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Research on Factors Affecting House Price Inflation

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Abstract:

This research paper explores the various factors influencing house price fluctuations, focusing on the real estate markets in United States. The accelerated urbanization process in United States led to a population surge that significantly increased housing demand, driving rapid rises in house prices. Concurrently, the impact of income inequality on house price fluctuations is also examined, with studies indicating that income changes directly affect housing price volatility. Additionally, fluctuations in land prices and supply are crucial factors influencing house prices. In the United States, residential real estate constitutes the largest proportion of economic assets, and house price fluctuations are closely linked to the overall economy, particularly in the context of the financial crisis, where house price volatility influenced borrowing and consumption behaviors. This paper will utilize a housing price data analysis model for the city of Boston to investigate how various factors. In general, the volatility of Boston home prices can be judged by these factors to determine the degree of impact on home prices.

Keywords: Urbanization; housing price; influencing factors.

1. Introduction

As an integral part of society, property prices have always been a popular focus of attention. As the economy of each city continues to grow, so does the price of housing, which can fluctuate in price depending on different factors. At the same time the volatility of house prices is a focus of great interest to people. From 1990 to 2007, China has fully developed its urbanization through data analysis. A large number of people in the cities rose and the rise in population led to a sharp increase in the demand for housing. This led to a second fluctuation, which led to a rapid development of the real estate economy and a rise in real estate development and investment, which led to a gradual rise in house prices [1]. By examining the relationship between unequal incomes and house price fluctuations prior to ZHANG (2016), changes in incomes affect house price fluctuations [2]. Constructing a house costs land, so house prices will rise because the price of land is constantly changing. Also, the supply of land changes house prices [3]. Fundamental to the issue is the factor of house prices, which fluctuate depending on the growth of the

city's economy and the increase in market demand. Also the rise and fall of house prices depend on the proportion of personal income distribution and total assets of personal income. Therefore, this paper will discuss how house prices vary according to different factors, thus producing different purchase prices at different times of the year.

In the Financial Stability Report published by the Federal Reserve, the stock of residential housing in the United States has reached $39.3 trillion, or roughly 31 per cent of total US assets [4]. Residential real estate accounts for the largest proportion of economic assets in the US, and MBS and other financial products are made up of real estate as well as a part of the US securities market [5]. The lending standards in the United States, which are different from those in other countries, reflect documentation standards, loan valuation ratios (including second mortgages) and unpaid principal at loan origination, which can have a number of drawbacks and can lead to a large proportion of long term homeowners ending up with no equity in their property or with negative equity in their property [6]. The US housing market economy has experienced a lot of fluctuations over the past three decades. However, home prices in different areas can change accordingly with the overall US economy [7]. In the context of studies in the background of macro modelling research, the explanation for the Great Recession is that fluctuations in house prices altered borrowing and consumption [8]. Strict mean reversion occurs after incomes are affected, and house prices and construction can bring about changes in house prices [9]. In the neoclassical framework demonstrates that house prices are defined by the law of housing demand [10]. Through the analysis of comprehension data, it is possible to get that in the United States house prices are found to change with different factors. In conclusion this research paper will go through the Boston city house price data analysis model to conduct the research and analysis of the Boston city house price.

2. Methods

2.1 Data Source

The dataset used in this paper is fetched from the Kaggle website. The dataset calculates the number of people living in Boston area housing. The data analysis is mainly done through precise calculations of the literature to obtain accurate information about the data.

2.2 Variable Selection

In the original dataset there are a lot of data included that change the house price, CRIM analyses the impact of crime rate on house price, ZN analyses the impact of housing usage data rate on house price, INDUS analyses the impact of house size on house price, CHAS analyses the impact of river on house price, NOX analyses the impact of air quality on house price, RM analyses the impact of number of houses on house price, AGE analyses the impact of homeowner demand and usage. RM analyses the impact on house price by the number of houses, AGE reflects the demand and usage of the owners, DIS represents the impact on house price by the employment rate of the city and the development of the city, RAD analyses the traffic environment of the house and TAX analyses the impact on house price by the tax rate, all these data represent the change of house price by different factors. For the current times, people consider the factors that affect the price of the house through different aspects, while at the same time people are eager to have a perfect property. That is why it is important to analyse the comparative data to find a house that is suitable to buy and make a rise in profit (Table 1):

