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Determinants of Housing Prices in District Mardan KPK, Pakistan

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ABSTRACT

Residence is basic need of life. Sale and purchase of house is common practice among the society. To investigate the factors that affects house pricing, researchers condicted this study. This study is based on influencing factors or determinants of housing prices in district Mardan. The study has collected primary data through a questionnaire, using a stratified random sampling technique. The data was collected from 250 house buyers; the buyers were selected on the bases of listing done through property dealers. The respondents were selected on the base of house buyers, who bought a house in the last 5 to 10 years. The study has used a multiple regression model. The study found that house size, number of floors, and electricity connection in a house increase house prices. Bad smell and distance to urban areas negatively affect house prices in district Mardan.

Keywords: Housing prices, Property values, Mardan, Stratified random sampling.

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Introduction

The important driving factors which fluctuate house prices across different areas or at different locations of the same area. As Aziz, Anwar, and Dawood (2020) observed that neighboring features also contribute to housing prices. Mardan is one of the prime located districts in KPK[1], which has Peshawar on one side and Islamabad on the other side. Housing prices in Mardan vary in different locations and as well as at the same location due to various influencing factors. For better understanding the driving factors influencing the housing prices in Mardan, it is important to study the determinants of housing prices at the micro-level. This study will help policymakers to understand the dynamics of housing markets and taxing in the housing sector. The current study is a policy-oriented investigation of influencing factors of house prices in Mardan. This study will help policymakers to understand the important factors that increase or decreases house prices. For example, the availability of Masjid, schools, and markets encourage house prices for customers, and these facilities should be provided on the supply side. The issue of land value can be intensified with help of good policy options and better policies can be driven with the help of ground-level investigation. The scope of this research is not limited to Mardan but is also applicable to the regions or cities with the same type of socio-economic features. This includes Charsadda and Swabi as

[1] KPK stand for Khyber Pakhtunkhwa, which is the province of Pakistan.

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well, which look at the issue in depth to able housing policymakers, students, and real estate stakeholders, to utilize this study for different interests both in individual and community level planning. There are many studies conducted over this issue. whilst specifically in district Mardan none of the studies has highlighted the property values, land values, and housing prices and their influencing factors in district Mardan. This study especially focused on Mardan to fill this gap in the literature by estimating the determinants of housing prices in district Mardan.

According to Pakistan's economic survey (2017), the total population of Mardan was 2373,061 in 2017, which has crossed 25 million in 2020. Over 70 percent of the population is residing in rural areas of the district and less than 25 percent population is residing in urban settlements of district Mardan. Increasing population is one of the most challenging aspects of the economy, which requires well-thought attention from a policy perspective. An increase in population escalates resource consumption and demand for housing also grows. Housing demand put pressure on the market prices of houses and thus housing prices increases. A desirable house in terms of facilities in it is high price house. The housing prices are subjected to housing schemes' security and location in many cases. But there are many other factors, which reallocate the housing prices in the market. Those factors are the location of the house, size of the house, design, number of floors, availability of gas, electricity connection, internet, schools, hospital, market, view, non-availability of disseminates like bad smell and availability of other facilities. Housing prices in Mardan range from 5 million Pakistani rupees to 15 million Pakistani rupees, with a house size of 5 Marla or 20 Marla.

Where the increase in population is a natural process, migration from rural areas to cities has been increased pressure on cities. Where concerned authorities of several cities have failed to provide suitable housing to the inhabitants of expanding cities [Ali et al (2000)]. Mardan city is also expanding very rapidly in terms of the growing population's Ecological footprints and limited biological capacity. It has caused pressure on land values and space for accommodation.

Problem Statement

Mardan is considered as one of main city in industrial cities of Pakistan and prime located districts in KPK. Housing prices in Mardan varies from one sector to another. The literature on housing prices and its determinants can be found for other cities, while no one study explored the case of Mardan. To understand the driving factors of housing prices in Mardan, this study is conducted to understand the determinants of housing prices at micro level, especially for Mardan.

