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Research on real estate and its application of refraining the speculation

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ABSTRACT

Taking Hebei Province as the concrete analysis object, this essay aims to discuss the generally rising house prices in each city. It makes a detailed analysis of the various factors that affect house prices, and draws final conclusions and relevant suggestions.

Problem 1: Math models of city house price. Through the analysis of the affecting factors such as urban population, household consumption level, land cost in each region and the number of real estate enterprises, the essay makes a comprehensive discussion, and establishes a multiple linear regression equation model. The expression is:

$y = 2398915.227 - 1494.917*x1+0.01*x2-625.169*x3$

The essay makes a detailed analysis of the formation of house price, evolution mechanism and speculation of real estate through the above linear regression equation.

Problem 2: Model of house price evaluation elements. By analyzing the factors from data obtained from Statistical Bureau of Hebei province, the essay finally gets the variable function of each indicator:

$y_1=-0.185*x_1-0.029*x_2+0.24*x_3+0.3.9*x_4+0.245*x_5+0.274*x_6+0.004*x_7$

$y_2=0.482*x_1+0.0410*x_2-0.005*x_3-0.153*x_4-0.007*x_5-1.00*x_6+0.370*x_7$

And it reaches the final comprehensive evaluation model of principle elements:

$Z = (4.339*y_1+1.508*y_2)/21.539$

Thus, we get the ranking of each factor on house price.

Problem 3: The essay uses grey forecasting method to predict the house price in the next few years on the basis of problem 2 and combines the statistic regression math constructed in problem 1, and makes further analysis over each element, thus obtaining the following predictions:

Predictions of house price in the year 2010-2013			
2010	*2011*	*2012*	*2013*
11957	*14139*	*16720*	*19772*

Finally, the essay gives the policy suggestions over refraining the speculation of real estate on the basis of the above results:

(1) The government shall issue related laws and regulations to encourage residents to buy property in the countryside and villages;

(2) The supervision over land development shall be strengthened;

(3) The increase of population should be controlled;

(4) The constraint of laws and policies shall be strengthened.

KEYWORDS

Multiple linear regression; Factors analysis; Grey prediction; House price.

BACKGROUND

The housing price in large cities of our country has been continually rising in general in recent years. On one hand, the rise of housing price makes the living cost marginally increase, which makes it difficult for moderate and low-income groups to buy property; on the other hand, part of speculators buy house for hoard through various financing channels, expecting to obtain high profits, which leads to high house prices. Therefore, it is a social concern about how to effectively refrain the rise of housing price and refrain the speculation of real estate. The government has issued various policies that increase the loan rates of real estate and restrict the second-hand house lending, which covers the following several aspects:

1. Set up a math model of city housing price. The essay makes a detailed analysis of the formation of housing price, evolution mechanism and speculations of real estate;
2. Find out the main reasons that affect housing price through analysis;
3. Give some policies and suggestions of refraining the speculations of real estate, and make scientific predictions and evaluations over your suggested probable effects.

As for problem 1, the essay first analyzes the city population, residents' consumption level, land cost in each region, the number of real estate enterprises and average sales price of relevant houses, then judges the influence extent of each factor, establishes a multiple linear regression equation, and makes a comprehensive analysis of each element[1].

As for problem 2, the essay evaluates the influence extent of each factor over housing price through factor analysis such as city population, residents' consumption level, land cost in each region, and the number of real estate enterprises.

As for problem 3, the essay obtains data from the model, makes an analysis of the correlation between each factor and housing price, and then proposes some suggestions to refrain the speculation of real estate from multiple aspects and angles.

