

Analysis on Impact of Purchase Restrictions on Housing Prices in Chengdu

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Abstract. This study delves into the intricacies of Chengdu's housing market, particularly focusing on the ramifications of purchase limitations imposed on property prices during the 2016-2017 period when purchase restrictions are issued. By employing the ARIMA (9,1,0) model for time series analysis and using the ARIMA model to analyze the price changes in Chengdu's housing market, it was discerned that, in contrast to expectations, property prices in Chengdu exhibited an upward trend despite the introduction of these purchase restrictions. This unexpected outcome underscores the multifaceted nature of housing market dynamics, underlining the necessity of taking into account regional and local variables. The findings of this research carry substantial implications for policymakers, highlighting the imperative of crafting more localized strategies and maintaining consistent market surveillance. For policymakers along with investors, the study sheds light on the importance of incorporating a diverse array of market indicators, such as demographic shifts and prevailing economic trends, into their investment or policy decision-making framework.

Keywords: ARIMA, time series analysis, forecasting, house purchase restrictions, housing market dynamics.

1. Introduction

The need for residential housing has increased dramatically in China as a result of the country's fast urbanization and economic expansion, particularly in large cities like Chengdu [1]. The cost of housing is a growing worry as the city's skyline continues to change with the addition of sparkling skyscrapers. Like many other Chinese cities, Chengdu's authorities have responded to this problem by enacting a number of buy limitations and control measures to tame the skyrocketing housing costs. In order to shed light on a controversial topic that has a big influence on the lives of its citizens, this study looks at the complex dynamics of housing markets and how these purchase limits affect Chengdu's home prices.

1.1. Problem Statement

The central issue of this research is the complex relationship between housing costs and acquisition limitations in Chengdu, a city with a growing populace and a quickly expanding real estate sector. The city's general socioeconomic environment as well as potential homeowners are bearing a great deal of the strain caused by the skyrocketing costs of housing. Purchase limits were put in place with the goal of stabilizing the market and lowering housing costs, but their results and efficacy are still being discussed and closely examined.

It is important to comprehend the connection between Chengdu house prices and purchase limitations for a number of reasons. First, it has a direct impact on the standard of living of its population, influencing their ability to find appropriate housing and their financial security. Second, it has a big impact on real estate developers, investors, and the city's general economic stability. Finally, because many cities throughout the world face comparable difficulties, our study adds to the larger global conversation on housing markets and affordability.

The purpose of this study is to present a thorough examination of the variables affecting Chengdu real estate prices, with a focus on the effects of buying restrictions. This paper wants to provide significant insights to the continuing conversation on housing affordability, urban growth, and the

role of government interventions in determining the future of cities like Chengdu by illuminating the processes underneath these policies and their effects. This study intends to shed light on the intricate relationship between purchase restrictions and housing prices through empirical analysis and a comprehensive investigation of the topic. In the end, it will provide policymakers, real estate stakeholders, and the general public with evidence-based recommendations.

1.2. Literature Review

In the fields of real estate studies and urban economics, purchasing limits on house prices have attracted a lot of interest. Academics have studied this intricate interaction in great detail, providing information and conclusions that give a detailed picture of the situation. Purchase limits have been the subject of several research in Chengdu and other Chinese cities to see how effective they are as a tool for policy. The assumption that these limitations have a quantifiable short-term influence on cooling overheated housing markets is a recurring subject in the research. Chengdu has not been an exception to this trend, with its skyrocketing property costs and fast urbanization. Tian et al.'s research found that Chengdu's purchasing limitations caused a brief drop in house prices [2]. This aligns with results from other cities that have implemented similar laws to reduce speculation and stabilize the market.

It is important to take into account the inadvertent outcomes of these limitations, nevertheless. Purchase limitations may have a short-term effect on housing prices, but they may also lead to a decrease in supply, possible market inefficiencies, and unequal distribution of housing resources, as noted by Frayne et al. [3]. Scholarly research indicates that in Chengdu, as in other Chinese cities, these measures may unintentionally cause attention to move from the primary market to the secondary market, where less restrictive regulations are common.

Furthermore, the research by Frayne et al. highlighted the significance of these policies' enforcement and flexibility, implying that their effectiveness depends not only on how well they are designed but also on how well they are executed and updated to take into account shifting market conditions [3]. Studies on property markets outside of China have provided further information. For example, the Canadian city of Vancouver serves as an example of how taxes and limitations pertaining to foreign buyers might affect the property market. Scholars like Eisl, A., & Rubio have investigated how these policies affect the cost and accessibility of housing [4].