Significance of the study

This paper investigates the factors which effect of house prices in Mardan. The research looks at the problem in depth and will provide addition to the existing literature on the determinants of housing prices. The study will put forth some policy recommendations to the concerned authorities by estimating the impact of environmental features or surrounding features, housing features, on house prices in district Mardan. Mainly the issue of land value can be intensified with help of good policy options and better policies can be driven with the help of ground level investigation.

Scope and applicability of the research

The scope of this research is not limited to Mardan but is also applicable to the regions or cities with same type socio economic features. This includes Charsadda and Swabi as well. In terms of common usability of this research, it is valid for housing policy makers, students and real estate stakeholders, who can utilize this study for different interests both on individual and community level planning.

Objectives of the study

The main objectives of the study are

(I) To examine the determinants of housing prices in district Mardan.
(II) To study the relationship between housing prices and their influencing factors in district Mardan.
(III) To design policy actions for the provision of adequate housing in Mardan.

The rest of the study is organized in a way that section 2 includes a literature review on population factors, housing attributes and prices, environmental factors and prices, location and prices and section 3 explain the methodology of the study, section 4 is about the results and discussion while section 5 contain concluded remarks of the study.

Literature Review

This part includes previous studies conducted on housing prices or demand for housing attributes. This study is based on a thematic review of literature, which focuses on recently published and previously related studies on housing policies. This part also includes studies on modeling and analysis perspectives to come up with relevant policy implications for the growing and demanding population at district Mardan.

Population growth and housing prices

There are many studies available in the literature, As Choi and Jung (2017) observed that the part of population (between age of 15-64) which is known as the active portion of population have impact on housing prices significantly.

Owusu Ansah (2012) argued that increasing demand for housing is one of the influencing factors for the housing values in urban areas. The author found that high population density, availability of swimming pools in a house, and security of the region are highly significant Factors for the hiking prices of houses, along with land value, location, and several floors. due to the increase in population and business the pressure on land value and housing prices also increases. The increasing population requires housing schemes and plans to accommodate the increasing number of families and households. Demand for housing has increased over the years due to the growing population across developing and developed countries.

Pasha & Butt (1996) associated housing values with population growth in developing countries. Housing prices are positively associated with housing demand. Green (1998), et al have worked on the prices index for housing in the USA. The authors discussed the volatility of housing prices across different localities in the USA. This study has associated housing prices with population growth and many other important factors like location and land values etc.

Housing attributes and housing prices

Housing attributes are considered one of the most influencing factors for pricing in housing markets. The study of Dawood *et al*. (2020) mentioned that the attributes of neighboring also contribute to land values. Back in the late 90s Green (1998) added to the literature that the component base approach, for housing prices, can be an effective technique to design policy actions for the provision of adequate housing to the rising population.

Ali *et al*. (2015) argued that houses prices differ from town to town Due to certain characteristics, which include distance to market and hospitals. This study also mentioned that housing prices are determined by various environmental and socioeconomic factors of the region. The study has utilized the hedonic pricing model to analyze the housing prices and demand concerning changes in different housing attributes. Many attributes significantly affect the price of a house, these include several rooms in a house, land area covered or size of a house, front view or back view of the house, availability of water in the region, availability of gas connection, electricity connection and closeness to market, schools, and hospital.

Hedonic pricing model and housing prices

There are various methodologies and approaches for housing prices used in previous studies. The study of Nguyen (2020) has applied a hedonic pricing model, to the housing market. Assessment of local area values including the neighborhood amenities, social, economic, and environmental dimensions of sustainability is the key to fostering development, and such type of assessment can be done through the land price function (Nakamura, 2019). According to Cebula (2009) family house at real market price in Savannah shows environment has positive impact on house prices by the number of fireplaces, bathrooms, stories in structure, bedrooms, garage car spaces, the presence of a deck, a private courtyard, a pool and/or hot-tub, square feet of finished living space, an exterior construction of brick or stucco, whether the house was new, and the presence of an underground sprinkler system.