ESTABLISHMENT OF MODEL

MATH MODEL OF URBAN HOUSING PRICE

Model preparation

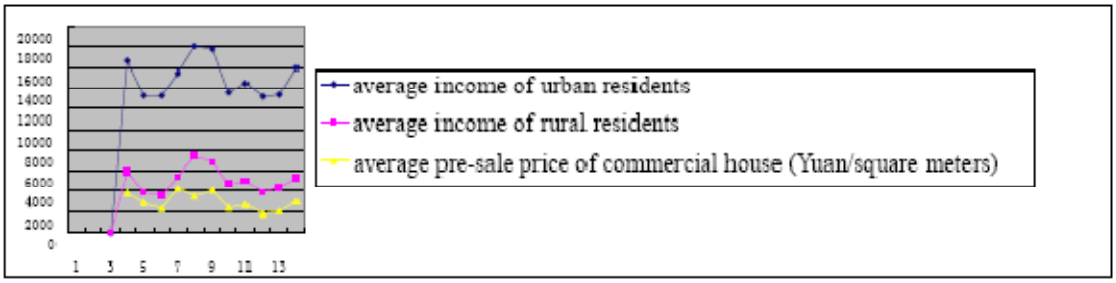
The model of multiple linear regression analysis is:

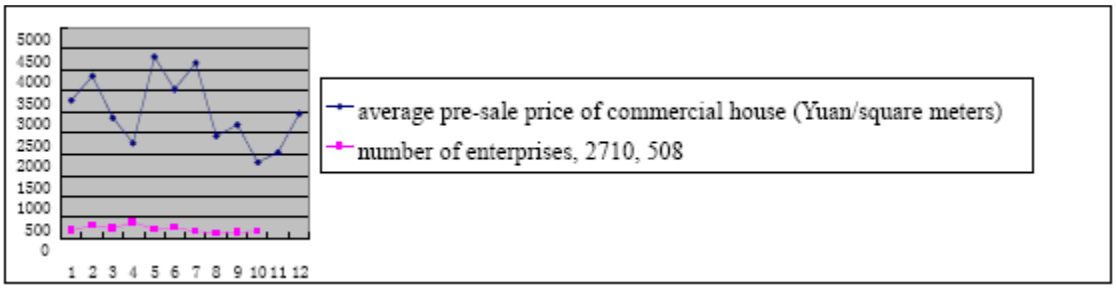
$$\begin{cases} y = \beta_0 + \beta_1 * x_1 + \cdots + \beta_m * x_m + \varepsilon \\ \varepsilon \sim N(0, \delta^2) \end{cases}$$

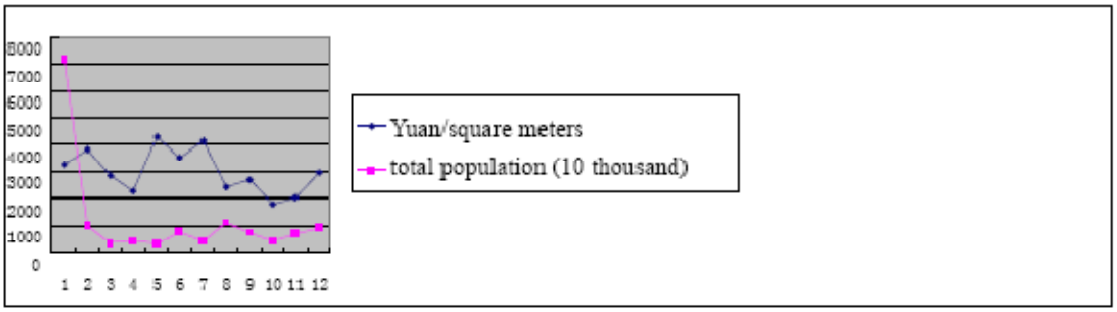
In the formula, $\beta_0, \beta_1, L, \beta_m, \delta^2$ are all unknown references irrelevant to x_1, x_2, L, x_m.