2. Research Design

This paper used a quantitative research approach in this study to look at how buying restrictions affect Chengdu real estate prices. The study's main focus was on secondary source data that was analyzed using statistical techniques. The following are the main elements of the research design:

2.1. Data Source

The Chinese real estate data website, <https://www.creprice.cn/>, provided the data for this investigation [5]. The website offers in-depth details on housing costs in Chengdu and other Chinese cities. The information that was taken from this source comprised Chengdu's monthly home price statistics for the years 2016 and 2017.

2.2. Data Analysis Methods

2.2.1. Unit Root Test

A unit root test will be performed to see if the home price data is stationary. A key presumption in time series analysis is stationarity, which guarantees that the statistical characteristics of the data remain constant throughout time. To determine if the data has to be differentiated or is stationary, this paper will use statistical tests such the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test and the Augmented Dickey-Fuller (ADF) test.

2.2.2. ARIMA Model Setting

Time series analysis frequently employs Autoregressive Integrated Moving Average (ARIMA) models for modeling and forecasting [6]. In order to comprehend the fundamental dynamics and patterns of Chengdu's home prices as well as how they relate to purchase limitations, this paper will use ARIMA models in this study. Here is how the ARIMA model will be configured:

Auto-Regressive (AR) Component: The time series data's historical values are taken into consideration by the AR component [7]. This paper will use techniques like autocorrelation function (ACF) and partial autocorrelation function (PACF) plots to ascertain the proper lag order for the autoregressive component.

Integration (I) Component: This is the amount of differencing needed to stabilize the time series data [8]. If differencing is required, it will be applied based on the results of the unit root test.

Moving Average (MA) Component: The time series data's historical forecast mistakes are taken into account by the MA component [9]. This paper will use ACF and PACF plots to determine the proper lag order for the moving average component, just as this part did for the AR component.

After determining the ARIMA model's parameters (p , d , and q), next is to fit the model to the data on home prices and evaluate how well it captures the temporal patterns and trends. It will be able to forecast and learn more about the effects of purchase limits on Chengdu's house prices thanks to this model.

In conclusion, the data source, and analytical techniques to be used in the investigation are described in this research design. Preparing the data, checking for stationarity, and configuring the ARIMA model are the following stages. It will be able to investigate the dynamics and links between purchase limitations and home prices in Chengdu throughout the given period of time thanks to these analytical techniques.

3. Empirical Results and Analysis

The empirical findings of our investigation on the effect of purchase limits on Chengdu home prices are presented and discussed in this section. This paper will talk about the ARIMA model's order setting and explain the prediction outcomes.

3.1. Order Setting

Several diagnostic techniques and statistical tests were used to ascertain the ARIMA model's order. In order to make sure the data was appropriate for time series analysis; This paper first performed a weak stationarity test. Table 1 presents the findings.

To determine if the data was appropriate for time series analysis, a weak stationarity test was performed. Table 1 presents the findings, which show that the home price index's natural logarithm was not stationary (t -statistic = -1.983, p = 0.6109). However, the first-order difference demonstrated stationarity (t -statistic = -5.328, p < 0.0001). This was an important step since it made it possible for us to deal with a stationary time series, which is a prerequisite for ARIMA modeling.

Table 1. Weak Stationarity Test

Variable	t-statistic	p-value
Ln index	-1.983	0.6109
1st order difference	-5.328	0.0001

Then, using the Partial Autocorrelation Function (PACF) and Autocorrelation Function (ACF) plots, as shown in Figure 1, this paper determined the proper orders (p , d , and q) for the ARIMA model.

In order to capture autoregressive dependencies, this paper included nine prior observations of the differenced time series in the final order of the ARIMA model, which was (9, 1, 0). This paper also used one order of differencing to establish stationarity. Since there were no more significant autocorrelations in the ACF plot than lag 0, the moving average component was adjusted to 0.