DATA AND METHODOLOGY

Data for the study

The data for this research is collected through a questionnaire, which includes the information related to house size, location, availability of schools, hospitals and roads, electricity, gas, and other facilities, which determine the price of the house.

Sample size

The study has included 250 households, who have purchased or bought a house in Mardan in the last five or ten years. The study also includes 10 property dealers as a sam of study for qualitative analysis of the influencing factors to understand the house price volatility.

Sampling technique

The study has used stratified random sampling to collect the data. Each cluster has 50 samples units. Within stratified households or sampling, units are selected randomly. The sample size is calculated with a sample calculator, using the house's population of district Mardan.

Important Variables of the study

- House price is taken as the dependent variable, which is buying price of the house.
- Size of the house is taken in Marla's during the transaction.
- Location of the house is taken as dummy variable which takes value one of the locations has an influence.
- Area dummy is taken in binary form, where if the area is planned it takes value one otherwise zero.
- Availability of gas and electricity are also taken as binary response functions, which take a value if the facility is available otherwise zero.
- Availability of roads, hospitals, schools, and other facilities which influence the house prices are also included as important variables.

Econometric model for the study

The study has used a multiple linear regression model. The dependent variable is house price and independent variables are all the facilities around the community and income of the person at the time of transaction

Approach/Methods to be used

This research is based on the hedonic pricing technique, which is a technique based on component-based pricing of houses and it is also called an attribute-based pricing technique.

Methodology

This research is an empirical study, which is based on an econometric analysis of selected influencing factors of housing prices in district Mardan. The data is tested for all the issues including multicollinearity, heteroscedasticity, endogeneity, etc. after removing the econometric issues from the data, at the final stage, the regression analysis is carried out. The study has used a multiple linear regression model, which is written as follows:

Hph= (f) α (Numbers of floors) +∑β (House size) +∑β (Availability of electricity) +∑β (Gas connection) +εt

Hph is the hedonic price of housing which is the dependent variable of the study αo is the intercept of the model

∑βh is the vector of house features, which include house size, number of rooms, washrooms, kitchen, TV launch, Gas connection, electricity connection, water connection, number of floors, construction designee, car park, etc.

∑βe is the vector of environmental amenities and dis-amenities, which include a front view, back view, resilience to floods, sanitation, and smell around the house.

∑βs is the vector of surrounding features, which includes a distance of market, hospital, and school and availability of roads. The area dummy is included, where if the area is planned, it takes value one otherwise zero. εt is the error term of the given model.

Results and discussion

Table 1: *Respondent Descriptive statistics*

Descriptive statistics	Mean/average	Standard Dv:	Maximum	Minimum
Age of the respondent	38.50	17.00	62.00	28.00
Education	12.00	8.00	18.00	0.00
Monthly income (k)	48.00	22.00	250.00	25.00
Household size	8.00	6.00	17.00	5.00
N	**250.00**	**250.00**	**250.00**	**250.00**

K=1000

The respondent's characteristics are shown in table 1. The results of the study indicate that the average age of the respondents is 38.50 years, while the maximum age of the respondents is 62 years. The education average is 12 years of schooling and the maximum education reported is 18 years of schooling. The data shows that the average income of respondents is 48,000 with 8 persons in a household on average. The maximum income reported is 250,000 or 250k with 17 members of the household at maximum.