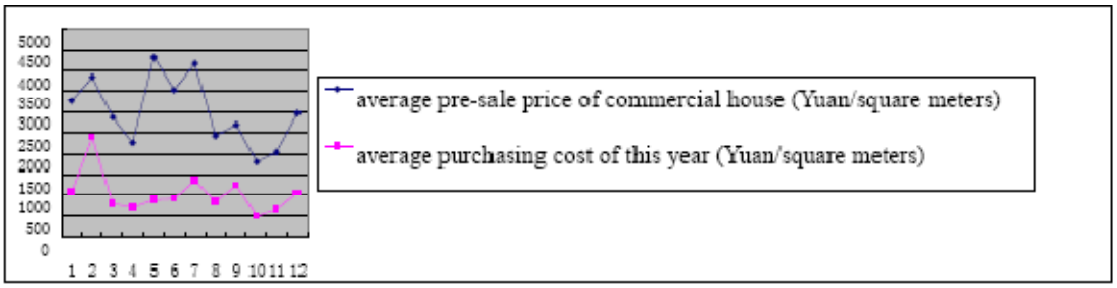
Model solution

Firstly, it analyzes the influence of each factor on housing price, and draws relevant images by use of MATLAB:







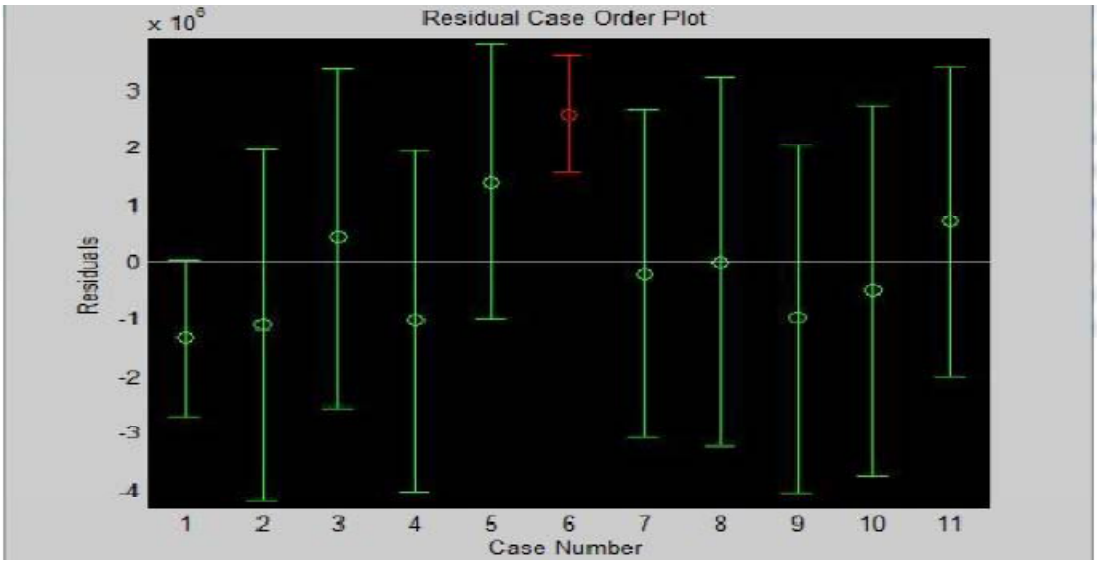


Through the analysis of the pictures above, the urban population, residents' consumption level, land cost in each region, number of real estate enterprises and average sales price of relative houses are directly correlated.

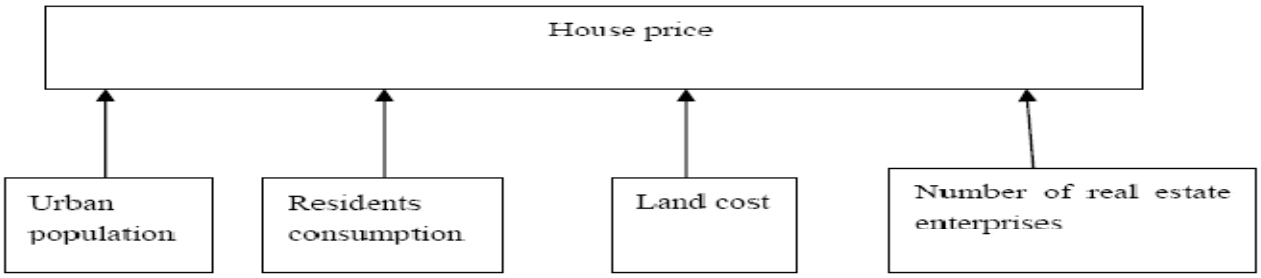
Through the multiple linear regression analysis over data using SPSS, the essay obtains the linear regression equation:

$$y = 2398915.227 - 1494.917 * x1 + 0.01 * x2 - 625.169 * x3$$

and gets residual case order plot by use of MATLAB software:



