Housing Demand Model for Metropolitan Regions of Uttar Pradesh

* Vishwas Tiwari	Diwakar Khare
Department of Statistics, D.A-V. College, Kanpur, U.P., INDIA * corresponding author	Department of Statistics, Institute of Social Sciences, Dr. B. R. Ambedkar University, Agra (India)

ABSTRACT *The present study is on demand models for houses metropolitan in urban regions of Uttar Pradesh. The study utilizes the data which was collected by the national sample survey office (Ministry of Statistics and Programme Implementation, Government of India). The multiple linear regression model has been proposed for study of housing demand in metropolitan region of Uttar Pradesh. We have also identified the important factors affecting housing demand in metropolitan regions of Uttar Pradesh.*

1 Introduction:

Housing is very important for our life. High proportion of household budget spent on housing. Malpezzi and Tiwari (1991) have estimated that average housing expenditure in developing countries ranges from 10 to 30 percent of household expenditure. It is important to measure the demand of housing in the context of growth of cities and changes in relative prices.

The housing demand of a household reflects willingness to pay for set of housing services. Mayo et.al.(1985) and Malpezzi and Tiwari (1991) have analysed housing demand in developing countries, based on econometric models using a multivariate analysis of key determinants such as income price, household demographic characteristics and other important variables.

Dholakia (1980), Mehta and Mehta (1989), Malpezzi and Tiwari (1991) and Tiwari et. al. (1999) have estimated housing demand in India. Mehta and Mehta (1989) and Malpezzi and Tiwari (1991) used household level data and the regions of their analysis were on Ahmedabad and Bangalore. Tiwari et.al. (1999) analysed the importance of prices and income on the demand for housing in Mumbai metropolitan region.

In real estate valuation and house market research, house prices and rental value are generally analysed by hedonic regression model. Hedonic regression models examine the effects of characteristics of goods on their prices. Factors that determine the housing rent (for tenant) and imputed rent (for owner) in the metropolitan cities of Uttar Pradesh are analysed in this paper using by National Sample Survey Office Data.

For determining housing demand in the metropolitan cities of Uttar Pradesh, we are using the data which was collected by National Sample Survey Office. This is the most recent data base available on households which can be used to estimate housing demand.

Data Description:

The national Sample Survey Office conducted an integrated household survey in its 58th round during the period July, 2002 to December2002.on village facilities, condition of urban slums, disability, housing condition and household consumer expenditure were the subjects covered. The National Sample Survey Office has classified the towns with population more than one million. From this classification, we have selected 5 districts from Uttar Pradesh. The districts with population more than one million are Kanpur, Lucknow, Agra,

Varanasi and Meerut. Uttar Pradesh has more number of metropolitan cities then any other state.

All the five districts have importances which are described below.

Kanpur is the biggest city of Uttar Pradesh. It is often referred to as the hub of commercial and industrial activities of the state. The city is situated on the banks of the river Ganga and spans up to 1,640 square kilometer in terms of metropolitan area and has city area of around 829 square kilometer with a population of approximately 5 million. Kanpur is one of the fastest growing cities of India. Kanpur is an important centre for India's leather industry and small arms. It is also one of the largest sugar producing areas in northern India. Due to the industries, the pollution levels have risen dangerously high. Due to lack of proper planning, the city equals Delhi as a victim of congestion and over crowding.

Meerut is also a metropolitan city of Uttar Pradesh. It is an ancient city located 70 kilometer northeast of the national capital New Delhi. From Lucknow the distance of the city is 453 kilometer. It is a part of national capital region of India. It covers an area about 172 kilometers square which is the third largest in Uttar Pradesh after Lucknow and Kanpur. Meerut is one of the important industrial towns of western Uttar Pradesh. It is rich agricultural area with such pockets of land that do not fit in for crop purpose. Being in the proximity of Delhi, it is ideal for industry. It is famous for handloom works and scissors industries, industries like textile, transformer, sugar, distillery, chemical, engineering paper, sports goods manufacture are also situated here. According to the 2001 census the city has the population of approximately 3 million.

Lucknow is the capital city of Uttar Pradesh. Lucknow is placed among the fastest growing cities and now it is metropolitan city in India. It is rapidly emerging as a manufacturing, commercial and retailing hub. The unique combination of rich cultural traditions and brisk economic growth provides Lucknow with an aura that refuses to fade away. Currently the population of Lucknow is more than 5 million. According to census of 2011, Lucknow is the largest urban area in Uttar Pradesh and its population is more than Kanpur. Lucknow's population comprises people from central and eastern Uttar Pradesh.

Agra is a city on city on banks of the river Yamuna in the state of Uttar Pradesh. It is one of the most populous cities in Uttar Pradesh with a population of approximately 2 million. Since 80% of city's sewage flows in to Yamuna River, it is most polluted city in Uttar Pradesh. Approximately 57% of the population of Agra district lives in urban area. Due to presence of historic monuments, it has long tradition of tourism industry. The city also has substantial industrial base. A lot of manufacturing plants and industry related wholesale markets are prominent in Agra city. Maximum part of the population depend traditional leather and footwear business and iron foundries. According to the National Sample Survey Office (NSSO) in 1999-2000, 431 of every 1000 employed males were self-employed in the city which grew to 603 per 1000 in 2004-05 tourism contributes to a large extent in the economy of Agra.

