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# Using Hedonic Pricing Model to Analyze Parameters Affecting Residential Real Estate Value in Artvin City Center

**TS05I: Land Valuation Methodologies Embracing Technological Change**



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## General information

- Every residential real estate has various structural, positional, environmental and socio-economic characteristics. These distinguishing characteristics result in different value and price of a real estate.
- A realistic estimation of real estate value is of great importance both for buyers/sellers and for those who want to invest in property.
- It is quite difficult to estimate the value of real estate because of the mentioned characteristics.
- It is not clear how to select and apply the parameters that are effective on estimating the sales price.

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## The aim of this study

- ❑ Recently, determining the parameters and their degree of importance affecting the value of residential real estate has been the subject of many studies.
- ❑ Examining these studies reveals that there is no a standard for the selection of parameters and their application.
- ❑ With the support of the World Bank in 2008, the Land Registry and Cadastre Modernization Project was initiated in Turkey by the General Directorate of Land Registry and Cadastre. One of the elements of this project is related to the Land Valuation procedure, but studies were limited to some districts in Istanbul and Ankara.
- ❑ That is why there is no sound base for the valuation process as yet.

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## The aim of this study

- ❑ At this point, it is very important that these studies should be extended to rest of the country. Because it is well known that the parameters affecting the value are shaped in line with local features.
- ❑ Thus, this study aimed to determine characteristics and their contribution degrees affecting value and sales price of residential real estates in Artvin city center.

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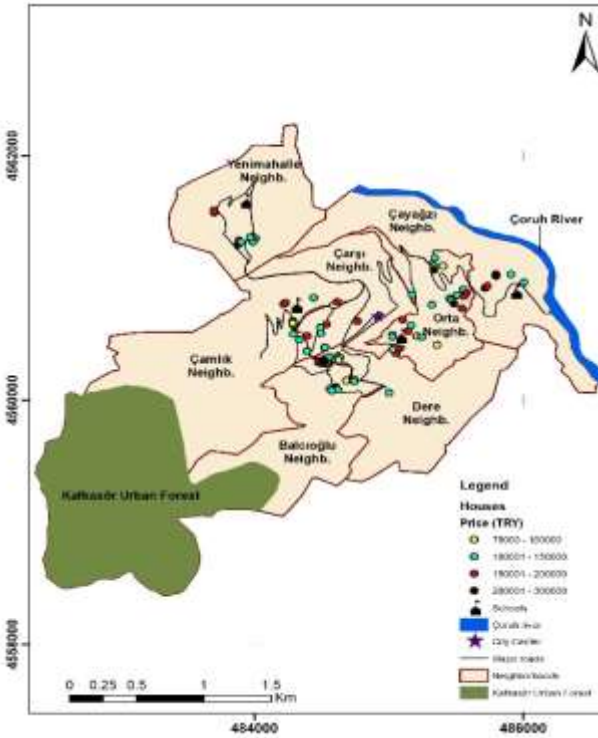


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## Location of the study area



- ✓ This study was carried out in the city center of Artvin.
- ✓ The study area was limited with approved zoning plan area and it covers an area of 768.91 hectares.
- ✓ In the study area, there are seven neighborhoods.
- ✓ Altitude changes between 180 m to 1280 m and this makes the city a hillside city.

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## The material

- The material of this study includes some residential real estates sold in 2015 on the basis of these seven neighborhoods.
- The sales data were obtained from Artvin Directorate of Land Registry for the twelve-month period.
- Total of 584 real estates (house, office, land, plot etc.) were sold and only 298 were used for residential purposes. Since a part of 298 was located in the same building, one residence for each building was selected.
- Also, because the sales prices registered are lower than their market value, only the residential real estates that we were able to reach its actual sales prices were preferred.
- Thus, a total of 73 residential real estates were studied.

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## Parameters used in the analysis

- ❑ **Determining parameters affecting the value of house is important. For this reason, the following sources of data were taken into account;**
  - (i) the real estate characteristics commonly used in the literature;**
  - (ii) the geographical structures and physical characteristics of Artvin city;**
  - (iii) the list of parameters already determined for residential real estate in the modernization Project.**

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## Parameters used in the analysis

		Variables	Description
		Structure of variable	Continuous
Floor area	Usable floor area of a flat (m <sup>2</sup> )		
Age	Age of the building at the time of sales		
Floor level	The level on which a flat is located in the apartment		
Rooms	Number of rooms in a flat (including living room)		
Balcony	Number of balconies in a flat		
Facade	Number of sides of a flat		
D_school	Distance to primary school (meter)		
D_transport	Distance to public transportation (bus station) (meter)		
D_center	Distance to the city center (meter)		
Total_floor	Number of floors		
Categorical	Floor		
	En-suite bath		It shows the presence of an en-suite bathroom
	Elevator		Availability of an elevator (yes=1, no=0)
	Parking area	It shows the presence of parking space (yes=1, no=0)	
	Çarşı_Neigh.	If it is Carşı Neighborhood (Centre of the city)=1, the others=0	
	Environment1	If development level of environment of the house is good=1, the others=0	
Environment2	If development level of environment of the house is poor=1, the others=0		
Road_type	If the real estate is on the main road =1, on the street=0		
Position	If the position of the flat is on the front= 1; if not, 0		
Physical_poor	If physical condition of the building is neglected=1, the others=0		
Physical_good	If physical condition of the building is very good=1, the others=0		
Aspect_south	If the largest facade of a flat is at the south, south west and south east=1, the others=0		





## Methodology

- ❑ The data related to these 22 parameters was collected from the relevant institutions and organizations.
- ✓ **Artvin Directorate of Land Registry;** the numbers of the cadastral islands, parcels and independent units, the dates of sales, sales prices and the type
- ✓ **Artvin Directorate of Cadastre;** the cadastral maps
- ✓ **The Municipality of Artvin;** the city maps, the Occupancy Permits.
- ✓ **In situ observations;** position of the flat, direction of frontage, floor, development level etc.
- ✓ The actual sales prices were obtained from the face-to-face interview with the buyers and sellers.
- ❑ All collected data was analyzed by using Hedonic Pricing Method (HPM). In these analyses, SPSS v.14 and ArcGIS 10.2 softwares were also used.