According to the above linear regression model, we discuss the influence factors, formation and evolution process of house price:



MODEL OF HOUSE PRICE EVALUATION FACTORS

Model preparation

The basic idea of factor analysis is to condense the multiple original variables into few presumed factor variables through relevant research over the variables, thus making these factors have better resolving ability[2].

The general model of factor analysis is that:

$$\begin{cases} X_1 = a_{11} f_1 + a_{12} f2 \cdots + a_{1m} f_m + e_1 \\ X_2 = a_{21} f_1 + a_{22} f2 \cdots + a_{2m} f_m + e_2 \\ \cdots \\ X_k = a_{k1} f_1 + a_{k2} f2 \cdots + a_{km} f_m + e_k \end{cases}$$

In the formula, f_1 is common factor, who are pair wise orthorhombic; e_1 is special factor, only works to corresponding X_i ; a_{11} is the load of common factor, load of variable *i* on the *j*th factor, that is, correlation coefficient.

The load factor is greater, which illustrates that the relationship between the ith variable and the jth factor is stronger; or their relationship would be weaker. The special factor is the part of variable that could not be explained by common factors, the residual plot between measured variable and estimated value.

Model solution

Indicator correlation test

The premise of factor analysis is the correlation among indicators. The following table could be obtained through the data analysis using SPSS. It can be seen from the table that each indicator are strongly correlated between each other. Therefore, we need to make factor analysis over the above indicators, reduce the problem dimensionality, and avoid the influence of self-correlated indicators on results.

Correlation matrix[a]

		Total population (10 thousand)	Land acquisition cost	Urban income	Urban consumption	Rural income
Correlation	Total population (10 thousand)	1.000	.411	.170	-.089	.233
	Land acquisition cost	.411	1.000	.506	.389	.495
	Urban income	.170	.506	1.000	.835	.968
	Urban consumption	-.089	.389	.835	1.000	.886
	Rural income	.233	.495	.968	.886	1.000
	Rural consumption	-.018	.385	.726	.895	.768

Common factor analysis

The factor load is the correlation coefficient between common factor and indicator variable. The greater the load is, the more close relationship between common factor and indicator index. When determining the number of common factors, the same number of factors with the original variable shall be selected first, and the total variance of calculation factors is as follows. The factor with initial value over 1 shall be selected as common factor. It can be known from the following table that there are 2 characteristic values that match the conditions, and the cumulative variance contribution rate is 83.531%, which covers most of variable information. Therefore, the first two factors are selected as common factors[3].

Explained total variance

Factors	Initial characteristic value			Extract square and load	
	Total	% of variance	Cumulative %	Total	% of variance
1	4.339	61.992	61.992	4.339	61.992
2	1.508	21.539	83.531	1.508	21.539
3	.694	9.916	93.448		
4	.312	4.458	97.906		
5	.090	1.290	99.195		
6	.052	.747	99.942		
7	.004	.058	100.000		

The indicator variable function of two principle extracted factors could be seen from the following tables:

$$y_1 = -0.185 * x_1 - 0.029 * x_2 + 0.24 * x_3 + 0.309 * x_4 + 0.245 * x_5 + 0.274 * x_6 + 0.004 * x_7$$

$$y_2 = 0.482 * x_1 + 0.410 * x_2 - 0.005 * x_3 - 0.153 * x_4 - 0.007 * x_5 - 1.00 * x_6 + 0.370 * x_7$$

