

The usage of precedence in analysis of impact of the economic crisis for accommodation services

Milena Botlíková¹, Josef Botlík²

Abstract. The paper deals with the evaluation of changes in occupancy of accommodation facilities in different regions of the Czech Republic in time of the economic crisis. Input data are obtained from the Czech Statistical Office. In selected time intervals there are detected increases and decreases in values of selected data relating to accommodation services. These changes are compared within each region and are recorded into precedence matrices. Relations captured through precedence are gradually analyzed using the matrix exponentiation. Based on the exponentiation there are identified regions, among which we can observe non decreasing respectively non increasing changes of the monitored values. In more detailed, there are observed precedence of various lengths and found the maximal precedence. The precedence analysis make possible to monitor changes and directions of influence of economic crisis between regions. Comparison of calculated precedence at different time intervals shows the possible dependencies between the variables being monitored in individual regions. The research results can be subsequently used for comparison with changes of other economic variables and the determination of dependencies between these variables.

Keywords: precedence, sukcedence, cities with extended authority, infrastructure.

JEL Classification: O18, L83

AMS Classification: 65C20

1 Introduction

Paper is based on research projects CZ.1.07/2.3.00/09.0197, SGS/24/2010 and SGS/23/2010. In the projects there were sought generally applicable tools for capturing state variables changes. There were searched easily applicable tools to analyze the dynamic properties of systems.

Basic principles of described method lie in capturing of seemingly heterogeneous quantities and phenomena by their change through time or space, determination of precedences and sequences of these quantities, their description using mathematical apparatus and comparable results generating using standard operations.

A relatively wide opportunity offers the precedence matrix

With precedent and subsequent events, we can analyze the temporal and structural changes in systems. To facilitate the processing is appropriate the use of matrixes in which the link between a line element and a column element is captured. In practice, we use the capture of precedence or succedens of the inline element and the matrices are called precedence (succedens) matrices. Using simple operations on these matrices, we can analyze the existence and frequency of links between elements of the system. The results were published for example in [2], [3], [4] or [5].

2 Model creating

A segmentation of Czech Republic into regions was used for the analysis. On this basis was a simple network graph created, which captures relations between particular regions. Relation is defined by adjacency of particular regions, which have borders with other countries, have defined relation with surrounding.

In this phase of analysis is not captured, with which countries are given regions adjacent with, relation is a common relation to surrounding.

On the basis of network graph is the model transcribed into incidence matrix. In this matrix is the relation structure between particular regions captured. The matrix has defined one row and one column for every region

¹ Silesian University in Opava, School of Business Administration in Karvina, Department of Logistics, University sq. 1934/3, 733 40 Karvina, botlikova@opf.slu.cz

² Silesian University in Opava, School of Business Administration in Karvina, Department of Computer Science, University sq. 1934/3, 733 40 Karvina, botlik@opf.slu.cz.

and for surrounding. In every row is a value „1“ in such column, for which there is a relation of region, described by a row and a region described by a column.

As a time interval for the crisis period, was chosen the period from 2008 to 2011 (data for 2012 year are still incomplete). From the data the percentual changes were calculated out in relation to the beginning of interval. Upon comparison of percentual falls and growths in regions, were the courses of particular quantity changes between particular regions determined. Determining of the courses allowed the construction of oriented graphs and creating precedence matrix³.