Table 1. List of Variables

Variable	Meaning	Unit
CRIM	Per capita crime rate by town	Capita crime per rate
ZN	The proportion of more than 25,000 residences	Over 25,000 ratio
INDUS	proportion of non-retail business acres per town	Area proportion
CHAS	Charles River dummy variable	(= 1 if tract bounds river; 0 otherwise)
NOX	nitric oxides concentration	parts per 10 million
RM	average number of rooms per dwelling	rooms per dwelling
AGE	proportion of owner-occupied units built prior to 1940	owner-occupied units built
DIS	weighted distances to five Boston	weighted distances
RAD	index of accessibility to radial highways	accessibility to radial
TAX	full-value property-tax rate per $10,000	property-tax rate per $10,000

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2.3 Method Introduction

This paper will use multiple linear regression models to analyse the data as well as compare the data, and eventually a complete model system will be implemented. The impact of the data will be analysed using different data and different directions of comparison.

Multiple linear regression is a statistical technique that explores how several independent variables influence one dependent variable. It creates a linear equation to predict the dependent variable's value based on the independent variables, which can be numbers or categories. The main aim is to reduce the difference between the predicted and actual values, helping to identify the best coefficients for the equation. This method is commonly used in fields like economics, social sciences, and engineering to understand how different factors interact and affect outcomes.

3. Results and Discussion

3.1 Multiple Linear Regression

This document analysis the different factors that affect house prices. As table 2 shows:

Table 2. Linear regression analysis results

	Nonnormalized coefficient		Standardization coefficient	t	p	collinearity diagnostics	
	B	Standard error	Beta			VIF	Tolerance
Var	10.32	4.832	-	2.137	0.033*	-	-
ZN	0.044	0.018	0.119	2.421	0.016*	2.048	0.488
INDUS	0.042	0.085	-0.033	-0.49	0.623	3.888	0.257
CHAS	-1.81	1.191	-0.054	-1.52	0.128	1.052	0.951
NOX	-3.75	5.002	-0.051	-0.75	0.453	3.859	0.259
RM	-1.35	0.477	-0.11	-2.82	0.005**	1.293	0.774
AGE	0.022	0.017	0.072	1.273	0.204	2.703	0.37
DIS	-0.68	0.275	-0.169	-2.50	0.013*	3.863	0.259
RAD	0.592	0.087	0.599	6.826	0.000**	6.547	0.153
TAX	-0.001	0.005	-0.028	-0.27	0.784	8.95	0.112
R^2	0.416						
Adj R^2	0.406						
F	F (9,496)=39.309,p=0.000						
D-W	1.402						
dependent variable = CRIM							
* p<0.05 ** p<0.01							

By analysing the above table 2 it is clear that CRIM is belongs to the dependent variable while ZN, INDUS, CHAS, NOX, RM, AGE, DIS, RAD and TAX are the independent variables, which are represented in the table. The analysis of the data in the above table shows that the model equation is:

$$CRIM = 10.324 + 0.044 * ZN - 0.042 * INDUS - \ldots - 0.001 * TAX$$

The value of R-squared is 0.416, indicating that these variables explain 41.6% of the variation in CRIM. The standard error for the NOX variable was the largest value, and the F-test showed a significant result (F=39.309, p<0.05), which means that at least one of the independent variables affects CRIM. However, some of the variables had VIF values between 5 and 10, which indicates a potential multicollinearity problem that can be addressed using ridge regression or stepwise regression. A single variable in the graph was analyse: ZN positively affected CRIM (0.044, p=0.016), while INDUS, CHAS, NOX and AGE did not have a significant effect on CRIM.RM had a significant negative effect (-1.351, p=0.005). All in all, RM has a significant negative impact on house prices, which leads to a decline in house prices. By analysing the changes in each variable: ZN on CRIM is among the positive changes on house prices (coefficient of 0.044, p=0.016), which shows that an increase in ZN is associated with an increase in crime. Whereas these data did not produce significant changes in INDUS, CHAS, NOX and AGE. it is worth noting that RM had a significant negative change on CRIM (coefficient of -1.351, p=0.005), which

suggests that higher values of RM are associated with lower levels of crime. This analysis highlights the fact that understanding impact crime has the most prominent effect on house prices.

3.2 Model Evaluation

Summarising the analysis process, the data demonstrated that ZN and RAD may have a significant increase on CRIM, which means that an increase in these variables is strongly associated with higher crime rates. On the contrary, RM and DIS produced a decreasing trend on CRIM, suggesting that the higher the values of these factors, the lower the crime rate. On the other hand, the variables INDUS, CHAS, NOX, AGE and TAX do not seem to have a significant effect on CRIM, suggesting that changes in these factors are not associated with fluctuations in crime rates.