Varanasi is a city situated on the banks of the river Ganges in the state of Uttar Pradesh. Varanasi spans 112.26 square kilometer. Varanasi has several small cottage industries. Indian Railways runs a major diesel locomotive factory in Varanasi. A large power equipment manufacturer also runs a plant here.

The sizes of the estimation sample (88) enable extensive modeling of the housing characteristics. The model contains 38 variables include household size, social group, average monthly consumer expenditure, distance travelled, facilities of drinking water, bathroom, condition of house, area etc.

4 Housing Demand Model:

The model contains 38 variables include household size, social group, average monthly consumer expenditure, distance travelled, facilities of drinking water, bathroom, condition of house, area etc.

While hedonic price models have been routinely used to analyse the market price of housing, selecting an appropriate functional form has been a frequent concern in the literature.

The multiple regression model used in the study is of following functional forms

$$P = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + ... + \alpha_k Z_k + u \qquad (1)$$

Here P is the dependent variable which is rent paid by tenants and imputed rent paid by owner.

In the above model (1) Z's are explanatory variables and u's is a stochastic disturbance term. u's are additive stochastic term which have been assumed to be independently and identically distributed random variables with mean zero and fixed variances σ^2. It means that disturbance term u's are homoscedastic.

The model has been estimated by the famous method of least squares which has been most frequently used by the researchers. The results of multiple regressions have been obtained by SPSS 17.0 software.

Since the demand for housing is measured in term of expenditure that household incur on housing services. The actual rent paid by tenants is a measure of housing expenditure. The higher the housing expenditure, the higher is the household consumption of housing services. So in the present investigation, rent paid by tenants and the imputed rent (owner houses) as a dependent variables have been considered as used by Tiwari and Parikh (1998).

Many studies suggest that, for a housing demand study full data would include the following important independent variables.

Variable	Variable meaning and measure methods
Household size(Z_1)	Total number of person in the house
Gender of head household(Z_2)	Dummy variable: male-1, female-0
Social group of head household(Z_3)	Divided into 3 degree: schedule caste-1,other backward class-2,general-3
Consumer expenditure(Z_4)	Average monthly consumer expenditure measured in rupee
Distance travelled(Z_5)	Distance travelled to earning place by household
Maximum distance(Z_6)	Maximum distance travelled in a day by household
Source of drinking water(Z_7)	Dummy variable: corporation-1,other source-0
Availability of drinking water (Z_8)	Dummy variable: available-1,not available -0
Facility of drinking water (Z_9)	Dummy variable: exclusive use-1,common use-0

Distance of drinking water(Z_{10})	Dummy variable: with in premises-1, not with in premises-0
Facility of bathroom (Z_{11})	Dummy variable: available-1, not available-0
Facility of latrine (Z_{12})	Dummy variable: available-1, not available-0
Sharing the latrine (Z_{13})	The number of household sharing the latrine of the house
Source of cooking (Z_{14})	Dummy variable: LPG or electric-1, other type-0
Electric wiring (Z_{15})	Dummy variable: conduit of fixed-1, other type-0
Plinth area (Z_{16})	The plinth area of the house which is calculated in the square feet
Plinth level (Z_{17})	The plinth level of the house which is calculated in feet
Purpose of house (Z_{18})	Dummy variable: residential-1, residential as well as factory, shop or office-0
Age of house (Z_{19})	Dummy variable: less than 20year old-1, otherwise-0
Condition of house (Z_{20})	Dummy variable: satisfactory-1, not satisfactory-0
Drainage (Z_{21})	Dummy variable: covered -1, otherwise-0
Garbage (Z_{22})	Dummy variable: arrangement-1, no arrangement-0
Flood (Z_{23})	Dummy variable: flood-1, no flood-0
Type of Road (Z_{24})	Dummy variable: moterable road -1, no moterable road -0
Type of dwelling (Z_{25})	Divided into 3 degree: independent house-1,flat-2,other type-3
Rooms (Z_{26})	The number of living rooms in the house
Other rooms (Z_{27})	The number of other rooms in the house
Area of rooms (Z_{28})	The floor area of the living rooms of the house which is calculated in square feet
Area of other rooms (Z_{29})	The floor area of the other rooms of the house which is calculated in square feet
Floor area (Z_{30})	The floor area of the veranda of the house in square feet
Floor (Z_{31})	The floor of the uncovered portion of the house
Ventilation (Z_{32})	Dummy variable: satisfactory-1,not satisfactory-0
Couples (Z_{33})	The total number of married couples live in the house
Separate rooms (Z_{34})	Dummy variable: yes-1,no-0
Kitchen (Z_{35})	Dummy variable: yes-1,no-0
Type of floor (Z_{36})	Dummy variable: cement-1, other-0
Type of wall (Z_{37})	Dummy variable: cement-1, other-0
Type of roof (Z_{38})	Dummy variable: cement-1, other-0

