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The Estimation of Housing Demand Function To Make Use of Panel Data Regression

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ABSTRACT

In this paper surveys the effective factors for housing prices to use of hedonic price function of housing demand in Mazandaran province west cites. Statistical society of the project is apartments with two flats and more estimated with Double Logarithmic Function by using Panel Data method. The results show that the influencing factor on the prices consists of how big is the house, how luxurious it is and how far from the city center .The results also show that the number of flats in an apartment not only has a meaningful relationship with the high prices, but also decline the average expenditures. Finally, results show that the main factor influencing the price of housing is the size of the flat.

Keywords: *Panel Data , Hedonic Price Function, Unit root and Co integration of Panel Data*

1. INTRODUCTION

Housing is probably the most important asset in an economy. England, Quigley and Redfearn (1998, p. 172) estimate that it accounts for more than 50 percent of the U.S. private capital stock and 30 percent of household cost. The housing market can be volatile and subject to bubbles [see Ito and Iwaisako (1996), Goodhart (2001) and Garino and Sarno (2004)]. Given the possibility of interactions between house prices and consumption, the measurement of price movements in the housing market is hence of critical importance to understanding the economy. It is perhaps surprising, therefore, that the construction of house price indexes has not received more attention than it has.

A house can be seen as a bundle of multi-dimensional attributes that combine together to give a certain price. It is usually impossible to break up the house into its components and market them individually. If information on the prices of houses that correspond to the attributes of the house can be obtain, it should be possible to derive the implicit market price. House price thus reflects the purchaser's valuation of the particular set of attributes of each house unit.

Since policy-makers need to be aware of the features of the housing dimensions, the classification of these dimensions finds out important aspects. Here is question that how size and characteristics of houses will be effected in housing demand. Price hedonic function used for this paper. The price hedonic function estimate marginal propensity to households to pay that this display household preference for house features.

This paper involves 5 sections. After the introduction, section 2 is a review of the theoretical background of the research. Section 3 is introduces the model and the model parameters using data collected included. Introducing and estimating the model as well as testing for its validity are the subjects of sections 4. Finally, section 5 presents the summary and conclusion.

2. THEORETICAL FRAMEWORK

In welfare economics literature, hedonic means utility or satisfaction consumer from the consumption of goods or services. Hedonic method for the first time was used by Griliches (1960) to analyze in the housing market demand and the environmental economic, and the theoretical work was introduced by Lancaster (1966) and Rosen (1974). In patterns of goods, hedonic demand has several dimensions. Each household prefer something of housing characteristics and other goods. This selection contains different levels of welfare and utility for users. This utility can be found to U function:

$$U = U(X, Q_J, S_J, N_J) \qquad (1)$$

To achieve the utility, the consumer subject to budget constraint:

$$Y = X + P(Z) \qquad (2)$$

Where P(Z) is the value of housing features and the x is the value of other commodities. Thus, the price of housing is a function of the demand characteristics used in housing households. This function, hedonic price function (Ph) is called and as follows:

$$Ph_i = P(Q_J, S_J, N_J) \qquad (3)$$

Where i is the unit of housing and j represent of the desired properties. For consumers optimization process according to budget-constrained is as follows:

$$U = U(X, Q_J, S_J, N_J)$$
$$st: Y = X + P(Z)$$
$$\mathcal{L} = U(X, Q_J, S_J, N_J) + \lambda(Y - Ph_i - X)$$

Accordingly, we can write:

$$\frac{\partial \mathcal{L}}{\partial Q_J} = \frac{\partial U}{\partial Q_J} - \lambda \frac{\partial Ph_i}{\partial Q_J} = 0 \qquad (4)$$

$$\frac{\partial \mathcal{L}}{\partial X} = \frac{\partial U}{\partial X} - \lambda = 0 \qquad (5)$$

Dividing the equation (4) to (5), equation (6) is obtained as follows:

$$\frac{\frac{\partial \mathcal{L}}{\partial Q_J}}{\frac{\partial \mathcal{L}}{\partial X}} = -\frac{\partial Ph_i}{\partial Q_J} \qquad (6)$$

Equation(6) shows that changes of hedonic price function toward changes of housing different features equal to change of consumer preference related to housing and other goods purchase.