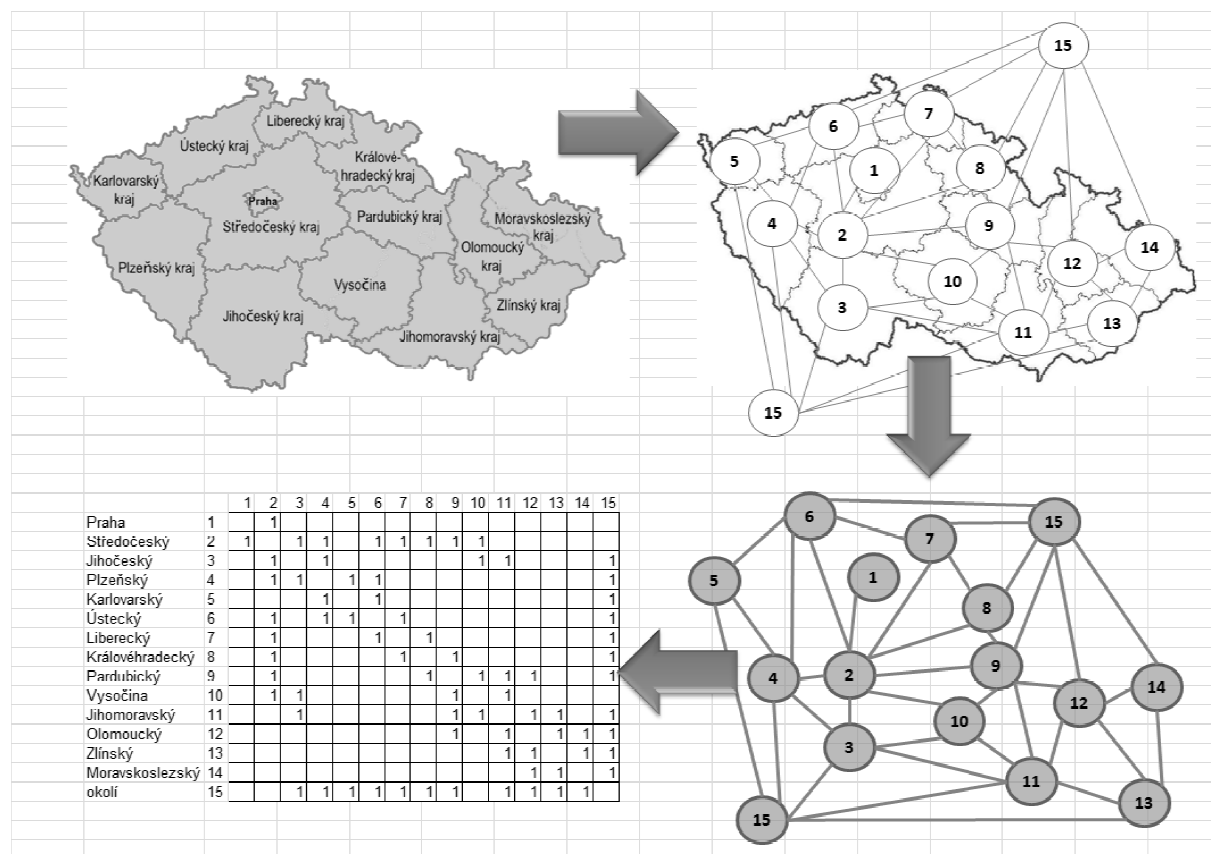


Figure 1 Creating of incidence matrix

3 Date and analysis

In this phase of analysis there are not the rules for creating of network graph abided by, there are not cycles tracked. Concurrently is the graph considered as an subgraph of higher land structure and abnormalities are not being solved (for example: Prague has a relation only to Mid-Czech region). The values of surrounding are determined, for this analysis, as an average from existing values.

The data from public database of Czech Statistical department was used for this analysis. Upon the growths and falls of guests in accommodation facilities there was analyzed the use of rooms in particular categories of accommodation facilities (hotels “*****”, hotels “****”, hotels “***”, guest houses and other hotels). The following table presents the occupancy of rooms in particular regions and changes in the interval of 2008-2013. From the table is clear lack of data for analysis of “*****” hotels.

³ More in detail look in literature in references below, for example, in the literature [1] or [6].

