

The model for determination the market value of residential properties based on their surface

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ABSTRACT

The purpose of this paper is to propose a model for determining the market value of residential properties (apartments) based on their surface. Every residential property can be viewed as consisting of a bundle of attributes, some related to the physical features of the property, some related to the location and a third group related to the building design. One of the attributes of the building design is the surface of the property. Currently, the sale market of apartments makes differentiation in value (sales at half of value) only for large balconies (terraces) surfaces, while the surface in itself can be divided into primary surface (living room, bedroom) and ancillary surface (corridor, bathroom, balcony). The distinguishing feature of the apartments built in the last 20-year is the consumption of a considerable surface of the total area for the ancillary facilities. This paper, through a case study in Tirana City tends to provide a model of inclusion differently in the value of primary and ancillary surfaces.

Keywords: Residential property, primary surface, ancillary surface.

INTRODUCTION

Real estate constitutes one of the most valuable assets for the state and individuals and therefore and the valuation assumes a special importance. They are diversified and in this diversity the residential properties make up the leading group. As the most important part of real estate market there is a need for the evaluation of these properties for different purposes. Besides the purpose of assessments the main basis of evaluation is the market value. Market value is the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion. [1] [2] Market value is a function of market conditions and the attributes of the property itself. Every residential property can be viewed as consisting of a bundle of attributes, some related to the physical features of the property, some related to the location and a third group related to the building design.

This paper attempts to give the answer to the question: What is the impact of the surface of an apartment in its market value? Do have the same impact on the market value as main and auxiliary surfaces.

MATERIALS AND METHODS

Numerous properties that surrounds us are valued using one or more from five conventional methods of valuation: the Direct Comparison Method, Investment Method, Profit Method, Residual Method and Cost Method. According to International and European

Standards all methods ultimately converge on three methods, method of comparison, the method of investment and cost method. For different properties and for different purposes of valuation are used different methods.

Methods of valuation of residential properties

From the five methods of valuation the Comparison Method is the most common approach used for the appraisal of residential properties. It is known also as Market Approach. This method entails making a valuation by directly comparing the property under consideration with similar properties which have been sold in the past, using the evidence of those transactions to assess the value of the property under consideration. [3] The method is based on a comparison of like with like. Properties may be similar, but each property is unique so that they can never be totally alike. [4] Even when properties appear to be similar, close inspection often reveals that they are in fact different. Because there are many differences in legal characteristics, economic and physical assets in other transactions and asset being assessed, it may be necessary the adjustment of price information from other transactions to reflect these differences and any assumption to be adapted in the undertaken evaluation process.

The market value of a property (the capital value) is function of market conditions and terms of the property itself. The market value of a property is variable in time because it depends on the supply-demand ratio for that type of property in a given moment of time. Different properties have different values, because every property has its own qualities and features. The attributes that are important and have to be taken into consideration in comparisons and adjustments are appreciated as following: the surface, number of rooms, number of balconies, the age, property conditions, additional qualities, etc. [5] Statistical methods are used to verify the truth of these selections, to construct the models of determining the market values as a function of characteristics and attributes of the property itself as well as to determine the contribution of each of the selected characteristics or attributes of property in the model of market value. The most suitable model for the apartments of old buildings is the one based on the surface area, while for the apartments of new buildings both models, the one based on the surface area and the one based on the number of rooms, gives almost the same results. [5]

Hedonic Price Model

The surface of the apartment is an important characteristic that has significant impact on its market value. An apartment with a large area has undoubtedly a greater value, although such a thing can't be said if we see the value per unit area. On the other hand an apartment consists of several environments, living room, bedrooms, bathrooms, hallways, balconies, etc, Surfaces of different environments can be classified in primary and ancillary surfaces. Models of determining the market based on the surface of the apartment or in the number of rooms does not consider such a split. The market has spontaneously set a ratio between the market value for the surfaces of larger balconies (terraces) versus the value for the other surface of the apartment.

