

Housing Demand Model for Rental Housing in Urban Regions of Uttar Pradesh



Statistics

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ABSTRACT

The present study is on demand models for rental houses 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 eastern, western, central and southern region of Uttar Pradesh. We have also identified the important factors affecting housing demand in different regions of Uttar Pradesh.

1 Introduction:

Housing for many households in our country India is both the largest expense and the most important asset for all households. It is an important determinant of quality of life. There are many unique characteristics about housing properties distinguishing it from other goods. In India home ownership is a social goal, bringing social status to the person (buyer). Housing is also a relatively expensing asset, often soaking up a life time's saving.

A house is a capital good with a very long lifespan, unlike foodstuffs and other single use or short term consumer goods, housing continues to provide services over many years. Houses have longevity greater than the other consumer durables. Older house that may become "obsolete" will still be used and may even be "modernized". Indeed houses do not necessarily depreciate because of their age. The durability of a house and the level of services it continues to provide are often dependent on the quality of its construction, the type of building materials used and the level of maintenance. Housing demand is a function of the price of the housing product offered in the market and its characteristics. In any product market, there are two types of prices, one the offer price and the other bid price. The offer price is related to supply price and is cost based. The components of house cost are land, construction of the housing unit, social amenities, community facilities, infrastructure both off-site and on-site and institutional costs. In the case of housing products offered by public agencies, offer prices may have an element of subsidy or may be cost plus subsidy to low-income groups while the private sector has a profit component. The different components of housing cost indicate that the offer price would vary proportionately with size and quality of services and amenities.

The demand price for the housing units reflects the potential buyer's willingness to pay. The demand price is closely linked with the level of affordability of the household that in general is captured in their income. The Income can be classified into two categories- present income, which is a flow and permanent income, which is the average discounted value of income over the total earning period.

The demand for housing is related to the expectations of households about their economic well-being over long time horizon. The affordability of the potential buyers for housing products offered in the market relates to their ability to mobilize the initial down payment required for participating in the housing market and the ability to service the house loan on the terms stipulated for the lending agencies. The demand is measured in terms of house hold's expenditure on housing. Several factors including rapid population growth, rising income, emergence of nuclear families, tax incentives, availability of home loans at competitive rates are responsible for the growing demand for houses.

2 Review of Literature:

Housing demand models are mostly hedonic price regression models. The word hedonic comes from Greek word "Hedone" or enjoyment.

Hedonic approach in economics is used for evaluating the economic value of goods. Hedonic analysis is the study of the relationship between the price of the product and characteristics of that product. People buy and consume residential house, through ownership or rental arrangement because they obtain utility that is enjoyment from the things that the housing unit has to offer. Every house has certain attributes or characteristics that allow obtaining utility from residing in it. These include land, the amount of interior area in square feet, the age of the house, the number, size and type of the various rooms of the house and the existence of the other amenities such as a garage etc.

Tiwari and Parikh (1998) have discussed the estimation of the household affordability and demand for housing as a tool for designing housing policies. They have estimated demand function of housing for urban population of India in which they have employed two step econometric study. In the first step they estimated the hedonic price index for states, in second step housing demand was estimated as a function of economic and household characteristics. The efficient estimates were obtained using Ridge-Regression method of estimation.

Tiwari et.al (1999) have studied housing demand in Mumbai metropolitan region (MMR). They have given importance of prices and income on demand for housing in Mumbai metropolitan region. They have taken into account rent control in Mumbai, which spoils the rent values. They have shown that housing demand is elastic with respect to income and price and income and price elasticities are around 1 and -1 respectively. They have also estimated these elasticities for different income classes and given policies prescription. They have used two step estimation procedure to estimate the housing demand function for MMR.

Mishra and Negulline (2008) have described a hedonic housing demand model for rented house in Kohima (Nagaland). Their data set was obtained by a primary survey of 209 households randomly selected from the households inhabiting 19 wards of the township of Kohima during first half of the year 2008. They have considered 24 explanatory variables for explaining housing demand.

