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METHODS OF SELECTING FACTORS
IN THE ANALYSIS OF THE REAL ESTATES MARKET**

1. Introduction

The application factorial method in the analysis of the real estates market requires deep knowledge of the investigated problem. The number of new transformed variables is subjective and their correct interpretation is necessary. This interpretation should be firmly linked with the values of factorial charges. The number of the methods of selecting factors allows several approaches to the analysis. The most fruitful method is the method of main components.

For the Cracow district Zwierzyniec a database counting 61 real estates was made. The real estates were planned for low apartment houses (Tab. 1).

For these real estates the following attributes were defined based on notary acts:

- Outline;
- Time (number of months between 1st January 2006 and the date of transaction);
- Limitations: 0 – exist, 1 – none;
- The surface of the allotment [m²];
- The shape of the allotment: -1 – unfavourable , 0 – neutral, 1 – favourable;
- Reinforcement:
 - Electricity 1 – no facilities media in the surroundings in the area,
 - Gas 2 – facilities media in remote neighbourhood,
 - Water 3 – facilities media in close neighbourhood,
 - Sewerage 4 – facilities media going through the allotment,
 - Central Heating 5 – facilities media in the allotment.
 - Telephone

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Table 1. The list of the values of attributes collected for real estates

No.	Out-line	Time	Limitations	Surface	Shape	Electricity	Gas	Water	Sewer-age	Central Heating	Telephone
1	6	0	1	1357	1	3	3	5	3	1	3
2	1	11	1	956	1	2	3	2	2	1	5
3	8	19	1	642	1	5	3	3	5	1	5
4	11	7	1	375	1	5	5	5	5	1	5
5	11	13	1	604	1	5	5	2	3	1	5
6	21	0	0	958	1	3	3	3	1	1	3
7	20	15	1	638	1	5	5	3	3	1	3
8	16	14	1	909	1	2	2	2	2	1	2
9	21	2	1	1050	1	2	1	3	1	1	1
10	16	14	1	2118	1	2	2	2	2	1	5
11	52	15	0	2076	1	4	3	3	3	1	3
12	51	3	1	1037	1	4	4	3	3	1	2
13	11	3	1	422	1	3	3	3	3	1	3
14	8	0	0	778	1	4	3	3	3	1	3
15	51	16	0	1000	0	3	3	3	3	1	3
16	10	2	0	1757	0	3	3	3	3	1	3
17	10	4	1	695	0	3	3	3	3	1	3
18	10	0	0	306	0	3	4	3	3	1	3
19	8	3	0	975	0	3	3	3	3	1	3
20	21	3	0	2218	0	3	3	3	3	1	3
21	6	6	1	416	0	3	3	3	3	1	3
22	19	5	0	778	0	3	3	3	3	1	3
23	6	7	1	471	0	3	3	3	3	1	3
24	11	7	1	674	0	3	3	4	3	1	3
25	19	8	0	1455	0	3	3	3	3	1	3
26	19	0	0	1110	0	4	3	3	5	1	3
27	11	8	1	825	0	5	3	3	3	1	3
28	9	11	0	1179	0	3	3	3	3	1	3
29	52	11	0	1255	0	3	1	3	1	1	3
30	9	0	1	1000	0	3	3	3	3	1	3
31	51	11	0	1568	0	3	4	3	2	1	3

Table 1. cont.

32	9	0	1	886	0	3	3	4	3	1	3
33	10	11	1	524	0	3	3	3	3	1	3
34	7	2	0	429	0	3	3	3	3	1	3
35	20	9	1	1011	-1	3	3	3	3	1	3
36	52	13	1	912	-1	5	5	2	1	1	4
37	52	10	1	588	-1	5	5	2	2	1	3
38	7	9	1	953	-1	5	3	3	2	1	2
39	7	9	1	1187	-1	5	5	5	5	1	2
40	7	9	1	948	-1	3	5	5	5	1	1
41	8	11	0	1808	-1	3	2	3	5	1	1
42	9	13	1	875	-1	3	3	3	3	1	2
43	7	8	1	1238	-1	2	2	2	2	1	1
44	7	10	0	975	-1	3	3	1	5	1	2
45	11	9	0	907	-1	3	3	3	2	1	1
46	8	7	1	1033	-1	5	2	2	1	1	3
47	8	7	1	2488	-1	5	5	5	3	1	3
48	21	14	0	2854	-1	2	2	2	1	1	1
49	10	6	1	390	-1	5	3	3	3	1	1
50	11	5	1	825	-1	3	3	3	3	1	3
51	10	14	1	400	-1	3	3	3	2	1	1
52	8	14	1	869	-1	3	3	3	3	1	2
53	10	3	1	697	-1	2	2	2	1	1	2
54	8	14	1	1060	-1	3	3	3	3	1	1
55	20	15	0	590	-1	3	3	3	3	1	2
56	8	2	1	612	-1	5	5	5	5	1	5
57	21	17	1	497	-1	3	5	3	1	1	3
58	21	17	1	620	-1	3	5	3	1	3	5
59	8	18	1	969	-1	5	3	2	1	1	3
60	51	18	0	1824	-1	5	5	3	3	1	3
61	7	9	1	487	-1	5	5	5	5	1	3

