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The Research on the Effect of Intercity Railway Project on Housing Price Nearby

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ABSTRACT: The research of the effects of intercity railway system on the housing price is a hot sport in recent years. Along with the construction of intercity railway between Chengdu and Mianyang, the impacts on the housing price draw the attention of real estate businessmen, consumers and researchers. Based on the hedonic price theory, this paper attempts to consider the intercity railway between Chengdu and Mianyang as the object, analyzes the impact on the housing price around it by establishing the hedonic price model and using the regression analysis.then adopt different methods to carry on quantization to the characteristic variable of the house, construct the hedonic price model to study the impact on peripheral price of house of the newly-bulit intercity railway transpotation project tentaiely.

KEYWORDS: Intercity railway; Housing price; Hedonic Price Model.

INTRODUCTION

After investigating for a long time, the office director of the National Development and Reform Commission formally declared that the intercity railway project between Chengdu and Mianyang could be start now on August 14, 2008, which means this intercity railway project gets national approval finally. Which also show us that the intercity railway economic is coming. "Intercity Railway Conception" is the booster of regional housing prices; the real estate projects near the stations along the railway are the direct beneficiaries of the intercity railway economy. This paper is try to do some research on the housing price nearby the intercity railway. Listed the merger of the data and electronic map data though the open house market of Mianyang city on net ,adopt the hedonic price model of the house, on the basis of trying being regarded as, have carried on the positive research to the impact on peripheral price of house of intercity railway which is newly built, and examine its space effect and time effect to the peripheral price of house.

THE RELATED CONCEPTIONS AND DEFINITIONS

Hedonic Price Model (HPM) hypothesizes that the price p of a product is determined by a function $p = F^*(x)$, where x is a bundle of characteristics that define the product. Hedonic Price Model is generally attributed to Court (1939), Lancaster (1966), Griliches (1971) and Rosen (1974). In the context of housing and real estate hedonic models are useful in three ways. In the first place a hedonic model is a very suitable way to predict house prices. House price prediction can be used for bulk appraisal for property tax, but can also help real estate brokers by determining the asking price for a house. However, it is also possible to use a hedonic method for a website feature, where potential customers can check their house value informally, after which they may decide to sell their house, although they did not intend to do so in advance. The third way, in which the hedonic model can be useful, is when it is used to create a hedonic price index. A hedonic price index uses a hedonic model to correct for quality differences over time.

Hedonic Price Model (HPM) is a successful model, which is characterized by a number of factors. And HPM is characterized by a large number of different characteristics, so that goods can be described as a combination of the number of the goods and their characteristics of the business. The hedonic price model can be expressed as a function of the $P=f(X_1, X_2... Xn)$, X_i for the properties of the building, and it includes the volume rate, green rate, transportation conditions, infrastructure, etc.

There are three main types of functions:

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(A) Linear hedonic price equation:

$$P = \alpha+\beta_1X_1+\beta_2X_2+\cdots+\beta_nX_n \quad (1)$$

Alpha (α) is usually determined by the general factors which can affect the price of housing; the Beta (βn) reflects the implicit price of each attribute, if the other attributes are not changed, one attribute change for one unit, the average price will change at last. Because the equation is linear, it is assumed that the marginal revenue of the residential property is constant, that is, the Beta (βn) does not change with the increase of X_n.

(B) Double logarithmic hedonic price equation:

$$\ln P = \ln\alpha+\beta_1\ln X_1+\beta_2\ln X_2+\ldots+\beta_n\ln X_n \quad (2)$$

Beta (β_n) means elasticity of the housing price to attributes of its own. That is, when the Xi increases 1%, how much the housing prices increase in the percentage. The logarithmic form turns out to be the perfect solution of the limitation of the marginal income on the residential property.

(C) Semi-logarithmic hedonic price equation:

$$\ln P = \ln\alpha+\beta_1X_1+\beta_2X_2+\ldots+\beta_nX_n \quad (3)$$

Semi-logarithmic form can avoid the case when the independent variable $X_n=0$, the value will be meaningless, which indicates when residential property increase Xi there must be an increase of the housing price rate.

