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Price Adjustments of Price-setting Factors under Sales Comparison Approach (SCA)

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Abstract

The sales comparison approach (SCA) usually represents the most important valuation approach. Besides this approach, there are two other performing valuation approaches at other bases. The sales comparison is a set of procedures, in which an appraiser derives a value indication by comparing the property being appraised to similar properties. Real properties vary considerably from one another, which is reflected by price-setting factors. Although price adjustments (caused by differences projected into price by the grid adjustment technique) are always ad hoc, certain relations among the price-setting factors can be detected. The research is based on evaluating price adjustments across different types of real estate. In addition, its objective is to determine the values of simultaneous relations of price adjustments for individual price-setting factors. The methodology consists of three steps. The first one clearly defines the content of individual price-setting factors and price adjustments for further analysis. The second step involves statistical analysis of an extensive appraiser database and evaluation of price adjustments. The final step uses selected statistics to compare the LRM and the SCA and interprets mutual relations. The results of the research should have practical implications for professional appraisal community and further research analyses of the SCA.

Keywords: Sales comparison approach, price-setting factor, price adjustment, real estate;

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1. Introduction

The sales comparison approach (SCA) usually represents the most important valuation approach. This approach is based on market substitution and dissimilarity of the property to be compared. Real properties vary significantly from one another, reflecting price-setting factors. Although price adjustments (caused by differences projected into price by the grid adjustment technique) are always ad hoc, certain relations among the price-setting factors can be detected.

The paper mainly focuses on evaluation of dissimilarities (price adjustments) and their projection on global relation of the price-setting factors provided by the LRM.

2. Sales comparison approach (SCA) and required outputs

2.1. Theoretical background

The sales comparison approach (also called market approach) is embedded in the International Valuation Standards (IVS) and also in the European Valuation Standards (EVS) as one of main approaches to receive a market value. Market value is outlined by the following definition: "*The estimated amount for which the 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*."(IVSC, 2011).

The most direct valuation approach is based on comparing the object to be valued with prices obtained for other similar objects (the more similar, the better) in the same market to the valuation date. Each property is unique and as the comparables move away from the ideal of absolute similarity, they become less reliable. The reasons for dissimilarities are usually location, physical state, purpose and time (Shapiro, 2012).

It is desirable to determine the scope of potential dissimilarities by each valuating process. One property to be valued has usually several potential dissimilarities and most of them are repeated in valuations very often. In the context of the SCA, price adjustments are mentioned. Moreover, the price adjustments are related to price-setting factors, which, in substance, create the market value of a property. Seeking certain mutual relations between price adjustments and corresponding price-setting factors represents another objective of this paper besides the evaluation of price adjustments.

2.2. Previous research

Some academicians like to study the sales comparison approach in order to offer methods for reducing or eliminating the subjective judgments used by appraisers (Isakson, 2002). Colwell, Cannaday and Wu (Colwell et al, 1983) focus on sales comparison approach, demonstrating how to derive adjustment factors using the ordinary least squares (OLS) method rather than appraiser judgment. Manaster (1991) reports that if the sales comparison approach is pursued, different appraisers using slightly different methods can and do arrive at final estimates of value that are very similar. Isakson (Isakson, 2002) presents the sales comparison approach to value as a system of linear algebra equations.

The key part of the SCA is represented by the technique of calculating, referred to as the grid adjustment technique. Particular price-setting factors are indirectly projected into corresponding price adjustments for each property to be compared in one case of valuation. Certain forms and procedures of the SCA are known, see for example Cupal (2014).

The important element of the calculation is also a source of comparable real estates. If objects to be compared are taken from supply in particular time, appropriate correction corresponding to sales should be used, see (Cupal, 2010).

Price-setting factors can sometimes cause 'crowding out effect'. Cupal (2015, vol. 26) deals with this effect in the form of compensation for apartments built in the earlier period while featuring higher utility properties. Then the market prices are comparable.