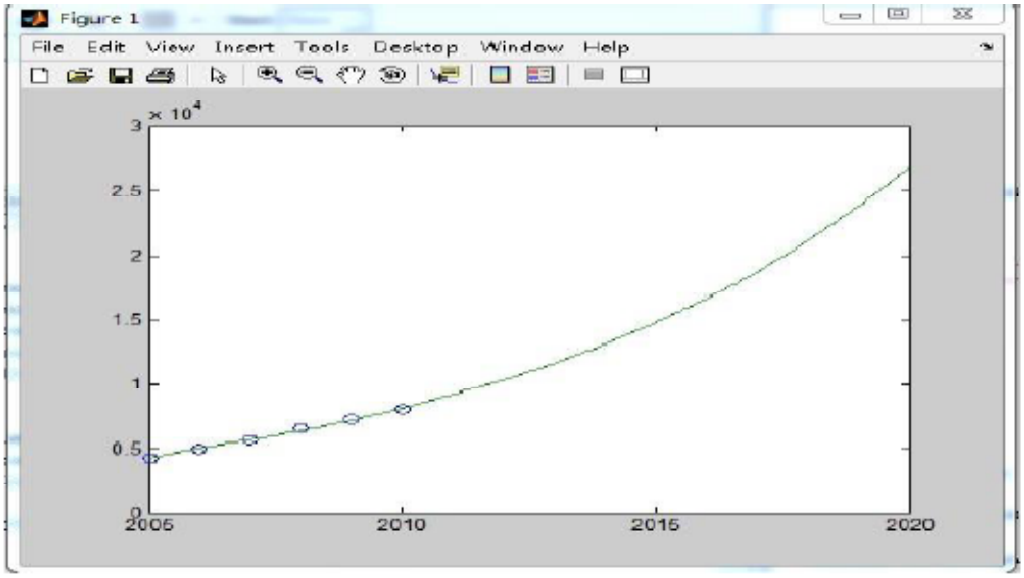
The comprehensive evaluation model of principle factor could be obtained:

$$Z = (4.339 * y_1 + 1.508 * y_2) / 21.539$$

Region	Factor scores		Comprehensive scores
	y_1	y_2	Z
Shijiazhuang city	-7539.6	233950	14861
Chengde city	4919.6	36000	3511
Zhangjiakou city	2264.7	69620	5330
Qinhuangdao city	4172.0	65680	5439
Tangshan city	4446.5	92820	7395
Langfang city	2023.2	113290	8340
Baoding city	286.8	100520	7095
Cangzhou city	3159.8	67570	5367
Hengshui city	5627.9	2145	2635
Xingtai city	5449.4	28470	3091
Handan city	6991.7	15560	2498

Model solution of problem 3

Grey predictions could be taken by using MATLAB software and the prediction diagram is as follows:



The prediction results could be obtained：

House price predictions in the year 2010-2013			
2010	2011	2012	2013
11957	14139	16720	19772

In conclusions, the essay raises the following suggestions concerning the house price:

(1) The government issued related laws and regulations to encourage residents to buy house in countryside and rural areas, which will naturally reduce the population density in regions with high real estate speculations, and thus indirectly refrain speculations of real estate.

(2) The supervision over land development should be strengthened.

Firstly, the government should not aim at maximizing the financial income. Secondly, the transparency and fairness of land auction should be strengthened, in case of rent-seeking. Finally, the land developers shall develop within a period of time, and land speculations shall be forbidden.

(3) The constraint of laws and regulations shall be strengthened.

On one hand, the purpose of using laws is to improve the real estate market, refrain the speculations of real estate, and block the speculation road of real estate speculators. On the other hand, effective measures should be taken to control the purchasing number of house, large number of selling and purchasing houses shall be prevented, and the real estate market should keep healthy.

EVALUATION OF MODEL

The statistical regression model is a common math model, used for analyzing the internal characteristics of research objects and the correlation of each factor, predicting the future dynamic conditions, and researching the control method. The math model of house price could be as a reference of actual predictions.

Besides, the essay uses factor analysis, which is widely applied in sociology, economics, management, medicine, geography and meteorology, and obtains quite accurate results.

SYMBOLIC ACCOUNT

1 x : total population
2 x : land acquisition cost
3 x : urban income
4 x : urban consumption
5 x : rural income
6 x : rural consumption
7 x : enterprise number
Z : comprehensive price of house price

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