With the use of the Statistica 6.0 pack the factorial analysis was carried out, focussing on the choice of method of selecting the factors. Maximum number of factors was assumed 11 (all the variables). The arguments were considered significant, when their factorial charges were greater than 0.70.

2. The method of main components

The method of main components enables to carry out an analysis on the primary matrix correlation (with “ones” on the diagonal). Based on this 4 (out of 11) factors were selected. They show that only the time and gas supply influence the price, which can be seen looking at values shown in Tables 2 and 3.

Table 2. Factorial charges determined with the main components method

Attributes	Factor 1	Factor 2	Factor 3	Factor 4
Outline	0.25	0.63	-0.50	-0.09
Time	0.02	0.76	0.18	-0.13
Limitations	-0.46	0.02	0.54	0.29
Surface	0.43	0.16	-0.39	-0.39
Shape	0.06	-0.23	-0.56	0.67
Electricity	-0.67	0.30	-0.23	-0.21
Gas	-0.81	0.35	-0.10	-0.14
Water	-0.62	-0.38	-0.21	-0.31
Sewerage	-0.59	-0.41	-0.24	-0.32
Central Heating	-0.31	0.34	0.36	0.24
Telephone	-0.43	0.25	-0.39	0.62

Table 3. Eigenvalue of subsequent factors

No.	Eigenvalue	Percentag of total variance	Cumulated eigenvalue	Cumulated %
1	2.59	23.5	2.59	23.5
2	1.76	16.0	4.35	39.5
3	1.49	13.5	5.83	53.0
4	1.41	12.9	7.25	65.9

In Table 4 residuals greater than 0.10 were singled out, which allows the observation of the percentage of unexplained correlations.

Based on the explanation of 66% of the variability of variance, singling out 4 factors, while only 2 indicate significant attributes, it can be stated that it would be more useful to limit the number of factors to two (ale but this would significantly diminish explained variance – to 39.50 per cent), or reduce the requirements in terms to the value of factors (e.g. into greater than 0.50, which shows 9 significant attributes).

Table 4. Residual correlation matrix

Attributes	Out-line	Time	Limita-tions	Sur-face	Shape	Elect-ricity	Gas	Wa-ter	Sewe-rage	Central Heating	Tele-phone
Outline	0.28	-0.13	0.10	-0.18	-0.01	-0.03	0.02	0.08	-0.06	-0.04	-0.12
Time	-0.13	0.38	0.03	-0.00	0.13	-0.06	-0.10	0.03	0.17	-0.13	0.02
Limitations	0.10	0.03	0.41	0.15	0.07	0.08	-0.07	0.08	-0.08	-0.25	-0.05
Surface	-0.18	-0.00	0.15	0.49	0.03	-0.08	-0.00	0.08	-0.01	0.20	0.11
Shape	-0.01	0.13	0.07	0.03	0.17	-0.00	0.01	0.03	0.05	0.01	-0.14
Electricity	-0.03	-0.06	0.08	-0.08	-0.00	0.37	-0.12	-0.14	-0.10	-0.20	-0.05
Gas	0.02	-0.10	-0.07	-0.00	0.01	-0.12	0.19	-0.02	-0.04	0.06	-0.05
Water	0.08	0.03	0.08	0.08	0.03	-0.14	-0.02	0.33	-0.17	0.08	-0.00
Sewerage	-0.06	0.17	-0.08	-0.01	0.05	-0.10	-0.04	-0.17	0.33	0.08	0.02
Central Heating	-0.04	-0.13	-0.25	0.20	0.01	-0.20	0.06	0.08	0.08	0.60	-0.00
Telephone	-0.12	0.02	-0.05	0.11	-0.14	-0.05	-0.05	-0.00	0.02	-0.00	0.22

3. Method of the resources of common variability (multiple R^2)

In this case the diagonal of the correlation matrix (resources of common variability) is calculated multiple R^2 of the respective variable with all the other variables. This is a typical method of the estimation of common variability resources in the analysis of main factors.

