

Analysis and Forecasting of Influencing Factors of Real Estate Price in Haikou City

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Abstract. With the start of construction of the Hainan Free Trade Port in 2018, Hainan has gradually become a new focus area. Haikou City, as the capital city of Hainan Province, has also begun to be paid more and more attention. Therefore, based on the relevant economic data of Haikou City from 2011 to 2021 and the grey correlation analysis and GM (1,1) prediction model, this paper investigates the variables that affect the cost of real estate in Haikou City and produces projections. According to the analysis, the real estate price in Haikou City is mainly affected by the number of deposits of financial institutions at the final year among the selected variables. Besides the real estate price in this area will have a relatively obvious growth in the next ten years. Considering the outcomes above, this study provides the government with reasonable control over the real estate industry by controlling the year-end deposit balance of financial institutions, an important indicator, and at the same time gives investors suggestions on long-term investment and holding of real estate-related products in Haikou City. These results can give relevant suggestions to Haikou City government and real estate investors, which also shed light on offering some suggestions for the study of new areas.

Keywords: Real estate price, influencing factors, forecast, grey correlation, GM (1,1) model.

1. Introduction

With the resolution of the financial crisis brought on by subprime real estate loans in the United States in 2008 and the recent expansion of the Chinese real estate business, the real estate industry, has been constantly discussed and studied by scholars all over the world. The real estate sector in mainland China has also drawn the interest and investigation of many academics as one of the significant pillar industries of the national economy. As an important indicator to measure the real estate industry in a region, the housing price plays a very important reference value in order to advance the real estate market [1]. Therefore, scholars began to study the factors affecting the real estate market price and forecast the real estate price in different regions, hoping to accommodate assertive suggestions for the conception of accordant behavior in the absolute acreage market.

As the capital city of China's Hainan Free Trade Port, the development of the real estate industry in Haikou, Hainan Province has naturally attracted wide attention. In addition, Hainan Province also experienced a collapse of the absolute acreage bubble in the final of the 20th century, which led to the slowdown of its economic development. Therefore, the development of the absolute acreage industry additionally has assertive advertence acceptance for the conception of bread-and-butter behavior in Haikou City. Hu used the ARIMA model to study the relevant data of the real estate industry in Hefei, Anhui Province from 2013 to 2019, predicted that the real estate price in Hefei would have a slight upward trend in the future [2]. Besides, it put forward three suggestions to improve the government information disclosure policy, strengthen the real estate market control and establish the affordable housing system [2]. In addition, Lei also proposed a new research method, which analyzed the influencing factors of absolute acreage price in Zhengzhou city through grey correlation degree analysis and VAR model and predicted the real estate price in Zhengzhou City through ARIMA model, GM (1,1) model and PC-BP neural network model. The study found that the real estate price in Zhengzhou is affected by various factors, among which the general budget of local finance is the most affected and the real estate price in Zhengzhou has a downward trend in the next six months [3]. Then, Shao also studied the influencing factors and price prediction of real estate prices in Maanshan City. Through the grey correlation degree model, this study found that the unit

price of land transaction, the resident population at the end of the year, interest rate, the proportion of tertiary industry and the proportion of industry are the five factors that have the greatest impact on the real estate market of it, and the real estate market of it will grow by nearly 43% in the future [4]. In addition, Liu et al. proposed to use graph neural arrangement and continued concise anamnesis archetypal to anticipation the absolute acreage market [5]. Alzain explored the real estate price prediction of four cities in Saudi Arabia, Riyadh, Jeddah, Dammam and Khobar through artificial neural network (ANN) technology and found that the predicted after-effects were agnate to the absolute results [6]. Koichi proposed to use a new comprehensive inference model to obtain more accurate predictions [7]. However, Mostofi has some doubts about the real acreage amount anticipation adjustment application abysmal neural arrangement and adopts arch basic assay. adjustment to advance the accurateness and achievability of absolute acreage amount prediction [8]. Therefore, previous studies have conducted extensive discussions and studies on the influencing factors of real estate price and real estate price prediction, which will also provide good reference for the research of this paper.

These studies have a high degree of guiding significance for the real estate industry research in various regions of the world. Based on the real estate price data of Haikou City in recent ten years, this paper uses SPSSPRO and SPSSAU software to analyze the important influencing factors of the price, forecast the real estate price of Haikou City in the next ten years, and draw relevant policy suggestions. This paper will discuss the factors affecting the price of Haikou real estate industry and the forecast of future price from the introduction, data and research methods, result analysis, limitation analysis, policy recommendations and conclusions.