The heterogeneous nature of real estate properties justifies the use of the Hedonic Price Model for estimating their value. The Hedonic Price Model takes into account the properties of real estate separately and estimates prices based on the assumption that these properties could be separated into characteristics as attributes of spatial unit, location attributes, quality of design and architecture, etc. Regression analysis and related estimation approaches are common in Hedonic Price Models. [6]

The model of multiple linear regression is well known and widely used in the valuation of real estate. The regression model is presented as an equation, with the dependent variable on the left-hand-side of equal sign, and a sum of terms on the right-hand-side consisting of the explanatory variables each multiplied by a parameter whose value is estimated by hedonic regression and that relates each explanatory variable to the dependent variable. [7] This model identifies the degree of importance of each variable, indicates the relative importance of each variable in the order of entry into the equation and shows how well the model works. [8]

The model of multiple linear regression is:

$$y = b_0 + b_1 \cdot x_1 + \dots + b_n \cdot x_n$$

where: y is the dependent variable (Sales price) ;

$x_1 \dots x_n$ are n independent variables (property attributes);

b_0 is constant

$b_1 \dots b_n$ are the value rating for the independent variables.

The model has to be understandable and explainable and it should predict Sale value as close as possible market prices. Accuracy of the model depends on both the variables included in the model replicating market value and the market data used for calibrating the model.

The data sample

The data includes 75 apartments sold in different areas of the city of Tirana. The data was obtained by carrying out a market survey and are summarized in Table1.

Data preparation

Some of features can't be evaluated quantitatively, but only qualitatively. They were assessed using the scoring system. Thus 5 = very good, 4 = good, 3 = fair, 2 = bad and 1 = very bad. Location is evaluated by its importance (1= very important, 2= important, 3= normal, 4= less important, 5= less more important).

Table 1 Data from market survey

No.	Sales Price (EUR)	Location	Total Surface (sqm)	Primary Surface (sqm)	Ancillary facilities Surface (sqm)
1	35500	5	82,81	56,2	26,61
2	28000	5	65	47,64	17,36
3	34000	5	78,7	54,3	24,4
4	23000	5	46,15	38,46	7,69
5	70000	4	91	59,9	31,1
6	41000	5	99,2	60	39,2
7	58000	4	105	73	32
8	35000	5	81,74	54,24	27,5
9	22500	5	54,6	35,75	18,85
10	82000	3	117	85,25	31,75
11	33000	5	80,38	55,2	25,18
12	38000	5	83,8	55,52	28,28
13	45000	5	92,5	62,5	30
14	36000	4	65	39,34	25,66
15	128000	1	106	89,2	16,8
16	36500	5	87,4	60,24	27,16
17	38000	5	79,1	56,77	22,33
18	43000	3	69,49	42,11	27,38

19	118000	4	126,63	90,7	35,93
20	36000	4	80,7	59,22	21,48
21	42000	4	94,27	61	33,27
22	41000	5	86,5	54,9	31,6
23	38000	5	83,8	54,9	28,9
24	26000	5	60,1	40,3	19,8
25	116000	1	116	78,71	37,29
26	46000	4	97,8	68,3	29,5
27	28500	5	68	42,2	25,8
28	67000	3	77	55,16	21,84
29	68000	3	68	57,3	10,7
30	35500	5	85,69	63,02	22,67
31	70000	2	83,6	54,64	28,96
32	26000	4	76,7	48,05	28,65
33	31000	3	60,3	32	28,3
34	105000	1	97	58,3	38,7
35	60000	4	88	57,45	30,55
36	40000	5	92	77,5	14,5
37	70000	4	91	63,87	27,13
38	48000	3	74,13	51,61	22,52
39	62000	3	112	87,2	24,8
40	195000	1	146	117,68	28,32
41	64000	2	75,56	55,56	20
42	51000	2	73,2	57,01	16,19
43	46000	3	71	42	29
44	27000	3	45	29,37	15,63
45	75000	2	78	50,25	27,75
46	46000	3	83,45	57,84	25,61
47	51000	3	56	32,8	23,2
48	48000	4	63,48	45,48	18
49	33000	4	68,6	47,9	20,7
50	50000	2	57,3	43,9	13,4
51	40000	3	73,1	59,6	13,5
52	135000	1	110	71,55	38,45
53	160000	1	129	90,32	38,68
54	68000	3	72	61,9	10,1
55	26000	3	53,6	36,91	16,69
56	67000	3	77	56,71	20,29
57	37000	5	83,8	53,87	29,93
58	60000	3	71	54,85	16,15
59	56000	2	80,67	63,96	16,71
60	75000	2	57	41,03	15,97
61	46000	3	72,2	54,68	17,52
62	45000	4	95,38	64,9	30,48
63	35000	5	95,1	67,27	27,83
64	48000	3	74,13	45,26	28,87
65	32000	5	75,9	60,15	15,75
66	30000	3	56,3	40,46	15,84