Fitting of Model:

On fitting the model (1) to data sets relating to tenant and owner houses of   Eastern, Western, Central and Southern regions of Uttar Pradesh, following estimating equation has been obtained by using SPSS 17.0 software

$$\hat{P} = \hat{\alpha}_0 + \hat{\alpha}_1 Z_1 + \hat{\alpha}_2 Z_2 + ... + \hat{\alpha}_k Z_k \qquad (2)$$

Where $\hat{P}$ is the estimated value of rent and imputed rent. $Z_1, Z_2, ..., Z_{38}$ are the independent variables. We find the Following tables for different regions of Uttar Pradesh.

Table-1 Model Estimates for Tenant's Houses

	Coefficients	t		Coefficients	t
(Constant)	-312.105	-.280	Z_{19}	230.439	1.216
Z_1	-38.265	-.899	Z_{20}	45.470	.169
Z_2	8.650	.026	Z_{21}	-95.268	-.429
Z_3	-75.778	-.651	Z_{22}	-187.424	-.716
Z_4	.145	2.887	Z_{23}	-697.818	-1.368
Z_5	9.871	.775	Z_{24}	15.014	.112
Z_6	-3.779	-.353	Z_{25}	33.236	.316
Z_7	46.396	.243	Z_{26}	-561.221	-2.141
Z_8	648.602	1.249	Z_{27}	-101.047	-.704
Z_9	-9.019	-.032	Z_{28}	6.023	4.248
Z_{10}	241.036	.859	Z_{29}	1.490	.759
Z_{11}	-116.619	-.832	Z_{30}	3.163	1.231
Z_{12}	-31.469	-.142	Z_{31}	2.845	1.289
Z_{13}	20.811	.516	Z_{32}	-236.276	-.794
Z_{14}	-76.641	-.400	Z_{33}	12.414	.058
Z_{15}	-101.211	-.446	Z_{34}	-49.050	-.225
Z_{16}	.074	.636	Z_{35}	85.035	.347
Z_{17}	-163.315	-1.402	Z_{36}	73.975	.281
Z_{18}	368.976	.913	Z_{37}	185.289	.475
			Z_{38}	-134.940	-.506

R-squared=.838,   Adj. R-squared= .695

Table-2 Model Estimates for the Owner's Houses

	Coefficients	t		Coefficients	t
(Constant)	-638.467	-.244	Z_{19}	-93.515	-.333
Z_1	-56.303	-.762	Z_{20}	949.501	1.739
Z_2	-69.442	-.089	Z_{21}	-339.469	-1.011
Z_3	291.712	1.276	Z_{22}	-966.281	-2.527
Z_4	.061	1.234	Z_{23}	-112.449	-.154
Z_5	-28.031	-.730	Z_{24}	35.098	.219
Z_6	21.171	1.088	Z_{25}	-134.985	-.523
Z_7	411.060	1.249	Z_{26}	-43.461	-1.170
Z_8	1930.468	1.312	Z_{27}	-129.277	-.923

Z_9	-175.386	-.224	Z_{28}	2.002	2.745
Z_{10}	-109.558	-.175	Z_{29}	1.787	.805
Z_{11}	-270.311	-1.186	Z_{30}	2.344	1.225
Z_{12}	-110.087	-.205	Z_{31}	3.222	2.437
Z_{13}	-50.988	-.289	Z_{32}	-489.434	-.884
Z_{14}	-1074.031	-2.404	Z_{33}	500.816	1.679
Z_{15}	97.172	.182	Z_{34}	-173.343	-.454
Z_{16}	.119	.421	Z_{35}	840.603	1.954
Z_{17}	-30.976	-.230	Z_{36}	294.756	.327
Z_{18}	17.151	.050	Z_{37}	622.648	.544
			Z_{38}	-862.639	-1.117

R-squared= .845,   Adj. R-squared= .708

Results and Discussions:

The regression results of the model (2) are presented in Table- (1) and (2), Broadly it is found that floor area of house determine the rent to a greater extent for the owner and tenants. Uncovered area and Garbage disposable system is also important rent deciding factors for owner occupied housing. Kitchen facility is also an important positive effect on rent for owner house. Tenants give the rent according to their monthly consumer expenditure. It is also found that number of rooms in a house determines the rent.

Facilities of drinking water and average monthly consumer expenditure determine the rent for tenants. Type of dwelling is also an important factor for deciding rental value of the house for tenants. Different rental values are determined for independent house and for flats.

Characteristics like availability of drinking water, numbers of households sharing the latrine, plinth level, no. of living rooms, floor area of veranda and uncovered portion affect the housing rent for tenants.

Characteristics like social group, availability of drinking water, age of the building, condition of the house, facility of garbage disposal, floor area of the house, number of married couples affect the housing rent for owners.

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