Two factors were singled out. Based on them only the attribute of gas supply plays an important role. Characteristic values for respective factors are shown in Tables 5 and 6.

Table 5. Factorial charges determined with the method of common variability resources

Attributes	Factor 1	Factor 2
Outline	0.19	0.56
Time	0.01	0.55
Limitations	-0.37	-0.02
Surface	0.33	0.13
Shape	0.06	-0.15
Electricity	-0.61	0.24
Gas	-0.79	0.31
Water	-0.55	-0.33
Sewerage	-0.53	-0.37
Central Heating	-0.26	0.23
Telephone	-0.38	0.21

Table 6. Eigenvalue of subsequent factors

No.	Eigenvalue	Percentage of total variance	Cumulated eigenvalue	Cumulated %
1	2.06	18.7	2.06	18.7
2	1.16	10.5	3.22	29.2

In Table 7 residuals greater than 0.10 were put. It is disturbing that the explained value is low 29 per cent and coefficients in residual correlation matrix – even up to 46 per cent.

Table 7. Residual correlation matrix

Attributes	Out-line	Time	Limitations	Surface	Shape	Electricity	Gas	Water	Sewerage	Central Heating	Telephone
Outline	0.65	-0.03	-0.22	0.12	0.15	0.11	0.08	0.11	-0.01	-0.19	0.02
Time	-0.03	0.70	0.11	0.04	-0.16	0.00	-0.01	-0.09	0.05	0.03	-0.07
Limitations	-0.22	0.11	0.86	-0.25	-0.04	-0.02	-0.07	-0.05	-0.24	0.07	-0.01
Surface	0.12	0.04	-0.25	0.88	-0.03	0.02	0.02	0.17	0.11	-0.05	-0.04
Shape	0.15	-0.16	-0.04	-0.03	0.97	-0.05	-0.07	-0.03	-0.00	-0.08	0.46
Electricity	0.11	0.00	-0.02	0.02	-0.05	0.57	0.03	0.03	0.07	-0.24	0.00
Gas	0.08	-0.01	-0.07	0.02	-0.07	0.03	0.29	0.08	0.06	0.08	-0.02
Water	0.11	-0.09	-0.05	0.17	-0.03	0.03	0.08	0.59	0.09	-0.07	-0.07
Sewerage	-0.01	0.05	-0.24	0.11	-0.00	0.07	0.06	0.09	0.59	-0.09	-0.05
Central Heating	-0.19	0.03	0.07	-0.05	-0.08	-0.24	0.08	-0.07	-0.09	0.88	0.08
Telephone	0.02	-0.07	-0.01	-0.04	0.46	0.00	-0.02	-0.07	-0.05	0.08	0.81

4. Method of iterated resources of common variability

First, as the resources of common variability the estimations of multiple R^2 are determined. After preliminary determination of factors, the method, during several iterations corrects the charges and estimates the quality of matching of the solution obtained based on the sum of the squares of residuals.

Among the two factors differentiated by this method the attribute of gas supply turned out to be the most important in the prices of real estates, which can be proved by calculations shown in Tables 8 and 9.

Table 8. Factorial charges determined with the method of iterated resources of common variability

Attributes	Factor 1	Factor 2
Outline	0.16	0.50
Time	0.02	0.58
Limitations	-0.31	-0.01
Surface	0.29	0.11
Shape	0.06	-0.14
Electricity	-0.58	0.21
Gas	-0.92	0.37
Water	-0.56	-0.36
Sewerage	-0.52	-0.36
Central Heating	-0.23	0.20
Telephone	-0.32	0.15

Table 9. Eigenvalue of subsequent factors

No.	Eigenvalue	Percentage of total variance	Cumulated eigenvalue	Cumulated %
1	2.11	19.2	2.11	19.2
2	1.13	10.3	3.24	29.5