3. REVIEW OF THE RELATED LITERATURE

In this section, we will pay attention to some studies carried out abroad which are related to housing demand. Dennis E. (1989) studied hedonic prices and implicit markets: estimating demand and supply functions for differentiated products. In this study, he examines the demand functions for product characteristics cannot be consistently estimated by ordinary least squares. Market equilibrium results in a matching of characteristics of demanders and suppliers. This matching restricts the use of buyer and seller characteristics as instruments when estimating demand and supply functions for product characteristics.

Hansen j. (2006) studied Australian house prices: a comparison of hedonic and repeat sales measures. This paper provides an overview of the theoretical nature of these issues and considers how regression based measures of house prices can control for compositional and quality change. Using unit record data for Australia's three largest cities – Sydney, Melbourne and Brisbane – between 1993 and 2005, the results suggest that the two regression based approaches provide similar estimates of the pure price change in housing. The measures are comparable in terms of statistical fit, with around half of the variation in prices growth (for those houses sold more than once) explained. The regression-based measures also produce similar estimates of pure price changes to those obtained by a mix-adjusted measure. However, all three measures behave quite differently from a simple median, implying that compositional change matters empirically. These results confirm that regression-based measures are likely to be a useful analytical tool when measuring pure house price changes in Australia.

Gholizadeh A. BehbudiD. Shokarian E.(2010) studied comparison between traditional hedonic price model and price model (Case study of urban regions of Hamedan Province). This study identifies effective factors on housing price at urban regions of Hamedan Province. In traditional model of hedonic price, structural characteristics of dwelling unit and also environmental and neighborhood characteristics for estimating of house price is spotted. Model of this study is Reid suggested model. Results of this study shows that quality of housing services such as land area, number of rooms, kinds of skeleton (metal or brick), annual fixes, package and lift are effective and significant. Demographic variables such as age, sex, level of education and marriage position of owners are important too.

Varese H.R., Mousavi M.N.(2010) studied An investigation of the factors influencing the housing price using hedonic price model(the case of Yazd third district). The model used in this research is the Hedonic model of price. There are 18 variables which mostly focus on physical conditions, locations and availabilities. The results show that the land and the substructure area as well as the number of floors have been among the most important factors influencing the price of housing in Yazd, so much so that for every one percent increase in the land and substructure area there will be %49 and %38 increase in the price of housing respectively. The estimation of some factors such as the building age, distance from the city center and the main street has revealed that such factors have negatively affected the price of housing and have caused a decrease in the price.

Asgari A.,Ghaderi J.(2002) studied determination of housing price in urban areas of Iran by using hedonic price method(HPM). In this paper the impact of different housing characteristics on house price have been derived using logarithm, double logarithmic and Box - Cox functional forms. A Sample of 12320 urban households based on the expenditures and incomes survey in urban areas carried out by Iran Statistical Center has been used.

Sabouhi M., Tavana H.(2002) studied consideration of agricultural land price by hedonic method a case study of Larestan city. In this study, the price of agricultural land in Larestan city, Fars province, was considered by Hedonic method in 2007. Results showed that, distance from Larestan and its main road had a negative effect on agricultural land price and land quality had a positive effect. Moreover, there were an inverse relationship number of hectares, percent agricultural land used and percent holding and for agriculture did not have a significant effect.

Zarra Nezhad M.,Anvaari E.(2006) studied estimation of hedonic housing price function for using panel data analysis. The empirical results reveal that the physical factors are the most important determinants of the demand for housing attributes and have the most effect on housing price as a whole. The environmental attributes take second place. The same is true for apartment, but it is just the reverse for villa. Being close to a street with a width of 4-10 meters is among the most important attributes affecting housing price in these two kinds of houses.

Saadatmehr M. (2011) studied estimation of hedonic price function for Khoramabad urban housing. The result showed that area of land, social security of regional, skeleton, building facet, lane or street width,

distance from city center, parking have positive and significant influence and age of building, number of room have negative and significant influence on housing price in Khoramabad. The results also showed that social security, in the preferences of the users, lane or streets with are ranked as first to third priorities. Distance from city center, skeleton and building facet are intermediate priorities. The number of room, parking and age of building are in bottom of list of priorities for users.

Khalili Araghi M.,Nobahar E.(2011) studied predicting for the city of Tabriz: application of the hedonic pricing and artificial neural network models. The results of the estimation of the price function show that most of the variables in the Hedonic pricing model are significant with the expected signs, according to the theory. Physical factors have more important effect than location factors (environmental and accessibility) on the housing prices. Among the structural characteristics, having lobby, swimming pool, number of bedrooms, and the frontage of the building are the most important factors affecting the prices. The most important location characteristic on the housing price is the distance to educational centers. For our comparison, we have utilized MSE, RMSE, MAE and criteria. According to all criteria, ANN model had less error in prediction of the housing Hedonic prices for the city of Tabriz. In order to test the hypothesis of equal predicting power of the two models, we have used MGN test. The result of this test indicates that the ANN approach is statistically superior to hedonic model.