2. Data & Method

2.1. Data and Target

In this paper, the relevant research on the real estate price in Haikou City is mainly divided into two parts, which are the evaluation of the influencing elements of the actual property rate in Haikou City and the prediction of the actual property rate in Haikou City via the use of the actual property fee statistics of latest ten years. Therefore, this paper will make an empirical study from the above two parts and draw relevant conclusions. The first is the evaluation of the influencing elements of the actual property fee in Haikou City. Because the relevant data and indicators of the real estate price in Haikou cannot be collected completely due to the restrictions of relevant conditions, and one of the application scenarios of the grey correlation model is that there is less data and insufficient information, this paper adopts the gray correlation mannequin to analyze the actual property charge in Haikou. Finally, influential factors affecting the real estate price in Haikou City are ranked according to the grey comprehensive correlation degree, and then the factors with great influence in the selected variables are found [4], so as to provide some suggestions on real estate management and investment for the Haikou City government, enterprises and individuals in the relevant real estate industry based on relevant data.

The second is the real estate price forecast of Haikou City, because real estate investment is a long-term investment for most investors, and real estate investment also has certain investment risks due to the fluctuations of housing prices [9]. Hence the absolute acreage amount anticipation is actual necessary. There are many methods to predict the real estate price. However, this paper mainly uses GM(1,1) model to forecast the real estate price in Haikou City. G(1,1) model belongs to one of the models of grey prediction theory. This model builds prediction model only by corresponding data series and is relatively simple and practical. In general, the selection of GM(1,1) model can analyze the change information with practical value. So this paper decides to use GM(1,1) model to predict the real estate price in Haikou City.

2.2. Model Construction and Processing

According to the relevant definition and formula of the grey correlation degree model, this paper will calculate the absolute correlation degree and relative correlation degree of the selected indicators, and obtain the comprehensive correlation degree of the selected variables according to the absolute correlation degree and correlation correlation degree, and sort out the impact of each variable on the real estate price in Haikou City.

The main function of grey correlation degree model is to measure the correlation degree by analyzing the broken line area formed by each sequence index, so the selection of correlation index is very important in the research. One can roughly divide the influencing factors of real estate price into supply, demand, policy and other perspectives for analysis [4, 10, 11]. Then, indicators are selected according to the four principles of systematicness, typicality, quantitative and dynamic [4]. Therefore, in order to reduce the influence of internal variance between variables, logarithmic processing is required for the above data. In accordance with the above requirements, This paper selects the average real estate price, resident population at the end of the nine years from 2011 to 2021, gross regional product, gross industrial output value, capital construction investment, real estate development investment, financial expenditure, financial income, institutional deposit balance at the end of the year, output amount of the accessory industry, achievement amount of the tertiary industry, boilerplate bacon of bounded residents, per capita blooming amplitude and ache per 10,000 bodies in Haikou City The cardinal of beds and added accompanying indicators were studied. Through ranking, one can obtain the influence of relevant indicators, so as to further obtain relevant conclusions. Relevant research data are derived from Haikou Statistical Yearbook of the corresponding year, National Bureau of Statistics.

After the analysis of the influencing factors of the real estate price in Haikou City, this paper will further forecast and study the future trend of the real estate price in Haikou City. Considering the characteristics of the data, this paper selects GM(1,1) model to forecast the housing price of Haikou City in the next ten years, and analyzes the errors to discuss the accuracy of the model. Among them, the relevant research data are from the corresponding year of Haikou Statistical Yearbook, National Bureau of Statistics. GM(1,1) in this paper mainly analyzes the real estate price of Haikou City through the following steps: First, in order to ensure that the selected data meet the requirements of the GM(1,1) model, this paper will conduct ADF test and grade ratio test on the selected average real estate price data of Haikou City from 2013 to 2022. Then, after passing the ADF test and the stage ratio test, the selected data is input into the GM(1,1) archetypal to account the accessory of the model, and according to the C value in the posterior difference model, the accuracy of the established model can be judged to meet the needs of prediction. Then, the conditions from 2013 to 2022 are input into the model to obtain the fitting value of the above years, and the fitting value obtained by the model is compared with the actual value to analyze whether the difference between the two meets the prediction requirements. Finally, if all the relevant tests pass, this paper inputs the relevant conditions from 2023 to 2032 into the model and obtains the final housing price prediction value.