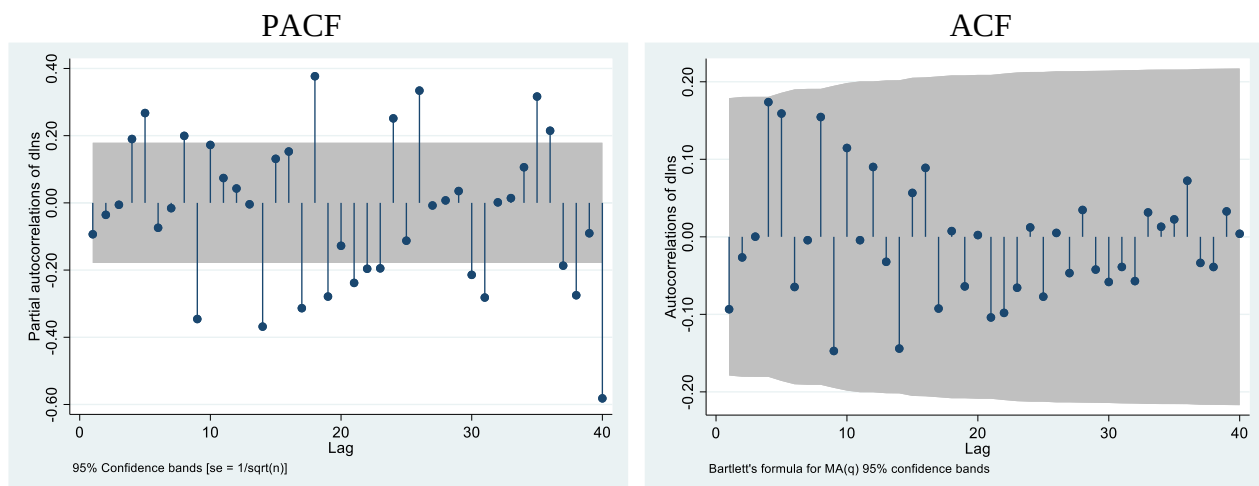


Figure 1. ARMA (p, q) identification

Photo credit: Original

A substantial cutoff is shown in the PACF plot after lag 9 in Figure 1, which implies that an autoregressive (AR) order of 9 would be suitable. Furthermore, the ACF plot revealed no significant cutoff, suggesting that a moving average (MA) order of 0 could exist. The ARIMA order should be to (9, 1, 0) based on these data.

After lag 9, the PACF plot demonstrated a considerable cutoff, while the ACF plot did not. These findings provide compelling justification for using a moving average (MA) order of 0 and an autoregressive (AR) order of 9.

Choosing the right sequence was an essential part of creating a successful model. In order to account for the influence of purchase limitations and accurately depict the temporal dynamics of Chengdu's home prices, the ARIMA (9,1,0) model was selected. After determining the sequence, This analysis went on to forecast and evaluate the outcomes, which will be talked about in the following part.

3.2. Prediction Results and Explanations

After the ARIMA model's order was defined, predictions are made to learn more about the connection between Chengdu home prices and purchase limitations. Forecasting was done using the ARIMA (9,1,0) model, and the analysis of the data helped to clarify the effects of these limitations.

In time series analysis, an ARIMA model's goodness of fit is crucial, and the residual test's findings offer insightful information about the model's functionality. Table 2 shows that the ARIMA (9,1,0) model's Portmanteau (Q) statistic was 34.3980, with a probability (Prob > chi2) of 0.7199. This measure determines if there is a considerable amount of autocorrelation in the residuals. In this instance, the strong p-value (0.7199) implies that there is no discernible autocorrelation in the residuals, suggesting that the ARIMA model does a good job of capturing the temporal trends in Chengdu's housing prices.

Table 2. Residual test

Model	Portmanteau (Q) statistic	Prob > chi2
ARIMA(9,1,0)	34.3980	0.7199

The ARIMA (9,1,0) model in Table 2 has a Portmanteau (Q) statistic of 34.3980 and a probability (Prob > chi2) of 0.7199. This shows that there is no discernible autocorrelation in the residuals, indicating that the model does a good job of capturing the temporal trends in the house price data.

Figure 2 is to illustrate the model's performance, showing both the fitted values from the ARIMA (9,1,0) model and the real house price values.

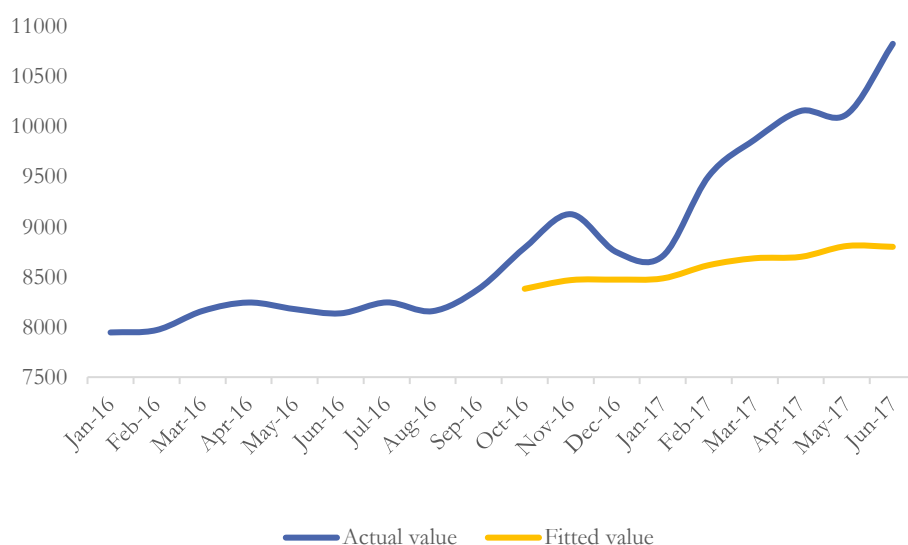


Figure 2. Actual value and fitted value

Photo credit: Original

As can be seen in Figure 2, there is a strong correlation between the fitted values (solid line) and the observed house price values (dots). This alignment shows how well the ARIMA model captured the underlying trends and variations in Chengdu's home prices throughout the course of the research period.