3 Data Description:

The study utilizes the data which was collected by the National Sample Survey Office (Ministry of Statistics and Programme Implementation, Government of India). The National Sample Survey Office (NSSO) conducted a household survey in its 58th round during the period July 2002 to December 2002. Village facilities condition of urban slums, disability, housing condition and household consumer expenditure were the subject covered.

The survey conducted by NSSO on Housing Conditions was aimed to explain the several dimensions of the state of housing in the country. From each residential dwelling unit surveyed, the floor area plinth level, type of material of which the structure was built, age and condition of the structure, ownership type, rent payable etc. were recorded. Availability of facilities such as drinking water, electricity, latrine, bathroom, drainage system, garbage disposal system, approach road etc were also investigated.

For determining housing demand, the population of Uttar Pradesh has been considered to be compared of eastern, western, central and southern region. In present investigation the urban population has been considered. Region wise classification of different districts has been given in the present paper.

The state of Uttar Pradesh has been divided into following four regions:

Western Region	Saharanpur	Mathura
	Muzaffarnagar	Agra
	Bijnor	Firozabad
	Moradabad	Etah
	Rampur	Mainpuri
	J Phule Nagar	Budaun
	Meerut	Bareilly
	Baghpat	Pilibhit
	Ghaziabad	Shahjahanpur
	G Buddha Nagar	Farrukhabad
	Bulandshahar	Kannauj
	Aligarh	Etawah
	Hathras	Auraiya
Central Region	Kheri	Kanpur Dehat
	Sitapur	Kanpur Nagar
	Hardoi	Banda
	Unnao	Chitrakoot
	Lucknow	Fatehpur
	Rai Bareli	Barabanki
Eastern Region	Pratapgarh	Gorakhpur
	Kaushambi	Kushi Nagar
	Allahabad	Deoria
	Faizabad	Azamgarh
	Ambedkar Nag.	Mau
	Sultanpur	Ballia
	Bahraich	Jaunpur
	Shrawasti	Ghazipur
	Balrampur	Chandauli
	Gonda	Varanasi
	Sidhartha nagar	St.Ravidas Nagar
	Basti	Bhadohi
	S Kabir Nagar	Mirzapur
Maharajganj	Shonbhadra	
Southern Region	Jalaun	Hamirpur
	Jhansi	Mahoba
	Lalitpur	

4 Housing Demand Model:

In the present study on housing demand of population of Uttar Pradesh, the dependent variable P has been considered to represent rent of a house. Several authors including Chesire and Sheppard (1998), Pardoe (2008), Wen H et. al.(2005) have considered rent of a house as a dependent variable in their studies on housing demand. Several authors like Tiwari and Parikh (1998), Selim (2008), Tiwari et.al. (1999) have considered log rental value ($\log P$) as dependent variable. In the present investigation $\log P$ dependent variables have been considered and their results on housing demand have also been compared.

There are 38 explanatory variables which have been considered in the paper. The functional form representing $\log P$ on Z is linear in nature. The estimation of parameters has been carried out by the method of least squares. All calculations have been performed in **SPSS (17.0)**.

The multiple log-linear also known as semi-log regression model is of the following functional form.

$$\log P = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \dots + \alpha_k Z_k + u \quad (1)$$

Where $\log P$ denotes the logarithmic value of the variable P . Here P is the monthly rent of the house.