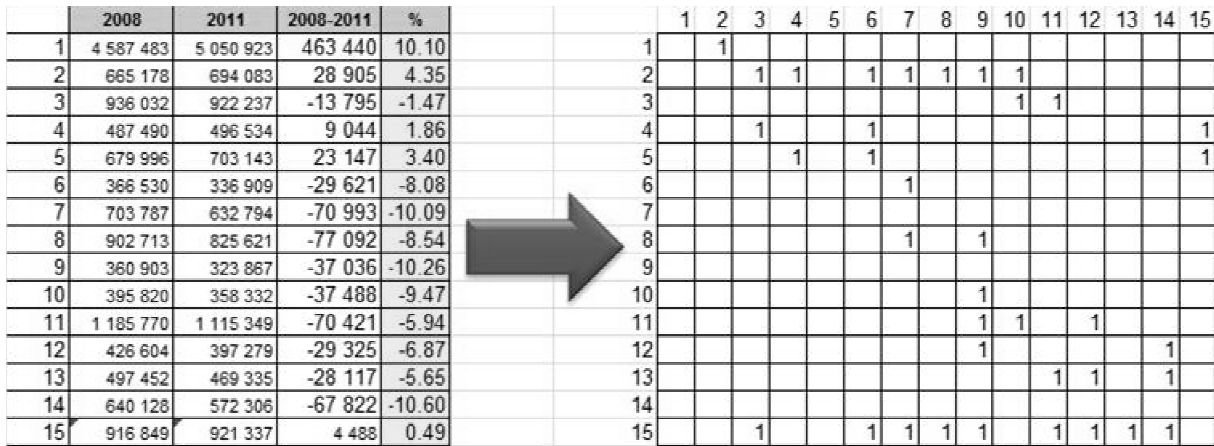


Figure 2 Creating of precedence matrix (number of guests in accommodation facilities in regions)

No.	regions	hotels *****			hotels ****			hotels ***			other		
		2008	2011	difference	2008	2011	difference	2008	2011	difference	2008	2011	difference
1	Prague	55.9	59.5	3.6	57.0	60.2	3.2	57.0	59.3	2.4	42.7	43.8	1.1
2	Středočeský	0	0	0.0	36.7	34.9	-1.8	36.1	34.0	-2.1	28.0	20.8	-7.2
3	Jihočeský	0	0	0.0	52.4	45.6	-6.8	32.6	30.6	-2.0	24.9	22.6	-2.4
4	Plzeňský	0	0	0.0	22.3	31.7	9.5	34.8	41.3	6.5	25.0	17.8	-7.2
5	Karlovarský	57.4	55.0	-2.5	66.7	66.6	-0.1	48.5	51.3	2.9	26.0	22.1	-3.9
6	Ústecký	0	0	0.0	37.0	38.7	1.7	29.7	27.7	-2.0	20.1	17.2	-3.0
7	Liberecký	0	0	0.0	42.6	45.5	3.0	32.7	35.4	2.7	26.3	24.0	-2.3
8	Královéhradecký	0	0	0.0	54.7	44.1	-10.6	35.9	37.3	1.3	31.3	26.3	-5.0
9	Pardubický	0	0	0.0	30.9	31.3	0.4	30.8	29.5	-1.3	30.2	23.4	-6.8
10	Vysočina	0	0	0.0	30.8	28.9	-1.9	29.0	27.2	-1.8	25.1	21.8	-3.3
11	Jihomoravský	0	0	0.0	43.1	34.2	-8.9	38.8	33.4	-5.4	28.8	22.4	-6.4
12	Olomoucký	0	0	0.0	45.0	31.3	-13.6	34.1	37.5	3.4	25.6	22.4	-3.2
13	Zlínský	0	0	0.0	57.3	54.6	-2.7	42.0	35.6	-6.4	30.3	25.8	-4.5
14	Moravskoslezský	0	0	0.0	40.4	33.5	-6.8	34.6	31.2	-3.4	29.8	24.6	-5.2
15	surrounding	8.1	8.2	0.1	44.0	41.5	-2.5	36.9	36.5	-0.4	28.2	23.9	-4.2