Samimi A.J.,Zaroki SH.,Etsami H.(2010) studied the estimation of residential demand with hedonic model(case study of Ghaemshahr city). The results show that, for the income elasticity for all parameters is smaller than an interactively highest and lowest income elasticity related to the level of infrastructure is the number of bedrooms. Traction coefficient of land area, below the level and number of bedrooms than the number of people in the household is positive and significant, and this proves that if the number of people in a household will increase the demand for residential units with an area of land, infrastructure and level number of bedrooms above goes further. The surface tension coefficient of infrastructure and the number of bedrooms than age households is positive and significant, and indicate that whatever age households exceeds his desire to have more residential units with an area above ground level and the number of building more rooms sleep is more.

4. MODEL

By referring to the history of hedonic researches isn't observed a particular theory to select the appropriate model for hedonic, then researchers choose an appropriate form of model based on how to use statistics to model. Therefore, in this study, is used of linear function semi-logarithmic and logarithmic mutual. But due to the superiority of the logarithmic function mutual (stability coefficients of hedonic model to determine prices of implicit properties, most of the statistics F in the model apartment units) analysis and interpretation of results is based on this. This study, estimate the hedonic price function for west towns of Mazandaran province. The hedonic price function is as follows:

$$ln(Price)_{it} = \beta_0 + \beta_1 ln(Metr)_{it} + \beta_2 ln(Distance)_{it} + \beta_3 ln(Number)_{it} + \beta_4 (Lux)_{it}$$

In which:

Price: The price of residential, Meter: infrastructure of unit, Distance: The distance to the city center, *Number*: Number of housing units in the apartment, *Lux:* is a dummy variable that in this paper we choose number 1 if the house has been at least two of such MDF cabinets, ceramics or parquet, package, cooler, elevator and parking, otherwise dummy variable (LUX) will give zero. In this study, for estimate model stratified random sampling method is used for residential units in 4 cities in Mazandaran province. In this study, a sample size of 80 cases (20 samples for each city) is adopted. Due to small been cities this sample size was adequate to represent the actual of statistical society.

5. ESTIMATED OF MODEL AND THE RESULTS

Nowadays, the increasing application of the panel data techniques to the determination of time-series stochastic properties has led to the development of a wide range of new proposals in the econometric literature. The combination of the information in the time and cross-section dimensions to compose a panel data set of individuals, i.e. countries or regions, onto which performs the analysis of the stochastic properties has revealed as a promising way to increase the power of these tests. The emergence of new econometric methods has led economists to focus on the convergence debate (Gaulier, Hurlin and Jean-Pierre, 1999; Carmignani, 2007; Guetat and Serranito, 2007; Lima and Resende, 2007).

5.1 Unit Root Test

In this study, we apply two first generation tests proposed by Levin et al. (2002) and Im et al. (2003) which are homogeneous and heterogeneous panel unit root tests, respectively, based on the assumption of independent cross-section units. In Levin et al. (2002), the alternative hypothesis is that no series contains a unit root (all are stationary) while in Im et al. (2003) the alternative allows unit roots for some (but not all) of the series.8 However, the cross-unit independence assumption of the first generation tests is quite restrictive in many empirical applications and can lead to severe size distortions (Banerjee et al., 2005; Breitung and Das, 2008).

Therefore, we also consider a second generation unit root tests that allow cross-unit dependencies with the tests developed by Bai and Ng (2004). The simplest way consists in using a factor structure model. The idea is to shift data into two unobserved components: one with the characteristic that is cross-sectionally correlated and one with the characteristic that is largely unit specific. Thus, the testing procedure consists in two steps: in a first one, data are de-factored, and in a second step, panel unit root

test statistics based on de-factored data and/or common factors are then proposed. The issue is to know if this factor structure allows obtaining clear cut conclusions about stationary of macroeconomic variables.

To assess reliability, the four unit root tests include: Levin, Lin & Chu, (2000), Pesaran, & Shin (2003), Augmented Dickey-Fuller (Fisher-type) and Phillips and Peron (Fischer- type).The results in Table (1) are provided. In these tests null hypothesis is indicated the unit root. The results show that the all series are stationary on level and hence are I (0).