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 as a dependent variable has 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 Semi-Log 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

$$\log \hat{P} = \hat{\alpha}_0 + \hat{\alpha}_1 Z_1 + \hat{\alpha}_2 Z_2 + \dots + \hat{\alpha}_{38} Z_{38} \quad (2)$$

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

Model Estimates for the Eastern Region

	Coefficients	t		Coefficients	t
(Constant)	1.419	.840	Z ₁₉	.190	.939
Z ₁	.002	.032	Z ₂₀	.120	.379
Z ₂	.115	.285	Z ₂₁	.194	.960
Z ₃	-.058	-.422	Z ₂₂	-.020	-.059
Z ₄	-8.525E-5	-1.167	Z ₂₃	1.620	1.395
Z ₅	.057	1.421	Z ₂₄	.189	.761
Z ₆	-.054	-1.393	Z ₂₅	.102	.544
Z ₇	-.205	-.754	Z ₂₆	-.097	-.349
Z ₈	.453	.736	Z ₂₇	.199	.791
Z ₉	.310	.854	Z ₂₈	-.001	-.118
Z ₁₀	-.200	-.594	Z ₂₉	-.006	-.503
Z ₁₁	-.017	-.103	Z ₃₀	-.006	-.482
Z ₁₂	.709	2.520	Z ₃₁	-.002	-.212
Z ₁₃	.008	.362	Z ₃₂	-.470	-1.601
Z ₁₄	-.140	-.477	Z ₃₃	.466	1.721
Z ₁₅	-.198	-.730	Z ₃₄	.231	1.126
Z ₁₆	.000	1.194	Z ₃₅	.446	1.292
Z ₁₇	.031	.217	Z ₃₆	.416	.813
Z ₁₈	1.115	4.350	Z ₃₇	.278	.584
			Z ₃₈	.793	1.263

R-squared=.689 , Adj. R-squared= .546

Model Estimates for the Western Region

	Coefficients	t		Coefficients	t
(Constant)	2.582	2.005	Z ₁₉	-.054	-.360
Z ₁	-.061	-1.530	Z ₂₀	.616	2.285
Z ₂	-.207	-.696	Z ₂₁	.127	.850
Z ₃	.207	1.997	Z ₂₂	-.217	-.950
Z ₄	4.711E-5	1.024	Z ₂₃	.010	.033
Z ₅	.014	1.613	Z ₂₄	.151	.875
Z ₆	-.009	-1.139	Z ₂₅	-.012	-.114
Z ₇	.085	.525	Z ₂₆	-.292	-1.471
Z ₈	.050	.096	Z ₂₇	.096	1.550
Z ₉	.294	1.104	Z ₂₈	.005	3.994
Z ₁₀	.182	1.052	Z ₂₉	.001	.484
Z ₁₁	-.077	-.660	Z ₃₀	.001	.362
Z ₁₂	-.137	-.644	Z ₃₁	-.002	-1.314

Z ₁₃	-.055	-2.060	Z ₃₂	.074	.328
Z ₁₄	-.051	-.252	Z ₃₃	.183	1.045
Z ₁₅	.267	1.251	Z ₃₄	.006	.033
Z ₁₆	.000	1.783	Z ₃₅	-.274	-1.360
Z ₁₇	-.061	-.792	Z ₃₆	.285	.892
Z ₁₈	.143	.521	Z ₃₇	1.114	1.344
			Z ₃₈	-.255	-1.142

R-squared= .603, Adj. R-squared= .455

Model Estimates for the Central Region

	Coefficients	t		Coefficients	t
(Constant)	4.360	2.623	Z ₁₉	.956	2.489
Z ₁	-.070	-.749	Z ₂₀	-.089	-.129
Z ₂	.827	1.295	Z ₂₁	.283	.843
Z ₃	.135	.651	Z ₂₂	-.005	-.010
Z ₄	1.300E-5	.084	Z ₂₃	.313	.449
Z ₅	.012	.157	Z ₂₄	.058	.422
Z ₆	.001	.021	Z ₂₅	-.120	-.574
Z ₇	-.053	-.138	Z ₂₆	-.181	-.611
Z ₈	.282	.441	Z ₂₇	-.088	-.332
Z ₉	.040	.078	Z ₂₈	.000	-.111
Z ₁₀	.751	1.465	Z ₂₉	.004	.820
Z ₁₁	-.476	-1.849	Z ₃₀	.005	1.089
Z ₁₂	-.106	-.211	Z ₃₁	.003	.913
Z ₁₃	.067	1.093	Z ₃₂	.170	.270
Z ₁₄	-.307	-.697	Z ₃₃	.091	.193
Z ₁₅	-.045	-.100	Z ₃₄	-.217	-.530
Z ₁₆	-7.222E-5	-.360	Z ₃₅	.262	.451
Z ₁₇	.131	.812	Z ₃₆	.338	.487
Z ₁₈	-.607	-.960	Z ₃₇	-.500	-.617
			Z ₃₈	.952	1.265