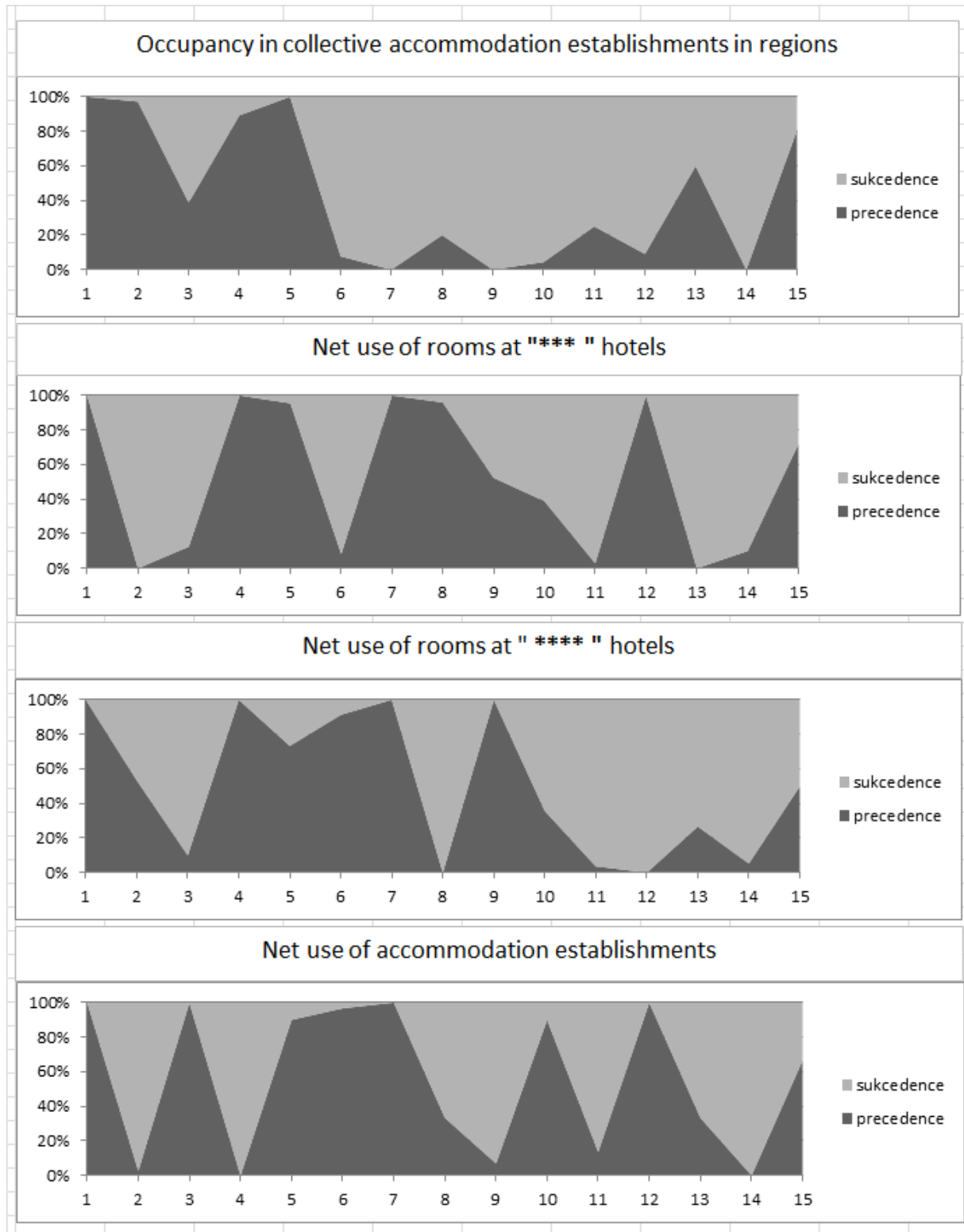
Table 1 Occupancy of rooms in percent

For particular tracked quantities there were gradually calculated powers of precedence matrices and the number of particular length precedences. Upon the number of precedences between particular regions were determined the ratios of precedences and succedences. These show the ratios between the growth and fall of given quantity for particular regions in comparison with other regions.

As a result, followed comparison of precedences of different lengths at specific quantities. On the Figure 3 are precedence matrices for tracked quantities. Resulting numbers of precedences were compared and show changes, to which it led during the crisis period of 2008. The more precedences given region contains, the higher growth (or lesser fall) of particular quantity values during the crisis period it recorded in relation to surrounding regions.

Occupancy in collective accommodation establishments in regions		Net use of rooms at "*****" hotels		Net use of rooms at "****" hotels		Net use of accommodation establishments								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1													
2		1												
3			1											
4				1										
5					1									
6						1								
7							1							
8								1						
9									1					
10										1				
11											1			
12												1		
13													1	
14														1
15														