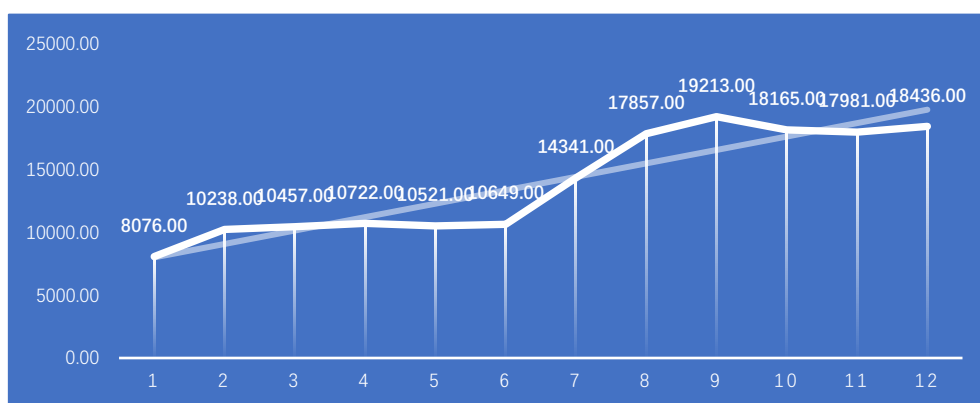


Fig. 1 Average price map of real estate in Haikou City (The starting year is 2010, recorded as 1).

3. Results and Disucssion

This cardboard chooses to abstraction the accepted trend of the absolute acreage amount in Haikou City. This cardboard selects the boilerplate absolute acreage amount in Haikou City from 2010 to 2022 to accomplish an overview of the accepted trend. Seen from Fig. 1, one can clearly see that the trend of real estate prices in Haikou is fluctuating and rising. There was a significant increase between 2010 and 2022. Therefore, this paper will further study the factors affecting the real estate price in Haikou City and forecast the real estate price in Haikou City in the next ten years.

3.1. Grey Relational Degree Model

According to the relevant principles described above, this paper selects the following indicators to bring into the gray correlation degree model of real estate prices in Haikou City for analysis: Permanent resident population at the end of the year, gross regional product, gross industrial output value, capital construction investment, real estate development investment, fiscal expenditure, fiscal revenue, institutional deposit balance at the end of the year, output value of the secondary industry, output value of the tertiary industry, average wages of local residents, per capita green space and number of hospital beds per 10,000 people. In order to reduce the influence of internal variance between variables, this paper adopts logarithmic processing for the above data. Then the grey correlation degree model is brought in for analysis and collation, and the results of the grey correlation degree of each index from 2011 to 2021 can be obtained. Seen from Table 1, the real estate price in Haikou City is mainly affected by the top five indexes of the selected variables: the amount of deposit at the end of the year of financial institutions, average salary, gross regional product, output value of the tertiary industry, and capital construction investment. Among them, the balance of deposit at the end of the year of financial institutions has the greatest impact on the real estate price in Haikou City.

Table 1. The influence degree of the selected indicators on the real estate price of Haikou City

Numble	Variable(Ln)	Correlation degree	Ranking
1	Year-end deposit balance of financial institutions	0.920	1
2	Average wage	0.850	2
3	Gross regional product	0.740	3
4	Output value of tertiary industry	0.707	4
5	Capital investment	0.669	5
6	Total value of industry	0.656	6
7	Investment in real estate development	0.617	7
8	Fiscal revenue	0.607	8
9	Output value of secondary industry	0.581	9
10	Year-end resident population	0.579	10
11	Fiscal expenditure	0.570	11
12	Number of hospital beds per 10,000 people	0.494	12
13	Per capita green space	0.419	13

3.2. GM(1,1) model

Primary, one needs to conduct a unit root test on the real estate price of Haikou City from 2013 to 2022 to determine whether this set of data meets the conditions of relevant measurement modeling and whether the data needs to be processed to ensure that the modeling series is a stable non-white noise time series. Therefore, this paper conducts unit root ADF test on relevant data, and the after-effects are apparent in the afterward table. According to Table 2, it can be concluded that based on the mean price of the variable real estate price (unit: yuan), when the aberration is 0 order, the acceptance P amount is 0.019, assuming acceptance at the level, abnegation the absent hypothesis. Therefore, this set of data passes the ADF test and the series is a stable time series.

Table 2. ADF test results table

Variable	Difference order	t	p	AIC	The critical value of t		
					1%	5%	10%
Haikou City real estate average price	0	-3.219	0.019	92.658			
	1	-2.504	0.114	105.24	-5.354	-3.646	-2.901
	2	-4.151	0.001	82.805			

Secondly, according to the above mentioned, this study conducted a grade-ratio test on the average price data of real estate prices in Haikou from 2013 to 2022. According to the data results, one can conclude that the level ratio of this data should meet the interval (0.834, 1.199), and the results show that the data of 2017 and 2018 are outside the level ratio range, so this paper carries out translation transformation of relevant data and obtains the corresponding level ratio. According to Table 3, one can see that after parallel conversion of the above data, their grade ratios all meet the specified range, so the GM(1,1) model can be used to predict the housing price of Haikou in the next ten years.