2.3. Stating the hypothesis

The main objective of the research is to determine values of dissimilarity by the SCA across all types of property and also to determine the values of simultaneous relations of price adjustments for individual price-setting factors. The follow-up task is to perform this on family houses.

To reach the objective, the following hypotheses were stated.

H_1: Apparently, index *I,* indicating the rate of heterogeneity of various property types will confirm the expected results; i.e. more simple and serial property with higher frequency of trading shows lower value of index *I*.

H_2: The significance of particular price adjustments differs in order of magnitude.

H_3: There is a certain mutual dependence between the LRM and the SCA, i.e. dependence between the price adjustment and the corresponding price-setting factor.

3. Data and sources

3.1. Data received from the SCA valuation procedure

This research uses 140 genuine market valuations by the sales comparison approach (SCA). The total number of all real estates in this database is 849, hereinafter referred to as 140(849). The distribution, according to the particular property type, is following: family houses – 69(426), lands – 30(187), apartments – 20(128), cabins – 6(31), restaurants – 2(11), warehouse and manufacturing grounds – 4(21), attic spaces – 2(9), apartment houses – 2(10), family houses (commercial purpose) – 3(15), garage – 1(7), commercial spaces – 1(4).

The key variable in this research is dissimilarity coefficient k_i, where *i* represents all types of price adjustments (see tab. 2). The total value of all price adjustments is expressed by index *I*. In these SCA valuations the following functional formula was used to obtain *I*: $I = \Pi k_i$. For example, if there are not any dissimilarities, every coefficient k_i equals 1.00, and also $I = 1.00$ as a result of their multiple. The SCA can be performed also in qualitative form as scoring methods with quality ratings (Rhodes,2014).

The dissimilarity coefficients k_i and index *I,* as products of effected valuations, represent variables, which enter another process, i.e. statistical analysis and evaluation.

3.1. Data as results of LRM

The research described (Cupal, 2015, vol. 23) provided the estimated linear regression models. These models can be used to predict market price of a family house. Two models, logarithmic and non-logarithmic, were estimated. For its better quality, the logarithmic one was used in this paper.

The dimension of the data set (Cupal, 2015, vol. 23) was expressed as *N* x *k* matrix with 150 observations and 12 basic variables. There were 11 explanatory variables: *GA* (Garage availability); Building structure *BS*; property condition *PC*; Flood risk zone *FRZ*; Location I *L1*; Location II *L2*; Location III *L3*; Number of Floors *NF*; Built up Area *BA*; Usable Area *UA*; Floor Area *FA* and Land Area *LA*.

These explanatory variables can be a priori grouped to meet the SCA statistical analysis as follows: G_1: Location (*LI, L2, L3, FRZ*), G_2: Physical state (*BS, PC*), G_3: Garage (*GA*), G_4: Residual component and G_5: Land (*LA*). T-statistics of explanatory variables used to test their significance became the starting point for the quantitative evaluation. The higher the value of the t-statistic, the greater is the impact on the market value. Therefore, all groups G_1-G_5 received composite values of t-statistics to evaluate the power of the price-setting factors corresponding to particular groups.

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4. Methodology

The methodology consists of three steps. The first one clearly defines the content of individual price-setting factors and price adjustments for further analysis. The second step involves statistical analysis of an extensive appraiser database and evaluation of price adjustments. The final step uses selected statistical tools to compare these and to interpret their mutual relations on data consisting of family houses.

The first and the third steps seem to be interconnected. The price-setting factors correspond to price adjustments of the SCA. However, there are some differences demonstrated on case of family houses (see fig.1). Particular price-setting factors detected by the LRM are linked with the SCA adjustments. Within the first step, the following allocation, based on the total significance (the third step), has been conducted:

1) Location (SCA) ~ Location (LRM): *L2*, *L3*;
2) Land (SCA) ~ Land area (LRM): *LA*;
3) Physical state and equipment (SCA) ~ Physical state (LRM): *PC*;
4) Garage (SCA) ~ Garage (LRM): *GA*;
5) Residual component (SCA) ~ Residual component (LRM): *FA*, *L1*.