Figure 3 Precedence matrices



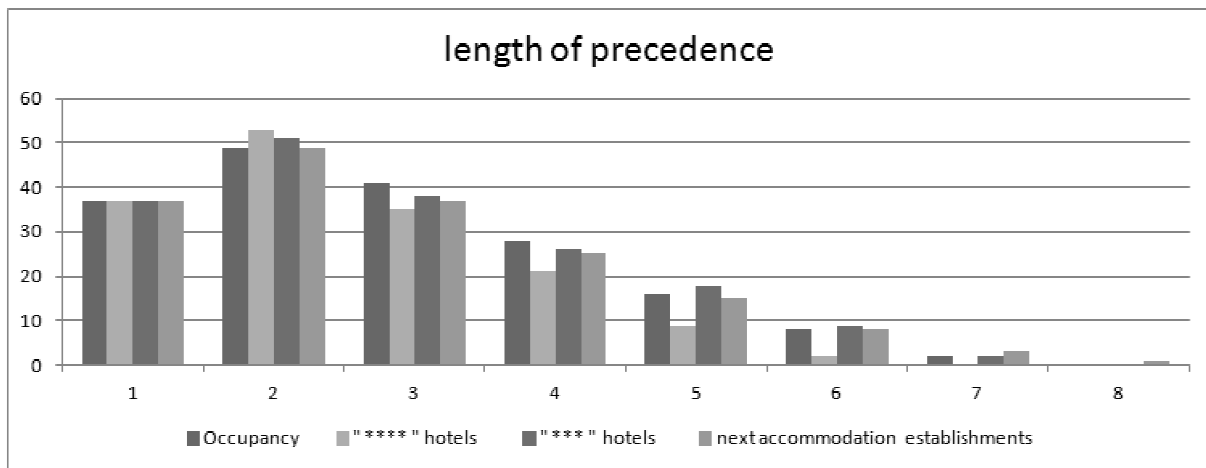
Graph 1 Ratio of precedences and sukcedence for particular regions

It is clear from graph 1, that the largest increase (lowest decrease) of attendance in collective accommodation facilities in regions, recorded Prague, what could be presumed. Relatively large number of precedences is then in Karlsbad region and Pilsen region. The largest fall, in relation to its surrounding, recorded Liberec region, Pardubice region a Moravian – Silesian region. In these regions there is null number of precedences.

Hradec Králové region, South Moravian region, Olomouc region and MSR at the same time recorded a significant fall of room occupancy in higher parameters hotels. Pilsen region has even layout of room occupancy,

in all categories of accommodation facilities it recorded a growth in relation to its surrounding. Interesting is the comparison of Liberec region. This region has larger fall of accommodated, than all the other regions in surrounding, yet it has increase in all types of accommodation facilities. It is clear, that this increase is caused by a larger number of long-term accommodated visitors and smaller capacity of accommodation facilities (even at small number of clients is a high bed use).

Total number of precedences for tracked quantities presents graph 2. On this graph it is visible, that the highest number of precedences is of level 2 precedence, relatively high number of level 3 precedences. It means, that we can follow a relatively lots of tracks between the region of length 2 and 3 transitions, where particular quantities are growing (resp. non-falling). It is clear from the graph, that the largest impact on surrounding regions have the numbers of accommodated in "****" hotels, yet, this impact is on direct surrounding and has not more distant relations. On the other hand, occupancy of beds in *** hotels and other accommodation facilities has the impact less intensive, but of wider range.