Table 2: *Descriptive statistics of housing attributes*

House attributes	Mean/Average	Maximum	Minimum
Number of rooms	5.00	12.00	2.00
Number of floors	2.00	3.00	1.00
Number washrooms	3.00	8.00	2.00
House size in Marlas	9.50	38.00	5.00

Table 4.2 shows descriptive statistics of housing attributes in district Mardan. The data shows that on average, there are 5 rooms reported in a single household. A maximum of 12 rooms are reported and only 2 rooms are reported at minimum. In district Mardan, most of the houses have 2 floors, while 3 floors

houses are also reported in the data. However, some of the houses have only one floor in district Mardan. The data shows that 8 washrooms are reported on maximum, and 3 washrooms are reported on average in district Mardan housing style. House size in the Mardan district is varying across different locations and streets, the size is measured in Marla, which ranges from 5 Marla's to 38 Marla's in a selected sample of the study. According to the selected sample of the study, the average house size in district Mardan is almost 10 Marla's.

Table 3: *Descriptive statistics of Surrounding*

Features	**Mean/Average**	**Maximum**	**Minimum**
Distance to market km	3.50	18.00	0.50
Distance to hospital km	3.50	16.50	0.50
Distance to school km	2.50	10.00	1.00
Distance to main road km	3.50	28.00	0.50

Table 3 shows statistics of surrounding for a selected sample of respondents. The house prices are associated with distance to market, hospital, school, and main GT road or Mardan motorway. The statistics show that the average distance to the market for the selected sample houses is 3.5 kilometers, while the maximum distance of 18 kilometers is reported to the main markets in district Mardan. However, few respondents reported walking distance from the main market. The results in table no 4.3 show that the average distance of houses from the hospital is 3.5 kilometers, while the maximum distance of 16.50 kilometers is reported for the selected sample of the study. These are the houses constructed on the outskirts of Mardan city, which include Babozoo and the areas between Mardan and takhbaye. The minimum distance of 0.05 kilometers is reported for the selected houses to Hospital.

The distance from residential areas to schools is also important for housing prices in district Mardan. In district, Mardan schools are constructed in a way that most of the houses reported 2.5 kilometers of the average distance to schools. The study result indicates that a maximum of 10 kilometers of distance is required to cover access to schools in district Mardan. The houses closer to schools are required to cover only one-kilometer distance to reach the school from the residential area at district Mardan.