Table 3. Model summary (intermediate process)

R	R 2	Ad R 2	Modeling error MSE	DW	AIC	BIC
0.645	0.416	0.406	6.565	1.402	3360.296	3402.561

Table 4. ANOVA Form (intermediate process)

	regression sum of squares	df	mean square	F	p
regression	15555.164	9	1728.352	39.309	0.000
residual error	21808.058	496	43.968		
aggregate	37363.222	505			

From analysing Table 3 and 4 it can be seen that the regression model can be analysed with a significant increasing trend in CRIM, as well as a small increasing trend in ZN and RAD. By reading the information in Table 3 it can be concluded that the linear sum of squares for the regression model is the smallest of all the data, while the linear sum of squares for RESIDUAL ERROR is the largest of the data. In contrast, the sum of squares produces the exact opposite of the data expressed earlier. Finally, it can be concluded that the change in the linear data is inversely proportional to the sum of squares.

3.3 Visual Results

Figure 1 shows the different degree of influence of the average value on the 10 factors, and by analysing the data of the average value, it can be obtained that TAX is the one factor that is most influenced by the average value.

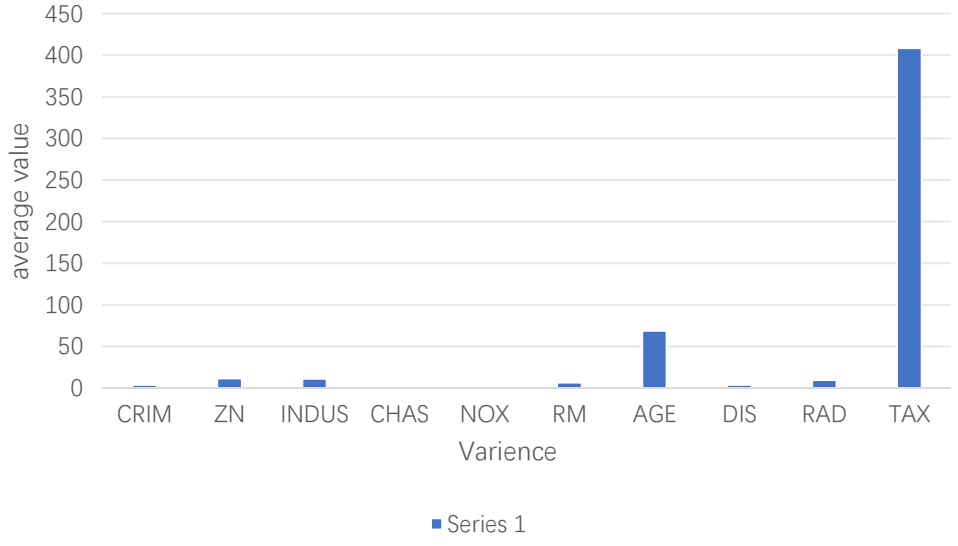

Fig. 1 Visual comparison of average values

This shows that the average is directly proportional to TAX, and when the average increases, TAX also increases, leading to fluctuations in house prices. NOX is the factor least affected by the mean, which also shows that

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the mean is inversely proportional to NOX when the mean increases, the value of NOX is not affected by changes or negative factors in house prices. Through the multivariate changes in the data, it can be learnt that the fluctuation in the mean value has little to do with the changes in DIS, CHAS and CRIM in relation to these factors. In short, the change in the mean value affects the fluctuation as well as the change in the house price.

4. Conclusion

The data was analysed using a multiple linear regression model for data analysis. The use of multiple linear regression models allows for greater predictive accuracy of the data and greater modelling flexibility without the need for variables to be independent of each other. The data will be accurate for a longer period of time already, making the analysis of the data more reliable.

In this analysis, a wide range of factors were analysed. The study examined how crime rates, changes in tax rates, geographical locations, surrounding environment, air quality, number of rooms, and the age of the housing stock affect property values.

The data analysis of the research article, it was found that the tax rate had the most significant impact on rooms. Multiple linear regression was also used to predict future trends in room rates. However the research process is also flawed, the statistics of the data already the timing of the data had a great impact on the results. The use of control variables is needed to reduce the errorability. Giving more authority to the data.

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