Other variables of the LRM appear statistically non-significant. The third step revealed the relations of those 5 key characteristics. T-statistics by the LRM revealed the significance of particular variables, and their comparative expression can be seen in fig.1. The SCA characteristics computed by expected deviation $E(\sigma_{ki})$ were plotted next to their corresponding characteristics of the LRM. The relations within the SCA should show the difference between price-setting on global unlimited market (LRM) and the usual sample set with its price adjustments affected by subjective factor of selection and funneling process. The remaining variables (LRM) or price adjustments (SCA) could not be paired.

The statistical analysis on an extensive appraiser database and evaluation of price adjustments employ dissimilarity coefficient k_i and index *I* (total dissimilarity between one pair of observation). The first analysis gives a certain indication of heterogeneity of various types of real estates, measured by *I*. The second one reveals the significance of all of the particular price adjustments; this is important for the valuation process in practice. Stating the three hypotheses in chapter 2.3. enables to clarify the important issue for valuation theory and practice.

5. Results and findings

5.1. The indication of heterogeneity based on the SCA: various types of real estates

Index I was used to detect the overall dissimilarity of a particular type of property and consequently to indicate the heterogeneity of the property. The following table displays the results.

Tab. 1. Total value of all price adjustments as index I (SCA; 849 obs.)

Types of property	Index *I*
Lands	**0.477**
Family houses	**0.335**
Apartments	**0.232**
Restaurants	0.948
Commercial spaces	0.920
Apartment houses	0.452
Warehouse and manufacturing grounds	0.328

Cabins	0.326
Attic spaces	0.294
Family houses (commercial purpose)	0.288
Garages	0.008

The measurement was performed on all the real estates of the SCA database. Only the first three types of property: lands, family houses and apartments, can be considered as significant results. The ones displayed below them are represented by a low number of observings.
However, the result indicates that hypothesis H_1 holds true. More simple and serial property with higher frequency of trading shows lower value of index *I*. According to the above mentioned definition, apartments should be the highest ranked. The results of relevant types confirm this. In fact, the results of other types of property confirm it as well. It is shown on garages with *I* = 0.008.

5.2. Evaluating the significance of particular price adjustments

First, all the price adjustments are evaluated by coefficients of dissimilarity k1 – k16 plus residual effects of all the property types. The following table shows the results.
Two main statistics were evaluated: occurrence of adjustments and adjustment extent measured by σ (population standard deviation), both of which are expressed in percentages. H_2 hypothesis can be confirmed, stating that the significance of particular price adjustments differ in order of magnitude. By multiplying each other, expected deviation $E(\sigma_{ki})$ is received.

Tab. 2. SCA statistical results for all 849 real estates

Coefficients / Index	Price adjustments	Occurrence of adjustments [%]	Adjustment's extent by σ [%]
k_1	***Location***	95.05	17.34
k_2	***Land***	56.30	16.34
k_3	***Physical state and equipment***	74.79	21.24
k_4	***Construction***	44.17	6.11
k_5	***Purpose***	14.02	25.00
k_6	***Garage***	0.71	2.24
k_7	***Size***	15.90	9.22
k_8	***Development potential***	14.13	25.20
k_9	***Utilities***	10.13	10.26
k_{10}	***Social conditions***	5.06	4.57
k_{11}	***Location in the building***	3.65	8,19
k_{12}	***Parking***	4.12	4.22
k_{13}	***Accessories***	2.36	8.96
k_{14}	***Possibility of terraces***	1.06	2.08
k_{15}	***Number of apartments***	1.18	10.15
k_{16}	***Land ownership***	0.82	0.45
k_R	***Residual component***	28.39	8.78
I	***Total adjustment index***	**100.00**	**39.81**

5.3. Expressing and clarifying a mutual dependence between price adjustment and the corresponding price-setting factor

This part of the research deals with family houses only. The results for family houses (occurrence of adjustments and adjustment extent) are shown in the following table.