Figure 1: *Residual trend analysis*

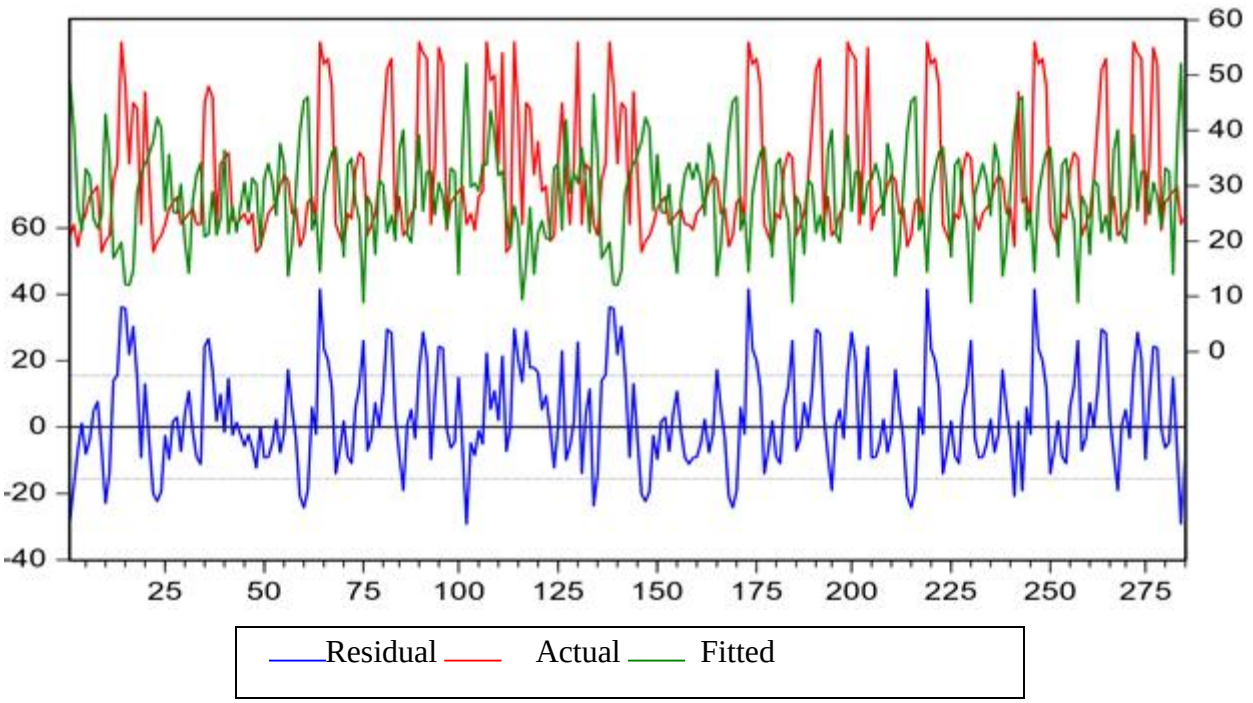

Figure 1 shows the residual distribution of the selected sample. The actual and fitted residual are aligned, which indicates that the variation in the error term is less than problematic limits. This also indicates that the data is a good fit for regression analysis. Before further analysis, the author has used error dependency tests to see further development in the collected data before using regression line estimates.

Table 4: *Heteroskedasticity Test: Breusch-Pagan-Godfrey*

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	5.749758	Prob. F(7,274)	0.0000
Obs*R-squared	36.11801	Prob. Chi-Square(7)	0.0000
Scaled explained SS	32.89292	Prob. Chi-Square(7)	0.0000
Test Equation: Dependent Variable: RESID^2 Method: Least Squares Sample: 1 250 Included observations: 248			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	477.2100	66.06317	7.223540	0.0000
House size in Marla's	30.73690	5.660302	5.430258	0.0000
Number of floors	38.40009	27.93673	4.374538	0.0004
Distance to urban settlement	-1.534329	16.39723	-0.093572	0.0055
Availability of bad smell	-35.05264	17.23623	-2.033660	0.0429
Area dummy	36.25939	22.71948	2.595960	0.0117
Availability of electricity connection	6.633607	17.60469	2.376809	0.0066
Availability of gas connection	15.24480	22.05357	5.691262	0.0000
R-squared	0.128078	Mean dependent var		235.9368
Adjusted R-squared	0.105803	S.D. dependent var		327.1054
S.E. of regression	309.3175	Akaike info criterion		14.33457
Sum squared resid	26215579	Schwarz criterion		14.43789
Log-likelihood	-2013.175	Hannan-Quinn criteria.		14.37600
F-statistic	5.749758	Durbin-Watson stat		1.690906
Prob(F-statistic) 0.000003				

Table 4 shows the results of testing data for heteroscedasticity, which is an issue when the error term of estimated regression is correlated for each variable separately as well as collectively. The data shows that f statistics is greater than 2, which is acceptable and signifies the significant association. The explained variation in error term is 36 which is represented by observations r squared.

The results of this model indicate that there is no heteroscedasticity issue in variable house size because the p-value is less than 0.05, which means the hypothesis stated, there is no hetro is accepted. Following are the other variable, which none of the p-values is greater than 0.05, which also means no hetro, and the explained variation in error terms due to error terms is only 12, which is not highly significant but acceptable for further analysis in the framework of regression. The value of Durban Watson indicates a low level of autocorrelation and suggests the use of regression analysis. The issue of hetro is resolved using Herbert white technique and a log is taken on the dependent variable of the study. The dependent variable is house prices which are explained by the following given estimates of independent variables. The t statistics for given variables are greater from 2 which indicates the significance of the association between the error term and the error term of independent variables of the study.