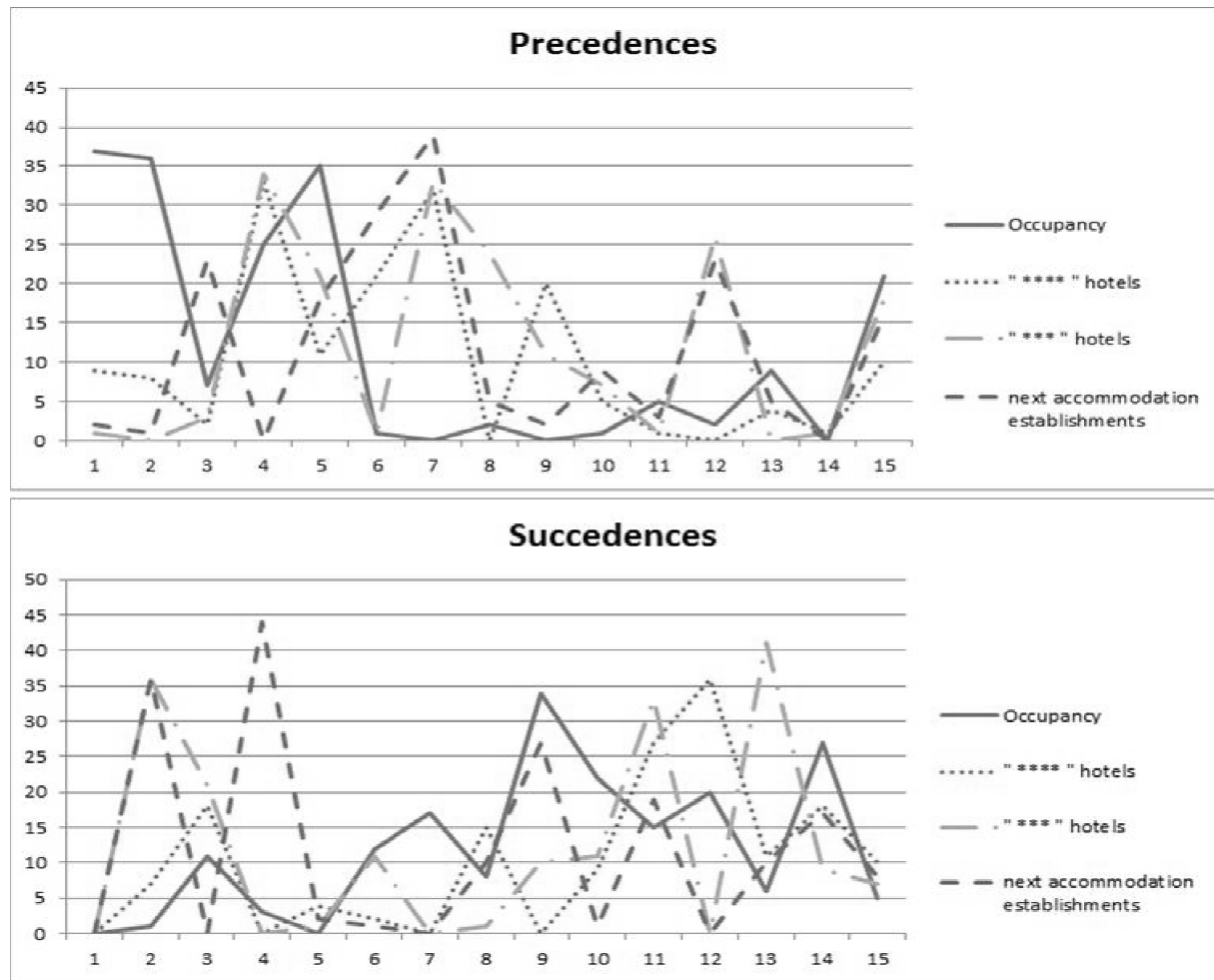
Graph 2 length of precedences

The last table shows the totals of precedences and succedences at tracked quantities in particular regions.

precedences															
region number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Occupancy	37	36	7	25	35	1	0	2	0	1	5	2	9	0	21
"****" hotels	9	8	2	33	11	21	32	0	20	5	1	0	4	1	10
"***" hotels	1	0	3	34	21	1	33	24	11	7	1	26	0	1	18
next accommodation establishments	2	1	23	0	18	29	39	5	2	9	3	23	5	0	16
succedences															
region number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Occupancy	0	1	11	3	0	12	17	8	34	22	15	20	6	27	5
"****" hotels	0	7	18	0	4	2	0	15	0	9	27	36	11	18	10
"***" hotels	0	36	21	0	1	11	0	1	10	11	33	0	41	9	7
next accommodation establishments	0	36	0	44	2	1	0	10	27	1	19	0	10	17	8

Table 2 Precedences and succedences Czech Republic regions

Graph 3 presents in detail the total of precedences and succedences for particular regions in tracked quantities.



Graph 3 detail of precedences and succedences

4 Conclusion

The contribution shows opportunities of precedence analysis of selected quantities. It is clear, that this way of analysis is able to use at tracking of intensity and range, by which the change of particular quantity influences its surrounding. Intensity is measurable by the number of precedences, the range by the level of precedence. It is suitable to extend the method by determination of multiplied number of precedences, which we reach by classic multiplication of precedence matrices. In this contribution were used operations, defined in [1], which give at the same length precedences between the same elements the existence of precedences, not the number at all.

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