Table 10. Residual correlation matrix

Attributes	Out-line	Time	Limitations	Surface	Shape	Electricity	Gas	Water	Sewerage	Central Heating	Telephone
Outline	0.73	-0.02	-0.24	0.15	0.14	0.12	0.07	0.09	-0.05	-0.17	0.04
Time	-0.02	0.66	0.11	0.04	-0.16	0.02	-0.05	-0.06	0.07	0.04	-0.04
Limitations	-0.24	0.11	0.90	-0.28	-0.05	0.03	-0.06	-0.02	-0.20	0.09	0.03
Surface	0.15	0.04	-0.28	0.90	-0.03	-0.00	0.02	0.16	0.08	-0.07	-0.06
Shape	0.14	-0.16	-0.05	-0.03	0.98	-0.06	-0.06	-0.03	0.00	-0.09	0.45
Electricity	0.12	0.02	0.03	-0.00	-0.06	0.62	-0.03	0.03	0.07	-0.20	0.07
Gas	0.07	-0.05	-0.06	0.02	-0.06	-0.03	0.02	0.03	0.02	0.08	-0.01
Water	0.09	-0.06	-0.02	0.16	-0.03	0.03	0.03	0.56	0.08	-0.06	-0.06
Sewerage	-0.05	0.07	-0.20	0.08	0.00	0.07	0.02	0.08	0.60	-0.08	-0.04
Central Heating	-0.17	0.04	0.09	-0.07	-0.09	-0.20	0.08	-0.06	-0.08	0.91	0.12
Telephone	0.04	-0.04	0.03	-0.06	0.45	0.07	-0.01	-0.06	-0.04	0.12	0.88

On the above Table four residuals greater than 0.10 were singled out. Cumulated percentage value of explained variance was 29.5 per cent (Tab. 9), with high coefficients in residual correlation matrix – up to 45 per cent (Tab. 10).

5. Factors of the greatest confidence

This method assumes that the number of factors is known (given by the user). Using the STATISTICA pack one can estimate charges and resources of common variability, which maximize the probability that the observed correlation matrix will occur. In case of this method the Chi-square test of the quality of matching is applied. If the variables in the analysis originate from multinomial normal distribution, then the distribution of covariance follows the Wishart distribution. Based on these assumptions a Chi-square test can be constructed to check if all the residual correlations equal zero, that means if residual correlation matrix is diagonal. If the test is statistically significant, then the conclusion can be made that the residual correlation matrix is significantly different from diagonal matrix, then significant correlations between variables remain unexplained.

Factorial charges were determined (Tab. 11) for these factors, for which eigenvalue are greater than 1 (Tab. 12). Two factors were singled out. Based on them the most significant attribute – gas supply system – was defined.

Table 11. Factorial charges determined with the method of the greatest confidence factors

Attributes	Factor 1	Factor 2
Outline	-0.09	0.48
Time	-0.14	0.50
Limitations	-0.23	-0.06
Surface	0.21	0.13
Shape	0.16	-0.12
Electricity	-0.60	-0.04
Gas	-0.98	0.02
Water	-0.43	-0.58
Sewerage	-0.38	-0.58
Central Heating	-0.35	0.19
Telephone	-0.35	0.07

Table 12. Eigenvalue of subsequent factors

No.	Eigenvalue	Percentage of total variance	Cumulated eigenvalue	Cumulated %
1	2.04	18.5	2.04	18.5
2	1.22	11.1	3.26	29.7

The values obtained in residual correlation matrix (Tab. 13) indicate inaccuracy of the accepted solution.

