCLUSION

In conclusion, this research finds that the transaction volume, housing price, and supply of the secondary housing market in Shenzhen has been effectively decreased by the guidance price policy. This means that this policy has successfully reduced the real estate speculation in Shenzhen. Furthermore, by guiding housing prices and the mortgages issued by banks, the mortgages homebuyers can obtain lower, which means a higher down payment is required to buy a house. This leads a considerable part of housing demand motivated by speculation to withdraw from the secondary housing market, which effectively lowers housing prices and enables the rapid upward trend of housing prices to be stabilized.

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