Table 5: *Empirical results*

Dependent Variable: house price **Method: Least Squares** **Sample: 1250** **Included observations: 248**				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
House size in Marla's	1.594518	0.197869	8.058437	0.0000
Number of floors	1.436487	1.381866	6.039527	0.0005
Distance to urban settlement	-2.531260	0.782208	-3.236047	0.0014
Availability of bad smell	-3.932590	0.819917	-4.796327	0.0000
Area dummy	2.850949	1.120451	2.544464	0.0115
Availability of electricity connection	2.607719	0.866398	3.009841	0.0029
Availability of gas connection	0.251196	1.105006	0.227326	0.8203
R-squared	0.843665	Mean dependent var		31.45745
Adjusted R-squared	0.883891	S.D. dependent var		11.33256
S.E. of regression	15.55450	Akaike info criterion		8.351086
Sum squared resid	66534.18	Schwarz criterion		8.441488
Log-likelihood	1170.503	Hannan-Quinn criteria.		8.387339
Durbin-Watson stat	1.030372			

The results given in table 5 are the final regression model results. The results of the study indicate that there is a positive association between house size and the prices of a house. The t value is greater than 2 and the p-value is less than 0.05, which indicates a statistically significant association between a dependent variable and house size. A number of floors is an indicator of house size, which is positively associated with house prices in district Mardan and the association is statistically significant with a t value greater than 2 and a p-value less than 0.05. Distance to urban settlement is negatively associated with house prices in district Mardan, which means that increase in the distance toward urban area for a house will reduce the property value in district Mardan and vice versa. Availability of bad smell in the study area will reduce the prices of houses in district Mardan. This relationship is statistically significant in this case with a t value greater than 2 and a p-value less than 0.05. The results indicate that price of houses is negatively associated with bad smell, which is an indicator of surrounding features. Area dummy is taken in binary form, which takes value one if the area or location of the house is in a planned area otherwise zero. The association between area dummy and house prices is negative and statistically significant in this case, with a t value greater than 2 and a p-value less than 0.05. The availability of gas and electricity is positively associated with house prices. This indicates that houses with electricity connections will have a higher price and vice versa. The association of a house price and electricity connection is statistically significant but the in case of gas connection the association is not significant because the p-value is greater than 0.05. The value of R squared is 84, which indicates that 84 percent of explained variation is due to independent variables and the model is a good fit. The Durbin-Watson stat indicates that there is no serial correlation and the data used for the study is justified enough to estimate regression estimates.

Major findings

The study found that the greater the house in size the greater will be priced.

The study found that houses in urban and planned areas have higher prices as compared to houses located in rural and unplanned areas of district Mardan.

The house with an electricity connection has higher economic values in property markets but the gas connection doesn't matter for most of the buyers in district Mardan. The reason for this might be the

limited availability of gas connections in district Mardan, because in rural areas the gas connections are not available in the district Mardan.

The study found that bad smells have a negative influence on property values in Mardan, which means that houses constructed around unplanned and dumping sites have lower economic values and vice versa.

The study found that distance to markets and schools has a positive influence on property prices.

Conclusion

Housing prices and house features are statistically associated in district Mardan. This study examined the relationship between environmental features or surrounding features, housing features, and house prices in district Mardan. The study concluded that prices are different according to area whether it is urban or rural. The study further resulted that the housing scheme where electricity and gas connections available has higher prices. Where bad smell significantly reduces the house price in Mardan. So, the study suggests that government should develop and plan the housing schemes and making sure of availability of basic necessities in fast-growing cities, such as Mardan.

Policy Recommendation

- The study suggests that government should develop and plan the housing schemes in fast-growing cities, like Mardan.
- The study suggests that dumping sites should be defined to save property values in terms of reducing housing prices due to dis-amenities in district Mardan.
- The study suggests that electricity connection and gas connection should be provided across all the areas of Mardan which will help to increase the overall value of land and housing in district Mardan.

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Conflict of Interest

Authors have no conflict of interest.

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