Table 13. Residual correlation matrix

Attributes	Out-line	Time	Limita-tions	Sur-face	Shape	Elect-ricity	Gas	Water	Se-wer-age	Central Heating	Tele-phone
Outline	0.76	0.03	-0.29	0.21	0.15	0.09	0.00	0.06	-0.07	-0.23	0.00
Time	0.03	0.73	0.10	0.07	-0.16	0.07	-0.00	-0.05	0.08	0.01	-0.04
Limitations	-0.29	0.10	0.94	-0.32	-0.04	0.07	-0.00	0.03	-0.16	0.09	0.05
Surface	0.21	0.07	-0.32	0.94	-0.04	-0.02	-0.00	0.12	0.04	-0.06	-0.07
Shape	0.15	-0.16	-0.04	-0.04	0.96	-0.03	-0.00	-0.01	0.02	-0.05	0.47
Electricity	0.09	0.07	0.07	-0.02	-0.03	0.65	-0.00	0.00	0.05	-0.23	0.08
Gas	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.03	0.00	0.00	0.01	0.00
Water	0.06	-0.05	0.03	0.12	-0.01	0.00	0.00	0.48	0.01	-0.04	-0.05
Sewerage	-0.07	0.08	-0.16	0.04	0.02	0.05	0.00	0.01	0.52	-0.06	-0.02
Central Heating	-0.23	0.01	0.09	-0.06	-0.05	-0.23	0.01	-0.04	-0.06	0.84	0.09
Telephone	0.00	-0.04	0.05	-0.07	0.47	0.08	0.00	-0.05	-0.02	0.09	0.87

Additionally Chi-square test was taken, results are presented in Table 14.

Table 14. Values characteristic for the Chi-square test of the quality of matching

	Explained percentage	Chi-square	df	Significance level
Result	29.66	67.48156	34	0.0006

The test results show that only 29.66 per cent of correlation is explained by the accepted solution.

6. The centroidal method

This method represents geometric approach to the factorial analysis. This is the least “modern” method of factorial analysis. In this case the resources of common variability are calculated by iteration until gaining maximum number of iterations or until the iteration, in which the change of the resources of common variability is smaller than the declared minimal change in the resources of common variability.

Based on the accepted values:

- minimum change in the resource of variables: 0.01,
- maximum number of iterations: 50.

four factors were determined, the eigenvalue of which were above 1 (Tab. 15), among them there were no charges greater than 0.7 (Tab. 16).

Table 15. Eigenvalue of subsequent factors

No.	Eigenvalue	Percentage of total variance	Cumulated eigenvalue	Cumulated %
1	2.16	19.6	2.16	19.6
2	1.21	11.1	3.37	30.7
3	1.42	12.9	4.79	43.6
4	1.14	10.3	5.93	53.9

Table 16. Factorial charges determined by the centoridal method

Attributes	Factor 1	Factor 2	Factor 3	Factor 4
Outline	-0.38	0.56	-0.33	-0.19
Time	-0.23	0.19	-0.57	0.19
Limitations	0.46	-0.41	-0.34	0.22
Surface	-0.45	0.36	0.18	0.09
Shape	0.19	0.20	0.30	-0.65
Electricity	0.43	0.41	-0.31	0.28
Gas	0.64	0.35	-0.43	0.21
Water	0.55	0.18	0.29	0.31
Sewerage	0.55	0.28	0.41	0.34
Central Heating	0.26	-0.21	-0.39	-0.13
Telephone	0.49	0.30	-0.25	-0.49

Table 17. Residual correlation matrix

Attributes	Out-line	Time	Limita-tions	Sur-face	Shape	Elect-ricity	Gas	Water	Se-wer-age	Central Heating	Tele-phone
Outline	0.40	-0.07	0.03	-0.04	0.01	0.01	0.04	0.08	-0.06	-0.04	-0.09
Time	-0.07	0.54	0.04	0.02	0.06	-0.08	-0.06	-0.07	0.09	0.06	0.06
Limitations	0.03	0.04	0.45	0.02	0.17	0.01	-0.12	0.01	-0.11	-0.15	0.04
Surface	-0.04	0.02	0.02	0.63	-0.01	-0.07	0.02	0.05	-0.06	0.16	0.07
Shape	0.01	0.06	0.17	-0.01	0.41	-0.01	-0.09	-0.03	-0.03	-0.10	0.02
Electricity	0.01	-0.08	0.01	-0.07	-0.01	0.47	-0.03	-0.03	-0.03	-0.14	0.00
Gas	0.04	-0.06	-0.12	0.02	-0.09	-0.03	0.24	0.06	0.01	0.13	-0.08
Water	0.08	-0.07	0.01	0.05	-0.03	-0.03	0.06	0.49	-0.07	0.04	-0.03
Sewerage	-0.06	0.09	-0.11	-0.06	-0.03	-0.03	0.01	-0.07	0.33	0.08	-0.02
Central Heating	-0.04	0.06	-0.15	0.16	-0.10	-0.14	0.13	0.04	0.08	0.72	-0.00
Telephone	-0.09	0.06	0.04	0.07	0.02	0.00	-0.08	-0.03	-0.02	-0.00	0.38

The Centroidal method does not give any direct answer to the question which factors influence the price most. This is despite the fact that the model explains nearly 54 per cent of total variance (Tab. 15). The attributes “get diluted” and the most important attributes cannot be defined.