It is very necessary to deal with the independent variable coefficients when we build the Hedonic Price Model. The independent variables can be divided into three categories: continuous variable, discrete variable and dummy variable. Take a real estate as an example, green rate, volume ratio are a continuous variable; the transportation condition should be discrete variables, it means the value when we add another one bus line direct to the location. For dummy variables, figure "1" representative YES, figure "0" representative NO, such as whether the property is refined decoration (if the use of a logarithmic equation can be transformed into 1 and 2).

The research on the hedonic price model of the real estate should be introduced into the relevant variables and the accurate measurement. Basic on the literature study, this paper has done survey to the development of Hedonic Price Theory and Model, and has reviewed domestic and international some research results that influence to the peripheral price of real estate briefly about the intercity rail transportation project. So, we can summarize common variables as shown in Table 1:

Table 1. Commonly used explanatory variables in Hedonic price method.

location	The distance of the city centre, bus station and shopping centre, etc.
Structure	Construction area, construction age, floor, total number of layers, bedroom number ,etc
Neighborhood	School quality, the scale and distance of service facilities, road grade, sight (sea view, Park), noise, pollution level ,etc

THE CONSTRUCTION OF HEDONIC PRICE MODEL

The source of data

The price of real estate can include land, commercial properties, office buildings, residential, etc., and this paper only focus on the residential price. The research object of this paper is limited to the secondary real estate market of Mianyang City, that is, the secondary housing transaction data. The sample data comes from the real estate portal site of Mianyang City (www.mianyang.fang.com) and the website of Mianyang city real estate information (www.mytaofun.com).Except for the information provided by the website, we use the map to measure the number of feature variables associated with the distance.

Setting variables

The establishment of Hedonic price model should include the factors that affect the price of residences, which has three major categories: Location, Building Structure and Neighborhood Therefore, this paper selected 23 variables as follows, shown in Table 2:

Table 2. The variables.

Item	variable name	Interpretation
Price variable	*price, Inprice*	This group variable represents the Unit Price of residences: we use the unit price of the residences divided the adjusted benchmark price index of Mianyang City to get the value of price. Variable *Inprice* means logarithmic transformation to variable *price*
Location variable	*Metro_0 Metro_1 Metro_2Metro_3 Metro_4Metro_5*	This group variable represents the distance between the nearest sites of the residences. It is not measure the distance data directly, but measure the distance between the uses of virtual variable assignment that means, depend on the different distances to set up multiple virtual variables, if located within a range of concentric circles, the distance range corresponding to the virtual variable that is assigned to 1, otherwise assigned to 0.
	ring_1 ring_2	This group variable represents the ring position of the residences. the variable of HPM means "the distance to CBD" with residential units in the ring position and residential units in the ring position is divided into 1ST RING ROAD within 2ND RING ROAD.
Structure variable	*area*	This variable means the area of a residential unit
	room hall toile	This group variable represents the characteristics of the residential units. "room" means the number of residential units, "hall" means the number of living room, "toilet" means the number of bathroom.
	floor floor_M, floor_H	This group variable represents the structure of a residential unit, "floor_M" means middle-rise residential; "floor_H" means high-rise residential respectively. When a residential unit of the hierarchy of the type, its corresponding variable is assigned to 1, otherwise it is assigned to 0.
	age	This variable means the years from the construction till now
	decorate_1 decorate_2 decorate_3	This group variable represents the status of decoration; we set the virtual variables as decorate_1, decorate_2, decorate_3, which means simple decoration, better decoration and luxury decoration respectively.
Neighbourhood variable	*top*	This variable represents whether the residential community is a noble community. If it is the variable is assigned to 1, otherwise it is assigned to 0.
Other variables	*time2009*	The variable represents the time of residential unit is after the start of the construction of intercity rail, we set the virtual variable time2009, when the housing is listed in the city after 2009 the variable is assigned to 1, otherwise it is assigned to 0.