Table 1: Results stationary of variables

variables	LNumber	LDistance	LMetr	LPrice
Levin et.al	-6.38	-3.95	-3.57	-5.65
P-value	0.0	0.0	0.0	0.0
Pesaran et.al	-6.28	-3.78	-4.36	-4.64
P-value	0.0	0.0	0.0	0.0
ADF	48.06	-29.25	33.39	43.39
P-value	0.0	0.0	0.0	0.0
PP	49.83	30.71	46.59	49.38
P-value	0.0	0.0	0.0	0.0
lag	1	0	2	2

Source: research findings

5.2 Test of The Panel Data Integration

The first integration test of panel data was used by Pedroni (1995). In this test, for the null hypothesis (H_0) implies that no the integration between variables in the model. This study was used of the Pedroni integration test. In this method, for each country estimate a separate regression, and then to test stationary for disturbance or error term uses of seven statistic. Four of these statistic, AR coefficients is used the same for the different sections. Therefore, the first order autoregressive parameters are constrained to be the same for all sections. Pedroni introduce this statistic as the panel integration statistics.

Other three statistic, AR coefficients are estimated separately for each city. Thus, these statistics of autoregressive coefficients allows to change from one country to another as those are known group-mean panel co integration statistics.

The first panel cointe ration statistics is non-parametric variance ratio test. The second and third panel statistics, is respectively rho and t statistics Phillips Peron (PP). The fourth panel ADF statistic is similar panel unit root test of Levin, Lin and chu(2002). Similarly, In column group-mean panel cointe ration statistics contains the Phillips-Perron non-parametric results (rho and PP statistics). And the finally section presents ADF test parametric statistic. The results of Pedroni cointe ration are listed in Table 2. The results of this test show that is no integration between variables model.

Table 2: The Pedroni cointe ration test

Statistic type	Exogenous panel co.		Group panel co.	
	Stat	Prob	Stat	Prob
Panel v-stat	-0.99	0.24	-	-
Panel rho-stat	0.21	0.38	0.79	0.29
Panel PP-stat	-3.49	0.00	-4.25	0.00
Panel ADF-stat	-1.78	0.08	-1.33	0.16

Source: research findings

5.3 Testing the Signifiance of The Group Effects

The *t* ratio for α_i can be used for a test of the hypothesis that α_i equals zero. This hypothesis about one specific group, however, is typically not useful for testing in this regression context. If we are interested in differences across groups, then we can test the hypothesis that the constant terms are all equal with an F test. Under the null hypothesis of equality, the efficient estimator is pooled least squares. The F ratio used for this test is

$$F(n-1, nT-n-K) = \frac{(R^2_{LSDV} - R^2_{Pooled})/(N-1)}{(1-R^2_{LSDV})/(nT-n-K)}$$

Where *LSDV* indicates the dummy variable model and Pooled indicates the pooled or restricted model with only a single overall constant term. Alternatively, the model may have been estimated with an overall constant and n − 1 dummy variables instead.The F test that the coefficients on these n – 1 dummy variables are zero is identical to the one above. It is important to keep in mind, however, that although the statistical results are the same, the interpretation of the dummy variable coefficients in the two formulations is different.(Greene,2003)

The F statistic for testing the joint significance of the firm effects is 26.81 and the critical value from the F table is 2.68, so the evidence is strongly in favor of a city specific effect in the data. It means the integration between the two methods of ordinary least squares and panel data, panel data methods will be accepted.

Also, according to the cities randomly not selected from a large population, the method of fixed effects versus random effects method would be appropriate. Therefore, in this study, we use fixed effects.

The results show, table (3), that was a positive correlation between the area (infrastructure) cofficent and the price of housing in cities. This cofficient is 1.01 with t-statistics of 99% that is significant. The estimated coefficient between distance to the city center and residential home prices is (-0.02). Also, the number of residential units (in appartment) has a positive effect on the price of the units (0.03), but that isn't statistically significant (0.49). Luxry be housting units has significant effect on the prices of home and that coefficient is 0.04.