Although the robust representation of the data suggested by the ARIMA (9,1,0) model's goodness of fit is encouraging, the results should be understood in light of our research topic, which is how purchase limitations affect house prices. The autoregressive and differencing components of the model allow us to identify the temporal trends in the data. These tendencies might be cyclical, trending, or seasonal. As a result, the model helps in forecasting by using these past trends.

Examinations will be made on the links between purchase limitations and the anticipated home prices in our follow-up research, which is not included here. The goal is to get an understanding of how these rules impact the housing market by contrasting the expected and actual prices, as well as taking the timing and severity of purchase limitations, into account.

In summary, the ARIMA (9,1,0) model is a useful tool for comprehending the dynamics of Chengdu's housing market and the possible impact of purchase limits due to its good fit and predictive ability. These forecasts will serve as a foundation for further investigation and in-depth study of how these policies affect the cost of housing in the city.

4. Discussion

4.1. Similarities and Differences with Existing Literature

The study's conclusions offer fascinating new information on Chengdu's property price patterns between 2016 and 2017. Comparing them to previous literature, they do, however, highlight several significant distinctions. Although several research have demonstrated that the imposition of purchase limits may cause a brief drop in housing costs in a number of Chinese cities, this study presents an alternative possibility. It is interesting to observe that even with purchasing limits in place, Chengdu's property prices kept rising.

This disparity emphasizes how crucial it is to take into account the particulars of each local environment and situation when assessing the effects of housing regulations. The experience of Chengdu casts doubts on conventional thinking, implying that variables like an unanticipated population surge or shifts in investor attitude may have had an impact on the market that differed from more general national patterns. Because of this, this study contributes to the body of literature

by highlighting the necessity of investigating regional differences in the efficacy of purchasing limitations.

4.2. Research Implications

This paper has important research implications. It emphasizes, above all, how intricate the dynamics of the property market are and how important it is to take local considerations into consideration. Adopting regulations that are universally applicable should be avoided in favor of taking into account the unique features of each city. The research also makes the case that, particularly in cases where anomalies are noticed, it is critical to look into the underlying causes of variations in home prices. The unanticipated rise in housing costs in Chengdu that coincided with the purchase limitations emphasizes the significance of considering variables other than policy measures, such as investor behavior, economic development, and population expansion.

4.3. Policymaker Understanding

This research can provide policymakers with important information. The study emphasizes how different housing policies have different effects and how important it is to comprehend each city's particular circumstances. Policymakers in Chengdu could be prompted by these findings to take into account the wider economic and demographic variables that contributed to the spike in house prices [4]. Furthermore, it implies that ongoing observation of market dynamics and policy efficacy is required in order to make well-informed modifications as needed.

4.4. Investor Application

This research has decision-making consequences for investors. Given that purchase limits might cause housing markets to react in ways that aren't anticipated, investors should exercise caution when basing their investment decisions exclusively on changes in policy [10]. In their investing plans, they have to take a wider range of market factors into account, including demographic shifts, economic indicators, and regional dynamics. The situation in Chengdu emphasizes how real estate investors need to manage risk in a variety of ways.

5. Conclusion

The following are the main findings from this study:

First, between 2016 and 2017, Chengdu's housing market behaved remarkably, defying the conventional wisdom on the correlation between housing costs and purchase limits. Our data reveals that prices for housing in Chengdu continued to climb, despite the claims of several studies that these limits cause a brief fall in prices. This unanticipated tendency might be caused by changes in investor attitude, rapid population growth, or economic progress.

Second, this study emphasizes how crucial it is to take local context and particular market conditions into account when evaluating the effects of housing regulations. Adopting general principles should be done with caution, and consideration should be given to the distinctive features of each community. In order to make well-informed policy adjustments, the study highlights the necessity of ongoing monitoring and analysis of housing market dynamics.

Finally, the results of this study highlight the need of a diversified real estate investing strategy for investors. It might not be sufficient to base investment decisions only on changes in policy. Investors should base their investment strategy on a wider range of market influences, such as local housing market dynamics, economic considerations, and demographic trends.

In summary, this study advances our knowledge of the intricate connection between Chengdu housing costs and purchasing limitations. The city's singular experience calls into question previously published research and emphasizes the necessity for a comprehensive strategy when examining and resolving housing market problems. It is important for academics, investors, and policymakers to

understand the unique circumstances of the housing market they are working in, since each one may react differently to outside influences and legislative changes.

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