Study for Factors Influencing Pre-Owned Housing Prices in China

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Abstract: Against the backdrop of the sustained development of China's real estate market and active pre-owned housing transactions, it is crucial to explore the factors influencing pre-owned housing prices. This article focuses on this and uses a review method to integrate literature from multiple fields. Research has found that a combination of multiple factors influences pre-owned housing prices. In the inherent properties of a house, factors such as age, decoration, layout, and floor level directly affect its price. In terms of the external environment, location factors have a significant impact, and the completeness of supporting facilities such as education, healthcare, commerce, and transportation in the surrounding area greatly affects its market value. The supporting services, such as property services and greening rates within the community, will also have an impact on housing prices. In addition, the article summarizes existing research methods, such as multiple linear regression, geographically weighted regression, and random forest models. A deep understanding of these factors and mechanisms can not only help homebuyers and investors make scientific decisions but also provide theoretical support for the government to formulate precise and effective real estate regulation policies and help stabilize the market.

1 INTRODUCTION

In current China, the real estate market has undergone years of development and has become a significant mainstay industry of the national economy. In recent years, with the continuous advancement of urbanization and the continuous growth of the urban population, the demand for housing has become increasingly strong. However, due to limited land resources, the growth rate of the new housing supply has gradually slowed down, and the pre-owned housing market has become increasingly active. Its transaction scale continues to expand, and its proportion in the housing market continues to increase. From January to November 2023, the volume of business of pre-owned houses and the sales area of newly built commercial houses in China increased by 6.9% compared to the same period in 2022. Compared to the same period last year, the volume of business of pre-owned houses accounted for around 40% of the whole transaction volume of new and pre-owned houses, a growth of about 10 percentage points. In some major cities, the proportion of pre-owned house transaction volume even exceeded 50% (source from The Paper). At the same time, the government's regulation policies on the real estate market are becoming increasingly refined, and the positioning of "housing for living, not for speculation" is deeply implemented, aiming to stabilize housing prices and ensure people's livelihoods. In this context, studying the influencing factors of resold housing prices in China is of great significance. For homebuyers, it can help them accurately grasp market dynamics, weigh various factors, and make rational purchasing decisions, avoiding blindly following trends and causing economic losses.

Previous literature has studied the factors influencing resold housing prices from various research perspectives. Yang, Shao & Peng (2023) selected factors such as the presence or absence of elevators and decoration as independent variables, constructed a multiple linear regression model, and found a significant correlation between pre-owned housing prices in Beijing and their independent variables. Guo, Yu & Ke (2022) first used a multi-factor covariance model to determine the main factors

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affecting pre-owned housing prices in Yantai City and established a valuation model and Lasso regression model to ultimately select three important factors: property fees, administrative districts, and main floors. Zhao (2021) constructed a hedonic price model and a geographically weighted regression (GWR) model, and used interpolation analysis to discover that different factors have varying degrees of impact on pre-owned housing prices in different regions of Guangzhou, indicating spatial heterogeneity. However, some literature selects a relatively single research perspective, and the selected research models are not perfect enough. For example, the interaction between influencing factors may affect the research model. Mi (2018) studied the factors affecting pre-owned housing prices in Guangzhou but did not take into account the interaction between the insignificant influencing factor of whether the decoration is fine and other factors in the regression model.

This article aims to analyze the more common influencing factors of pre-owned housing prices and explore more effective research models, providing pricing references for real estate transactions and facilitating consumers to evaluate the cost-effectiveness when purchasing pre-owned houses.

2 RESEARCH METHODS FOR INFLUENCING FACTORS OF PRE-OWNED HOUSING PRICES

2.1 Multiple Linear Regression Model

This article found through reviewing existing literature that multiple studies have used multiple linear regression models and their related models to investigate the factors affecting pre-owned housing prices. The multiple linear regression model is a commonly used statistical analysis method that has advantages for studying this problem. Firstly, it can consider multiple influencing factors; Secondly, it can make the variable relationship clear and intuitive. This model assumes a linear relationship between the dependent variable (pre-owned housing prices) and the independent variable (various influencing factors),