7. The method of main axes

In every iteration the eigenvalue are calculated from present resources of common variability. In further stage the resources of common variability are counted based on singled out eigenvalue and proper vectors. Next, new resources of common variability are put on the diagonal of the correlation matrix and further iteration starts.

Iterations are performed until:

- the maximum number of iterations is reached,
- minimum change in the resources of common variability is smaller than the defined by the user.

Based on the accepted values:

- minimum change in the resource of variables: 0.01,
- maximum number of iterations: 50,

two factors were determined (Tab. 18), and based on them – 1 significant attribute: gas supply system (Tab. 19).

Table 18. Eigenvalue of subsequent factors

No.	Eigenvalue	Percentage of total variance	Cumulated eigenvalue	Cumulated %
1	2.10	19.1	2.10	19.1
2	1.12	10.2	3.23	29.3

Table 19. Factorial charges determined by the main axes method

Attributes	Factor 1	Factor 2
Outline	0.14	–0.50
Time	–0.01	–0.58
Limitations	–0.31	0.022
Surface	0.28	–0.13
Shape	0.06	0.14
Electricity	–0.59	–0.19
Gas	–0.92	–0.33
Water	–0.54	0.38
Sewerage	–0.50	0.39
Central Heating	–0.23	–0.19
Telephone	–0.33	–0.14

Table 20. Residual correlation matrix

Attributes	Out-line	Time	Limita-tions	Sur-face	Shape	Elect-icity	Gas	Water	Sewer-ag	Central Heating	Tele-phone
Outline	0.73	-0.02	-0.24	0.15	0.14	0.12	0.07	0.09	-0.05	-0.17	0.04
Time	-0.02	0.66	0.11	0.04	-0.16	0.02	-0.05	-0.06	0.07	0.04	-0.04
Limitations	-0.24	0.11	0.90	-0.28	-0.05	0.03	-0.06	-0.02	-0.20	0.09	0.02
Surface	0.15	0.04	-0.28	0.90	-0.03	-0.00	0.02	0.16	0.08	-0.07	-0.06
Shape	0.14	-0.16	-0.05	-0.03	0.98	-0.06	-0.06	-0.03	0.00	-0.09	0.45
Electricity	0.12	0.02	0.03	-0.00	-0.06	0.62	-0.02	0.03	0.07	-0.20	0.06
Gas	0.07	-0.05	-0.06	0.02	-0.06	-0.02	0.05	0.04	0.03	0.08	-0.00
Water	0.09	-0.06	-0.02	0.16	-0.03	0.03	0.04	0.56	0.08	-0.06	-0.06
Sewerage	-0.05	0.07	-0.20	0.08	0.00	0.07	0.03	0.08	0.60	-0.08	-0.04
Central Heating	-0.17	0.04	0.09	-0.07	-0.09	-0.20	0.08	-0.06	-0.08	0.91	0.12
Telephone	0.04	-0.04	0.02	-0.06	0.45	0.06	-0.00	-0.06	-0.04	0.12	0.87

Residual correlation matrix (Tab. 20) indicates that the accepted model is not adjusted.

8. Conclusions and Closing Remarks

The selection of the method of the determination of factor number is subjective and should be adjusted to the needs of the carried out analysis.

In the experiment two cases can be singled out:

- 1) selecting 2 factors, with about 29 per cent of explained variance and the values of residual correlation matrix up to 0.46,
- 2) the differentiation of 4 factors in two methods, for which the percentage of explained variance is greater than 50 per cent (Tab. 21).

Table 21. Values characteristic for the accepted methods

Method	Per cent of the explained variance	Maximum value in residual correlation matrix
Main Components	65.86	0.25
Centroidal	53.92	0.17

As the main criterion of the selection of factor number the factor eigenvalue greater than 1 (Kaiser criterion) was accepted. It is worth noticing that the centroidal method did not give a clear answer which attributes affect the individual price of real estates in the strongest way.

Based on this one can assume that for the analysis of the attributes of real estates, the best is the method of main components. With a high coefficient of explained variance this method gives clear results.

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