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## Hedonic Pricing Method (HPM)

- ❑ The value of a heterogeneous product is appraised as the sum of its all attributes.
- ❑ Considering heterogeneous nature of the house, the hedonic pricing method has been used commonly to analyze the relationship between house features and its price.
- ❑ In the HPM, heterogeneous goods were defined as the vector of objectively measurable features.
- ❑ The structure of the hedonic model is the same as multiple regression model. In the approach, various functional forms (linear, semi-logarithmic and full-logarithmic) can be used.
- ❑ In this study, semi-logarithmic functional form, the most common functional form recommended in the literature, was preferred.

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## The application

- With regard to the sales price and the features of a residential real estate, model was formed as:

$$\ln(P_i) = \beta_0 + \sum \beta_j x_j + \varepsilon_j \quad (1)$$

P; the actual sales price of residential real estate (in Turkish lira (TRY)),  
X; the features of residential real estate

$\beta$ ; the regression coefficients,  
 $\varepsilon$ ; the error term.

- The steps of the model application were given below;

- Data analyses of the continuous and the categorical variables were conducted
- Correlation analysis was executed for the continuous variables
- Spatial dependency of the data was tested by performing Moran's Index test
- All variables were subjected to hedonic regression analysis.

and The validity of this model was tested using ANOVA.

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## Results and discussion

- ❑ In the analyzing of the continuous variables, the results showed that the house prices varied from TRY 75000 to TRY 300000, and the size of the properties varied from 60 m<sup>2</sup> to 213 m<sup>2</sup>
- ❑ According to correlation analysis, it was seen that there was a correlation between the sales price and the parameters of floor area, number of rooms, balcony and floor level
- ❑ By handling the independent variables, it was seen that the parameter of floor area had a strong correlation with the number of rooms

Variables	Mean	Range (Min. – Max.)	Standard Deviation
Price (TRY)	146917.81	75000-300000	40512.26
Floor area (m <sup>2</sup> )	123.92	60-213	33.22
Age	6.59	0-36	9.47
Floor level	4.93	1-10	2.34
Rooms	3.99	2-7	0.99
Balcony	1.66	0-3	0.63
Facade	2.15	1-4	0.54
D_school (m)	558.22	50-1909	508.92
D_transport (m)	143.78	5-600	149.15
D_center (m)	2057.92	500-3900	765.88
Total_floor	7.19	4-10	1.79

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## Results and discussion

- ❑ Parameters effecting the sales price were determined by using regression analysis. In this context, it was found that the parameters of “floor area”, “age”, “development level”, “floor” and “Çarşı\_Neigh.” were effective on the price.
- ❑ By applying these parameters to the formula (1), the equation (2) was generated:

$$\ln P = 11.109 + 0.006 * (\text{floor area}) - 0.006 * (\text{age}) + 0.104 * (\text{development level}) + 0.121 * (\text{Carsi\_Neigh.}) - 0.123 * (\text{floor}) \quad (2)$$

- ❑ While the parameters of floor area, development level and Çarşı Neighborhood had a positive effect on the sales price, the parameters of age and floor had a negative impact.

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## Results and discussion

Functional form	Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
Semi-logarithmic	Constant	11.109	.072		155.298	.000		
	Floor area	.006	.000	.752	12.331	.000	.789	1.268
	Age	-.006	.002	-.196	-3.234	.002	.799	1.251
	Environment1	.104	.031	.189	3.407	.001	.950	1.053
	Çarşı-Neigh.	.121	.047	.142	2.567	.012	.960	1.042
	Floor	-.123	.050	-.136	-2.454	.017	.947	1.056

□ According to the results,

- ✓ every additional square-meter in the floor area increased the sales price at the rate of 0.6%.
- ✓ being located in the developed environment increased the sales price by 10%
- ✓ being located at ground level or below ground level decreased its value by 12%.

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## Results and discussion

- ❑ It was seen that the analysis results were in conformity with theoretical expectations. As specified in many studies, the floor area and the age had a highly significant impact on the sales value of real estate.
- ❑ However, unexpectedly, the parameter of distance to city center was not statistically significant on sales prices. The reason of this may be that Artvin is a small city and reinforcements are located at an accessible distance.

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## As a consequence;

- ❑ When examining the produced model, it was seen that only five out of the supposedly effective 22 parameters were statistically significant and they were able to explain 80% of the variations in sales price.
- ❑ In regard to the conformity of the regression analysis, it can be said that the produced model is of a satisfactory quality in terms of both the selected parameters and the ratio describing the variations in sales price. Therefore, this model can be used as a base for determining the sales price of residential real estate located in the city center of Artvin.
- ❑ Lastly, the parameters affected the value vary according to local and geographical attributes of the city. This result highlights the importance and necessity of city-based works. In this context, it is quite important to designate urban-based real estate value maps and to serve for all studies requiring this value.

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**Thank you for your attention...**

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