Table 3. Ratio of average real estate price before and after data level translation in Haikou from 2013 to 2022

Year	Original value	Stage ratio	Translation conversion value	The stage ratio after translation conversion
2013	10457	-	29670	-
2014	10722	0.975	29935	0.991
2015	10521	1.019	29734	1.007
2016	10649	0.988	29862	0.996
2017	14341	0.743	33554	0.89
2018	17857	0.803	37070	0.905
2019	19213	0.929	38426	0.965
2020	18165	1.058	37378	1.028
2021	17981	1.01	37194	1.005
2022	18436	0.975	37649	0.988

Then, based on the aloft data, this cardboard solves the development accessory a of the GM(1,1) model, the blah activity b and the after aberration arrangement C, area the after aberration arrangement C is beneath than 0.35, the archetypal accurateness is advised to be high; the C amount is beneath than 0.5, the archetypal accurateness is advised to be qualified; the C amount is beneath than 0.65, advertence that the archetypal accurateness is basically qualified; if the C amount is greater than 0.65, the archetypal accurateness is basically qualified. It shows that the accurateness of the archetypal is not up to standard. Therefore, the accordant after-effects acquired in this cardboard are given in Table. 4. One can find that the construction of this model meets the requirements, and since the value of C is less than 0.35, it can be considered that the accuracy of this model is high and it can be used for actual prediction.

Table 4. GM (1,1) model correlation coefficient results table

Development coefficient	Grey action	Posterior difference ratio
-0.034	28442.626	0.196

Then, one put the above real estate price data of Haikou City from 2013 to 2022 into GM(1,1) model to obtain the real estate price of Haikou City from 2013 to 2022 predicted by the model, and

make a comparative analysis with the actual price. Generally, if the difference between the fitting result and the actual result is less than 20%, the model fitting effect is considered to be good. As shown in Table. 5, except for the critical value in 2016, the relative errors are all within 20%, and the overall average error is 8.374%. Therefore, it can be considered that the GM(1,1) model has a good fitting effect and can be used for the price prediction of Haikou City in the next ten years. Hence, this paper uses this model to draw the average annual real estate price of Haikou in the next ten years, i.e., from 2023 to 2032, as shown in the Table. 6. The real estate price of Haikou City will have a relatively obvious growth in the next ten years, that is, from 2023 to 2032, that is, GM(1,1) model predicts that the real estate price trend of Haikou City will continue to rise and reach about 36,500 yuan in 2032.

Table 5. Comparison table of model fitting results from 2013 to 2022

Year	Original value	The predicted value of the model	Residual error	Relative error (%)	Average relative error (%)
2013	10457	10457	0	0	8.374
2014	10722	10763.938	-41.938	0.391	
2015	10521	11813.796	-1292.796	12.288	
2016	10649	12900.422	-2251.422	21.142	
2017	14341	14025.104	315.896	2.203	
2018	17857	15189.175	2667.825	14.94	
2019	19213	16394.014	2818.986	14.672	
2020	18165	17641.049	523.951	2.884	
2021	17981	18931.759	-950.759	5.288	
2022	18436	20267.671	-1831.671	9.935	

Table 6. Forecast table of average price of real estate in Haikou from 2023 to 2032

Year	Forecast price of Haikou Real Estate (Unit: Yuan)
2023	21650.370
2024	23081.495
2025	24562.740
2026	26095.862
2027	27682.677
2028	29325.066
2029	31024.975
2030	32784.418
2031	34605.481
2032	26490.322

4. Conclusion

To sum up, according to the aloft assay of the influencing factors of the absolute acreage amount in Haikou City and the anticipation of the absolute acreage amount in Haikou City, one can draw the following conclusions. First, the real estate price in Haikou City is mainly affected by the top five indexes of the selected variables: the amount of deposit at the end of the year of financial institutions, average salary, gross regional product, output value of the tertiary industry and investment amount of capital construction, among which the balance of deposit at the end of the year of financial institutions has the greatest impact on the real estate price in Haikou City. Second, the real estate price of Haikou City will have a relatively obvious growth from 2023 to 2032. Based on the evaluations, the Haikou government can reasonably control the real estate industry in Haikou by controlling the year-end deposit balance of financial institutions, an important indicator, so as to avoid some potential systemic risks. Moreover, investors can hold a positive attitude towards the real estate investment in Haikou City, and can make long-term investment and hold on the real estate related

products in Haikou City. Compared with some researches focusing on a province or even a country, this paper focuses on Haikou City, Hainan Province, which has a very clear pertinence in its research and a strong pertinence in its policies and suggestions. In addition, the relevant variables that affect the real estate price factors selected in this paper and the related research on them are a supplement to the previous research of other scholars, and have certain reference value for subsequent research. However, this paper still has some limitation. The selection of data is relatively small, and the collection of relevant economic data and variables in Haikou still needs to be improved. Since there are some errors between the selected model itself and the original data, there are still some errors in the research results of this paper. Nevertheless, overall, these results offer a guideline for influencing factor analysis of a certain field.

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