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p + \varepsilon \quad (1)$$

Among them y are pre-owned housing prices, x_i are various influencing factors, β_i is corresponding regression coefficients, and c is random error terms. By estimating the regression coefficients, it is possible to clarify the direction and degree of influence of each independent variable on the dependent variable. A positive regression coefficient indicates a positive correlation between the factor and housing prices, while a negative coefficient indicates a negative correlation, and the magnitude of the coefficient reflects the strength of the impact. For example, if the regression coefficient of the housing area is positive and the value is large, it indicates that the larger housing area can contribute to the higher housing price. Liu, Jin & Wang (2017) and others studied the influencing factors of pre-owned housing prices in Nanjing. Using a multiple linear regression model, they selected factors such as house area and number of bedrooms as independent variables, and calculated that the area and whether there is an elevator have a greater impact on unit area housing prices, while area and number of bedrooms have a smaller impact on unit area housing prices; Shen (2017) also used regression models to study the key factors impacting resold housing prices in Beijing, selecting factors such as greening rate and housing area, and established regression equations to verify the significance of the effects of each influencing factor. Finally, the conclusion was drawn that the interaction between urban areas, school district houses, and subway houses was significant; Chen (2019) also used a multiple linear model to study the important factors influencing resold housing prices in Shenyang, and found that the price of pre-owned housing purchased by buyers is mainly influenced by the building area, elevator equipment, and location. However, multiple linear regression models also have limitations, as they may lack the ability to capture complex interactions between variables.

2.2 Geographically Weighted Regression Model

Some articles also utilize more optimized models, such as the geographically weighted regression model, which is a regression analysis method that considers spatial nonstationarity and extends the traditional linear regression model. The traditional linear regression model assumes that the regression coefficients remain fixed throughout the entire study area, but in the real world, many phenomena exhibit spatial nonstationarity, meaning that the relationships between variables change with spatial location. The GWR model allows regression coefficients to vary spatially by assigning a local weight to each sample point, establishing a local regression model that more accurately describes the characteristics of spatial data and overcomes this problem. Its basic form is:

$$y_i = \beta_0(u_i, v_i) + \sum_{k=1}^{p} \beta_k(u_i, v_i) x_{ik} + \varepsilon_i \qquad (2)$$

y_i is the observed value of the dependent variable at the position; (u_i, v_i) is the coordinates of the location; $\beta_0(u_i, v_i)$ and $\beta_k(u_i, v_i)$ are the intercept at the position (u_i, v_i) and the regression coefficient of the independent variable, respectively; x_{ik} is the value of the kth independent variable of the ith sample point; p is the number of independent variables; ε_i is a random error term; The key to the GWR model is to determine the local weight of each sample point, and commonly used weight functions include Gaussian kernel function, double square kernel function, etc. For example, Gao (2020) studied the influencing factors of pre-owned housing prices within the third ring road of Wuhan city, and used this model to regress the unit price of houses and eight characteristic variables; Liu (2016) also used this model to study the impact of residential characteristics on the listing prices of pre-owned houses in Xuzhou City. The geographically weighted regression model he constructed is mainly used to study the spatial relationship between commodity residential prices and residential characteristics, that is, influencing factors; Li, Wang & Qi (2024) used a geographic regression weighted method to explore the influencing factors of residential costs in Shanghai.

2.3 Random Forest Regression Model

Compared to traditional multiple linear regression models, the random forest model has a stronger ability to handle nonlinear relationships and robustness. Random forest is a model that constructs multiple decision trees and synthesizes their predicted results to make the final decision. The core formula may vary slightly depending on the type of task (regression or classification), for example, for regression problems,

$$\hat{y}(x) = \frac{1}{K} \sum_{k=1}^{K} f_k(x), \qquad (3)$$

Among them, $\hat{y}(x)$ is the predicted value of the random forest on the input x; K is the number of decision trees in a random forest; $f_k(x)$ is the predicted value of the input x for the kth decision tree. This formula indicates that the prediction result of a random forest for regression problems is the average of the predicted values of all decision trees for the same input. Qin Yanjiao conducted a comparative study on multiple linear regression models and random forest algorithms for housing price prediction models, and found that for the random forest model, the average absolute error and root mean square error are smaller, making it more advantageous in the housing price research sector; Wei (2021) studied the important factors influencing resold housing prices in Nanning and found that random forests are suitable for feature selection on high-dimensional data; Sun (2019) simultaneously used multiple regression models and random forest regression models to explore the impact of regional factors on the unit area price of pre-owned houses in Shijiazhuang; Li, Wang & Tong (2023) also conducted a study on the nonlinear impact of street quality on housing prices based on the random forest model, and found that the random forest model has a higher goodness of fit compared to traditional linear models.