67	146000	2	107,12	83,82	23,3
68	62000	3	112	80,85	31,15
69	195000	1	146	128,31	17,69
70	205000	1	156	120,8	35,2
71	62000	4	124	90,03	33,97
72	60000	2	69	47,93	21,07
73	38000	4	63	40,56	22,44
74	27000	5	58,39	39,34	19,05
75	48000	3	80,12	58,44	21,68

The equation is:

$$P = b_1 * PS + b_2 * AS + b_3 * L$$

where:

P is Sales Price;

PS is primary surface;

AS is ancillary facilities surface

L is location

The goodness of fit of the model should be evaluated by some statistical tests:

Coefficient of determination (R²)

This is the proportion of variation of rent value explained by the regression model. The values of R² range from 0 to 1. Small values indicate that the model does not fit the data well. On the other side, when the R² equals 1, all variation in values are explained by the regression equation.

F-statistic

The F-statistic is used to test whether or not individual regression variables are significant in predicting the dependent variable, rent value. In general, an F-statistic of 4.0 or larger indicates that a variable is significant in predicting rent value at 95 % confidence level.

Critical probability (p-value)

It is the measure of the probability that the result is "worse" than actual outcome (renting with deviations larger than those observed)

If P_{kr} < α, hypothesis is rejected and if P_{kr} > α hypothesis is accepted.

RESULTS AND DISCUSSIONS

Results generated by the application of regression analysis based on the data (tab. 1) gives this relationship between market value, location, primary surface and ancillary facilities surface:

$$P = 11407.635 * PS + 706.1144 * AS - 12247.6 * L \tag{1}$$

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0,9760574
R Square	0,9526881

Adjusted R Square	0,937485							
Standard Error	16004,749							
Observations	75							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	3,71373E+11	1,24E+11	483,2721	3,78417E-47			
Residual	72	18442942623	2,56E+08					
Total	75	3,89816E+11						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Primary Surface	1407,6349	87,10464961	16,16027	1,18E-25	1233,994998	1581,274889	1233,995	1581,2749
Ancillary surface	706,11439	250,043441	2,823967	0,006131	207,6619033	1204,566883	207,661903	1204,5669
Location	-12247,6	1102,225469	-11,1117	2,84E-17	-14444,84773	-10050,3551	-14444,848	10050,355

Figure 12 Regression analysis

By examining the data resulting from the linear regression, the coefficient of determination $R^2 = 0.9526881$ indicates that the equation explains 95 % of the distribution of observations. The equation obtained is valid, statistical probability $F = 3.78417E-47 < 0.05$. An explanation of the factors affecting the price is sufficiently satisfactory. All the variables have the expected signs, and the linear form of the equation means that the individual coefficients can be interpreted as showing the contribution of a one-unit increase in the level of the to the overall price [4].

CONCLUSION

The impact of the primary surface on the sales value is 2 times greater than the impact of ancillary surface. The method of comparison is based on similarity and on a comparison of like with like. As a comparative parameter is used the sales value per unit area. In determining of this parameter this paper proposes the calculation of the total surface by accepting the coefficient 1 (100%) for the primary surface (living room, bedrooms) and 0.5 (50%) for the ancillary surface (other surroundings)

Model (1) should be revised because the value is not only a function of surface and location, but also the function of the physical condition, floor, etc.

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