Table 3: The results of model

Independent Variable	**Dependent Variable : LPrice**			
	Coefficient		**T-stat.**	**Prob**
Intercept	5.89		29.9	0.0
LMetr	1.01		10.31	0.0
Distance	-0.03		-2.87	0.005
LNumber	0.03		0.69	0.49
Lux	0.04		2.00	0.04
	C_NUS.	-0.01	R^2	0.72
	C_RAM.	0.05	F	26.61
	C_CHA.	-0.02	D-W	1.52
	C_TON.	-0.01		

Source: research findings

6. CONCLUSION

Summary estimate of the cities housing prices hedonic west province is remarkable. Price hedonic shows maximum propensity to pay for consumers, when it is paid that the maximum utility is achieved. Then price hedonic function shows the maximum propensity to pay to obtain the maximum consumer utility. The estimation results can be ranked as follows:

The main factor influencing on price residential units in the cities is infrastructure or residential area. Indeed consumers of residential units have sensitivity and willingness to pay more with relation to area of residential units. The distance to the city center is one of parameters affecting on prices of residential. The consumers of housing units choose units closer to the city center and are willing to pay higher. The luxury residential units has a positive effect on the prices of residential units and The luxury be increases consumers' propensity to pay further because more luxury residential units in this province are desirable based on results price hedonic function.

REFERENCES

[1] Arimah; Ben C. An Empirical Analysis of the Demand for Housing Attributes in a Third Word City, "Land Economics, ABI / INFORM Global p.366, 1992.

[2] Chris Downing; Nancy Wallace. Housing Investment Dynamics and Estimation of Hedonic Price Indexes , 2002.

[3] Chul Sohn; Hedonic Price Models in a Geographic Information System Economic Impacts of an Urben Greenbelt, Seoul, Korea. A Dissertation. Texas A M University, 2002.

[4] Dokmeci,v. Z. Onder and A. Yavas. "External Factors, Housing Values, and Rents: Evidence from survey Data", journal of Housing Research , 2003, 14:1, pp.83-100, 2003.

[5] Francois Des Rosiers; Marius Theriault, "Rental Amenities and The Stability of Hedonic Prices: A Comparative Analysis of Five Market Segments", The Journal of Real Estate Research, PP . 17-36 , 1996.

[6] Hough, d.e.kratz,c.g. "Can good artchitecture meet the market test"? Journal of urban economics, .vol.14, pp40-54, 1983.

[7] James Richard Landers; (1996). A Hedonic Study of The Incentive Effects of Enterprise Zones In Ohio. A Dissertation, The Ohio State University , 1996.

[8] Jennifer Laurice; Radha Bhattacharya. Prediction Performance of a Hedonic pricing Model for Housing. ABI/INFORM Global p.198, 2005.

[9] Johannes Hoffmann; Claudia Kurz. Rent indices for housing in west Germany 1985–1998, Research Centre of the Deutsche Bundesbank , 2001.

[10] Kain,J and J Quigley, "Measuring the Value Of Housing Quality", Journal Of American Statistical Association, 65(330): pp.532- 548 , 1970.

[11] Lancaster,k.j. "A New Approach to Consumer Theory", Journal of political Economy, 74, pp.132-157 , 1966.

[12] Linneman,P."Some Empirical Results on the Nature of the Hedonic Price Function for the Urban Housing Market", Journal of Urban Economics, Vol.8, pp 47-68, 1980.

[13] Mariko Hara;. Measuring Positive Externalities in Japanese Rice Production: A Hedonic Price Analysis.The Thesis. Rensselaer Polytechnic Institute Troy, New York , 2002.

[14] N. M. Arguea, C Hsiao and G. A .Taylor. "Estimating Consumer Preferences Using Market Data-an Application to us Automobile Demand". Journal of Applied Econometrics , Vol.9, 1-18 , 1994.

[15] Patrick Bajari and Matthew E. Kahn. Estimating Housing Demand With An Application to Explaining Racial Segregation Cities , 2002.

[16] Rosen, Sherwin. "Hedonic Price and Implicit Markets: Product Differentiation in Pure competition", Journal of political Economy, vol 82,34-55 , 1974.

[17] Sivitanidou,R," Urban Spatial Variations in Office – Commercial Rent: The Role Of Spatial Amenities and Commercial Zoning". Journal Of Urban Economics , Vol. 38, pp. 23-49 , 1995.

[18] Wenyu jia. Martin Wachs. Parking Requirements and Housing affordability: A case study of San Francisco , 1998.

[19] William C; Wheaton, "The Incidence of Inter-Jurisdictional Differences In Commercial Property Taxes". National Tax Journal, ABI/INFORM Global p. 515, 1984.