2.4 Other Methods

In addition to the research methods mentioned above, there are also research methods such as the median regression model, covariance regression model, and stratification model, which will not be introduced one by one in this article.

3 THE INFLUENCING FACTORS OF CURRENT PRE-OWNED HOUSING PRICES IN CHINA

3.1 Location Factors

Location factors are significant factors affecting pre-owned housing prices. Generally speaking, under other equal conditions, the more convenient the transportation, the more complete the supporting facilities (such as shopping malls, hospitals, schools), and the more concentrated the resources in the core urban area, the higher the pre-owned housing prices. In Beijing, Xicheng District and Haidian District are the core areas, while Daxing District and Tongzhou District are slightly more remote noncore areas. Studies have shown that the resold housing costs of the first two are higher than those of the latter two, indicating that location significantly affects housing prices (Yang et al., 2023). In the process of forming the costs of pre-owned houses in Baotou City, the

location factor of the houses also has a significant impact. The three districts of Baotou City, Kundulun District, Qingshan District, and Donghe District, have different pre-owned housing prices, indicating that the prices of pre-owned housing in Baotou City are greatly influenced by regional development (Ma, 2023). The resold housing costs in Zone A of Hefei City are greatly influenced by whether it is equipped with a subway, as the transportation facilities, hospitals, shopping malls, and other supporting facilities in Zone A are relatively complete (Jin&Wang, 2023). Location factors play a major role in the important factors influencing resold housing prices in Changchun, including supporting facilities, transportation conditions, and future development prospects (Yan & Zhao, 2021). Exploring the reasons behind this, this article analyzes that location factors significantly affect housing prices for the following reasons. Location with convenient transportation, low commuting costs, and high demand for real estate, such as houses near subway stations with higher prices. The well-equipped location, surrounded by schools, hospitals, and shopping malls, provides convenient living and enhances the value of the property. Places with beautiful environments, such as near parks, lakes, etc., have high living comfort and correspondingly increase housing prices. In addition, the concentration of resources in urban core areas and strong economic vitality often result in high housing prices.

3.2 Community Supporting Facilities and Services

Community-supporting facilities and services are also important factors affecting housing prices. The level of community property services and the green environment of the community can all affect pre-owned housing prices. Generally speaking, under other equal conditions, pre-owned houses with higher levels of community property services and better green environment in the community have higher housing prices. In the study on the influencing factors of pre-owned housing prices in Hefei City, regarding the influence factors of sample characteristic prices in the overall samples of the primary city area and nonmain urban area, residential areas with standardized property management and high greening rates are more favored by homebuyers. Jin and Wang (2023) used a multiple linear regression model to analyze the influencing factors of pre-owned housing prices in Hefei City. The non standardized coefficients of property prices and greening rates reached 0180 and 0.063, respectively, indicating that pre-owned housing buyers are increasingly concerned about the supporting services and facilities within the community. This inspires for real estate developers to strengthen their green environment and improve their property service management level.

3.3 Self Conditions of Pre-Owned Houses

The quality of pre-owned houses significantly affects their prices. This includes factors such as decoration level, number of rooms, availability of elevators, and floor height. Yang et al. (2023) analyzed the transaction data of pre-owned housing prices in Beijing and used a regression method to calculate the regression coefficients of the independent variable bedroom number as 2030.524, the independent variable living room number as 2694.756, the independent variable decoration method (divided into simple decoration and fine decoration) as 4097.853, the independent variable low floor as 546.939, the high floor as -402.045, and the independent variable elevator as 4812.397. It can be seen that the self-equipped conditions of pre-owned houses significantly affect the pre-owned housing prices. In Hefei City, the three factors of building area, number of bedrooms, and decoration situation rank among the top in terms of their impact on resold housing costs. Jin and Wang (2023) calculated the regression coefficients using a regression model, where the non standardized coefficients of the independent variables of number of bedrooms, number of living rooms, and equipped elevators were 0.139, 0.020, and 0.709, respectively. From this, it can be seen that the condition of a pre-owned house itself is a factor that buyers highly value.