Tab. 3. SCA statistical results for 426 observations of family houses

Coefficients / Index	Price adjustments	Occurrence of adjustments [%]	Adjustment's extent by σ [%]
k_1	***Location***	95.77	15.02
k_2	***Land***	100.00	15.78
k_3	***Physical state and equipment***	97.18	22.81
k_4	***Construction***	65.02	4.91
k_5	***Purpose***	2.82	16.26
k_6	***Garage***	1.41	2.24
k_R	***Residual component***	25.12	8.45
I	***Total adjustment index***	**100.00**	**33.49**

Thence, the expected deviation $E(\sigma_{ki})$ mentioned above may be obtained. It will represent the rate of dissimilarity from the SCA procedure. If it was possible to assign these coefficients of price adjustments to corresponding price-setting factors, mutual dependence of the SCA and the LRM could be indicated.

The connection mentioned occurs only at a gross level. Therefore, groups to meet the SCA and the LRM: Location, Physical state, Garage, Residual component and Land, were identified. In quantitative expression, the SCA uses expected deviation $E(\sigma_{ki})$ and the LRM derives the price-setting factor significance from t-statistics. The following figure shows the relation between them.

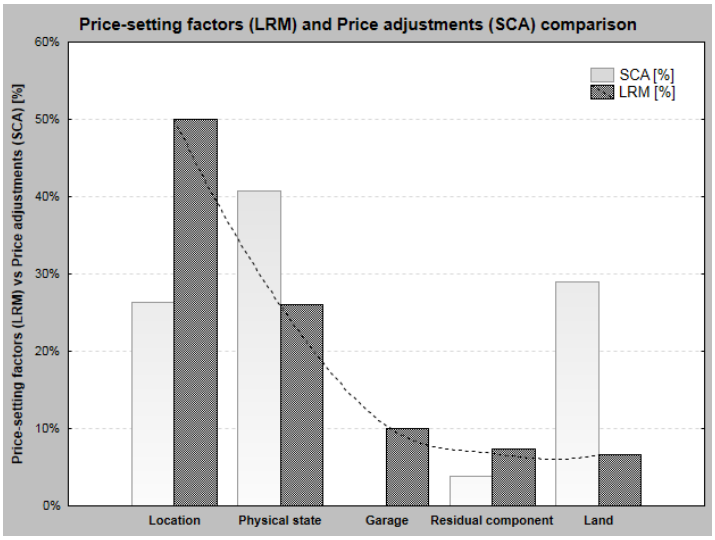

Figure 1. Price-setting factors (LRM) and Price adjustments (SCA) comparison (family houses)

The H_3 hypothesis can hold true, but there are many aspects to explain, which this research is not able to determine. However, as for qualitative research, could be partially clarified.

The most relevant fact is population versus sample, issue of statistics. The LRM represents population data and the SCA the sample data. This may be the main cause of the distortion, especially as for "Location". An element of subjectivity of the valuer could be another factor, though it is indifferent across variables.

For this reason, the LRM is considered as global in relation to price-setting factors and thus the LRM shows undistorted relations contrary to the SCA.

The SCA primarily uses the already adjusted data by selection of observations to be compared. It means two stages of adjustment. The first one represents sampling and the second one the SCA adjustments. Without sampling process the mutual relations would probably be much closer. "Location", where appropriate submarkets are being searched, is usually the most adjusted price-setting factor at the first stage. It explains the relatively lower level of 'Location' by the SCA as compared with other price adjustments.

6. Conclusion

The research deals with the evaluation of price adjustments by the SCA valuation approach across different types of real estate. The main objective of the research was to determine values of dissimilarity by the SCA across all types of property and also to determine the values of simultaneous relations of price adjustments for individual price-setting factors. Simultaneous relations of price adjustments for individual price-setting factors were determined only as the comparison of these, with causes of the resulting relations being partially clarified.

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