HEDONIC PRICE MODEL FOR THE RESIDENCES

The basic form of the hedonic price model for the residences can be expressed as:

$$P=f(z)=f(L, S, N)$$

In which:

P: residential market prices;

Z: residential feature vector, including S, L, N;

L: location feature vector for residences;

S : structural vector for residences;

N : neighborhood vector for residences.

In the basic model, the most common form of function is linear form, that is, the equation (4)

$$P = a_0 + \sum a_i Z_i + \varepsilon = a_0 + \sum a_{i1} L_{i1} + \sum a_{i2} S_{i2} + \sum a_{i3} N_{i3} + \varepsilon$$

Under the same conditions, we can calculate the partial derivatives of the characteristics Zi of the equation (4), so we can get the marginal price of the corresponding boundary, that is, the equation (5):

$$P_{Zi} = \frac{\partial P}{\partial Zi} = a_i$$

By the equation (5), it can be seen that the linear model of hedonic price model for residences is equal to the regression coefficient in the equation. Except for the linear model, the paper uses the semi logarithm model to compare the results. That is, the equation (6):

$$\ln P = a_0 + \sum a_i Z_i + \varepsilon = a_0 + \sum a_{i1} L_{i1} + \sum a_{i2} S_{i2} + \sum a_{i3} N_{i3} + \varepsilon$$

Similarly, under the same conditions, we can also calculate the partial derivatives of the characteristics Zi of the equation (4) .that is, the equation (7):

$$a_i = \frac{P_{zi}}{p}$$

By the equation (7), the regression coefficient of the equation is equal to the change ratio of the house.

THE ESTIMATION METHOD OF MODEL

The estimation of the Parameters in Hedonic price model is an important part of econometrics. After obtaining and processing the sample data of the theoretical model, we can choose the appropriate method to estimate the parameters of the model. the least square method (OLS) is the most widely used method in multiple linear regression analysis that is, the choice of the appropriate regression coefficient makes the sum of the squares of the residuals of all sample values.

THE CALCULATION OF MODEL

Firstly, the 18 variables of each sample were selected into the model, they are price,Inprice,priceT,Inpricet,time2009.ring_1,ring_12,ring_2,metro_0,metro_1, metro_2, metro_3, metro_4, metro_5,area,room,hall,toilet,floor.floor_M,floor_H,age,decoratr_1,decoratr_2,decoratr_3. Using the linear model equation (4) and semi logarithm model equation (6) to analyze the characteristics of residential market in Mianyang city by the statistical software SPSS15.0. The Estimation results as follows, shown in the Table 3:

Table 3. The results of Model calculation.

	Linear model		Semi-logarithm model (left)	
Model statistical test	Adj R2	F	Adj R2	F
	.615	.000	.566	.000
variable	coefficient	Sig	coefficient	Sig
area	3.015	.000	.000	.000
metro_0	-367.124	.000	-.092	.000
metro_1	-223.863	.000	-.047	.000
metro_2	294.872	.000	.078	.000
metro_3	235.872	.000	.047	.000
metro_4	-82.763	.172	-.023	.436
metro_5	-76.823	.263	-.023	.451
room	-123.653	.000	-.034	.002
hall	-78.345	.144	-.035	.157
toilet	47.238	.167	.013	.253
floor	-1.156	.891	.000	.769
floor_M	23.987	.124	.023	.056
floor_H	89.467	.056	.034	.002
age	-100.230	.000	-.023	.000
ring_1	-101.132	.118	-.011	.230
ring_12	-244.722	.000	-.082	.000
ring_2	-1112.387	.000	-.341	.000
time2009	317.556	.000	.98	.000
top	1543.766	.000	.421	.000

decorate_1	167.354	.000	.045	.000
decorate_2	378.654	.000	.087	.001
decorate_3	654.236	.000	.167	.000
The Number of variables into the model	15		16	

CONCLUSION

The conclusion of this research is following like this: the impact radius of the intercity railway project on the housing price around it is 2000m.Inside this range, the metro influences the house price around it in significant way. Specifically speaking, inside the distance of 0-500m, 500-1000m, away from the intercity railway project, the project has a negative effect on the housing price around it results from the nose during the construction and the problem of transportation.

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