3.4 Age and Property Rights Issues

This article studies the key factors influencing resold housing prices, so age and property rights cannot be ignored. In the real estate market, there are significant differences in age and property rights between pre-owned and non pre-owned houses. Second-hand houses have a wide range of ages, ranging from a few years to several decades. Increasing the age of a house can lead to significant depreciation, affecting its structural safety and facility performance, thereby reducing its price. The age of the new house is zero, and the quality is relatively more guaranteed. In terms of property rights, pre-owned houses have diverse properties, including commercial housing, affordable housing, etc., with different transaction restrictions and taxes, and may also have hidden risks of property

disputes. Non pre-owned houses have clear property rights and are mostly commercial properties. There are relatively few property disputes, and because there is no loss of use, the remaining years of property rights are relatively longer, making them more attractive in the market. In the study conducted by Jin and Wang (2023) on the key factors impacting resold housing prices in Hefei, the non standardized coefficients for property ownership and housing age were -0.296 and 0.004, respectively, using a regression model.

3.5 The Impact of Special Factors on Pre-Owned Housing Prices

For different regions and periods, there will be different special factors that affect pre-owned housing prices; that is, the impact of special factors on pre-owned housing prices has temporal and spatial differences. Li (2022) studied the spatiotemporal characteristics and influencing factors of pre-owned housing prices in Chengdu. Among the many factors studied, the determining factors of pre-owned housing prices were land price grade and school district attributes. The impact on housing prices became increasingly strong from 2012 to 2021, but the popularity of school district housing decreased after 2018. Zhao (2023) found that when studying the important factors influencing resold housing prices in Hangzhou, Other factors being equal, pre-owned houses with high waterlogging risk will suffer a 3% price discount, while high waterlogging risk in surrounding areas will suppress the costs of resold houses in that area. Li (2022) studied the influences of the pandemic on resold housing costs in Wuhan and learned that from January to September 2020, the transaction costs of resold houses in Wuhan generally decreased, with April being the highest peak. Due to proper control of the pandemic, housing prices began to steadily rise in October 2020. It can be seen that special and unpredictable factors such as natural disasters will inevitably have an influence on resold housing costs.

4 SUGGESTIONS

In the existing literature on pre-owned housing prices, this article finds that they generally lack discussion on some government policy factors, and government policies also have an undeniable influence on resold housing costs. The restriction policy extends the time for housing to be traded again, and a large number of properties are locked up. When the supply of pre-owned housing in the market decreases and demand is relatively stable, prices are difficult to rise significantly. And the tightening of credit policies, such as raising loan interest rates, increasing the repayment pressure on homebuyers, suppressing the demand for home purchases, and thus bringing downward adjustment momentum to pre-owned housing prices. Therefore, in the field of research on the influencing factors of pre-owned housing prices, this article suggests that researchers pay more attention to national or regional policies on pre-owned housing, especially in the event of major events such as the epidemic, what important measures and policies have been taken by the government to regulate pre-owned housing prices.

5 CONCLUSION

In summary, this study systematically analyzed and summarized the important factors influencing pre-owned housing prices in China. Factors such as location, community-supporting facilities, and micro individual conditions of pre-owned houses all have varying degrees of influence on resold housing costs. Previous researchers have mostly used multiple linear regression models, while geographically weighted regression models and random forest models also have advantages in the study of pre-owned housing prices.

These research findings not only provide clear price judgment criteria for homebuyers, enabling them to comprehensively consider various factors and make more reasonable choices when purchasing a house; It also provides data support for investment decisions of real estate enterprises, helping them optimize housing allocation and enhance market competitiveness. At the same time, this has significant reference value for the government to formulate real estate regulation policies, which helps the government to implement precise policies, stabilize housing prices, and promote the real estate market to develop continuously. However, the estate market is complex and ever-changing, and we still need to continue to pay attention to emerging influencing factors in the future, such as the course of city renewal and the popularization of green building standards, which may have a potential impact on pre-owned housing prices. We look forward to further deepening and expanding future research, providing more forward-looking theoretical and practical guidance for the development of the real estate market, and jointly promoting the Chinese estate

market to move towards a high-quality development stage in stability.

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