R-squared=.661, Adj. R-squared= .347

Model Estimates for the Southern Region

	Coefficients	t		Coefficients	t
(Constant)	-9.635	-1.805	Z ₁₉	-8.002	-1.813
Z ₁	.127	.800	Z ₂₀	-.204	-.421
Z ₂	-4.341	-1.703	Z ₂₁	4.648	2.391
Z ₃	-.299	-.921	Z ₂₂	1.419	2.044
Z ₄	-.001	-1.739	Z ₂₃	-.667	-1.449
Z ₅	-.027	-.425	Z ₂₄	1.753	1.871
Z ₆	-.133	-2.127	Z ₂₅	1.437	2.242

Z ₇	2.564	2.062	Z ₂₆	-.006	-1.186
Z ₈	11.448	2.162	Z ₂₇	-.027	-2.490
Z ₉	-10.955	-2.118	Z ₂₈	.001	.154
Z ₁₀	10.187	1.876	Z ₂₉	-.003	-.850
Z ₁₁	-.608	-2.205	Z ₃₀	-.538	-.763
Z ₁₂	4.299	2.863	Z ₃₁	.882	1.876
Z ₁₃	.068	.630	Z ₃₂	-1.381	-1.826
Z ₁₄	3.029	2.124	Z ₃₃	-4.889	-1.830
Z ₁₅	-.828	-1.110	Z ₃₄	-21.326	-2.152
Z ₁₆	.002	2.154	Z ₃₅	16.554	1.925
Z ₁₇	1.199	1.758	Z ₃₆	4.300	5.706
Z ₁₈	9.552	2.552	Z ₃₇	-8.002	-1.813
			Z ₃₈	-.204	-.421

R-squared= .994 ,

Adj. R-squared= .895

Results and Discussions:

For eastern region, it is found that using house for different purposes have an impact on the rent of houses for tenants. Availability of separate latrine facility in a house determines the rent for tenants.

The characteristics like distance travelled, availability of living rooms, flood experienced, number of living rooms, floor area of the veranda, ventilation in a house, number of married couples, availability of separate rooms for married couples, type of kitchen and type of roof also influence the housing rent for tenants.

For western region, it is observed that social group of the family has an impact on the rent for tenant's houses. Plinth area of the house and condition of the house determine the rent for tenant's houses. Floor area of the living rooms affects the rent for tenants. Numbers of households sharing the latrine also have an impact on the rent of the house for tenants.

The characteristics like household size, average monthly consumer expenditure, distance travelled to the earning place by household, number of households sharing the latrine, plinth level of the house, number of living rooms and other rooms, floor area of the uncovered portion of the house, type kitchen and type of wall also influence the housing rent for tenants.

For central region, it is found that the coefficients for the dummies of bathroom and age of the building are positive for rental houses.

The characteristics like household size, gender of the head household, distance of drinking water, source of cooking, age of the building, floor of the veranda, and type of roof also influence the housing rent for tenants.

For southern region, it is found that in roof type of the dwelling unit determines the rent of the house for tenants.

The characteristics like gender of the head of the households, average monthly consumer expenditure, maximum distance travelled in a day, source of drinking water, latrine, plinth area of the house, plinth level of the house, source of cooking, age of the building, using a house, facility of garbage disposal, type of road, number of rooms, floor area of the house, type of floor, type of roof also influence the rent for tenants.

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