Correction factors application to Krasnoyarsk city real estate in the lack of information conditions

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Abstract. Assessment activity needs to be by unified methodology. In this paper, we have described several tools that can improve the validity of the assessment. The paired sales method was used. The research was conducted under lack of information. Data was selected for the research of real estate in Krasnoyarsk at the end of 2018 and beginning of 2019. In this study, real estate categories such as «Residential Real Estate», «Commercial Real Estate» and «Land» were used. The most significant properties of real estate objects were selected. The number of real estate objects in each database exceeds 2000 objects. The correction coefficient for the effect of the location was used for assessing real estate. This coefficient was introduced in order to adjust the value of real estate for 7 districts of Krasnoyarsk.

1. Introduction
Since 2010 for legal entities and since 2015 for individuals the property tax has been calculated on the basis of the cadastral value of real estate. It was assumed that the state appraisers based on well-known data about the valuation object would be able to make the market value of the estimated real estate. However, the situation was not in favor of taxpayers: the real estate tax increased by 2-3 or even more times. This happened because state appraisers did not go to the locations and did not inspect them, did not consider the individuality of any objects. As a result, in 2017, the government recognized the work of such specialists as substandard and adopted the law on the change of cadastral valuation.

Today, the not state appraisers can challenge the cadastral value. But it is necessary to identify the market value of the property first. There are several approaches to the assessment of real estate: costly, profitable and comparative. The comparative approach is based on determining the value of the object based on the market value of similar real estate objects. Unfortunately appraisers have to work in conditions of lack of
information. This problem is especially relevant for local real estate markets, as Krasnoyarsk region. In such cases, the development of special methods is required.

2. Materials and Methods
In the sphere of real estate there are many approaches used by specialists around the world. Some methods used the artificial intelligence and automatic approaches to solve the problem [1, 2]. But not all of these methods can be used in Russia. The problem of real estate valuation as a business in Russia is quite young. Appraisers have to create precedents in court, to prove the reliability of the assessment. That’s why only the most simple and clear methods are used.

We have analyzed the most popular methods of appraisers from Krasnoyarsk city. There are about 130 such organizations in Krasnoyarsk. As usual, appraisers used the statistical analysis modeling with regression functions to valuate real estate objects [3, 4]. Also are popular methods that used correlation coefficients to calculate the prices of objects depending on other factors [5, 6]. In this research, we used the methods that taking into account the influence of the geographical location of the objects [7-9].

The task of assessment of real estate has many parameters. Their number depends on the type of real estate. It could be a commercial real estate as offices or storages. It could be a residential real estate as flats or townhouses. In addition, it could be a land for different purposes as agricultural, industrial or recreation purposes. For commercial objects the next set of parameters with its units has been used:

- the name of settlement (text data);
- the district of the object (text data);
- the address of the object (text data);
- the square of the land of object (square meters);
- the square of the construction of the object (square meters);
- the purpose of the construction on the object (categorical data);
- the material of the construction (categorical or text data);
- the cost for 1 square meters (rubles);
- the cost of the object (rubles);
- the property rights to land (categorical data);
- the source of information about the object (text data or hyperlink);
- the scheme or photo of the object (picture);
- the date of updating the information about the object (time data).

| № | Districts  | Address          | Square (m²) | The purpose of the construction | The material of the construction | The cost for 1 square meters (rub) | The source of information       | The date of updating |
|---|-----------|-----------------|-------------|---------------------------------|----------------------------------|-----------------------------------|-------------------------------|---------------------|
| 1 | Sovetsky  | av. Aviatorov, 1| 263.9       | Office                          | concrete                         | 75 002                            | www.krasnoyarsk.n1.ru          | 22.03               |
| 2 | Sverdlovsky| st. Vavilva, 1g | 1775        | Storage                         | bricks                           | 13 239                            | www.sibdom.ru                  | 23.02               |
| 3 | Central   | st. Lenina, 91  | 100         | Retail space                    | bricks                           | 86 000                            | www.abv-24.ru                 | 21.03               |
The sources of such information should be meeting the special requirements of federal low №135. First, the date of updating the information about the object couldn’t be older than 6 months. That is why appraisers have to update their data sets all the time. Moreover, the information source shouldn’t be only in digital forms. This requirement is actually because sometimes the court for revaluation the cost of real estate object happens few years after the appraising. So, the evidence in the court must be incontrovertible. Also the number of objects that appraiser need for comparative method should be big enough. As a source of information in this research, we used the data of free digests about the sale of real estate in Krasnoyarsk. Table 1 shows the part of dataset of the objects has been collected in march of 2019.

3. Results
For the calculation the coefficient for the effect of the location the method of paired sales was used in this research [10]. This coefficient shows the differences of the costs between similar objects in different districts. The coefficient calculated as:

$$X = \sqrt[n]{X_1 \times X_2 \times ... \times X_n}$$

The n is a number of pairs of the similar objects in different districts. The minimum value of n is 3 in accordance with the law. But in this research, we used 5 and more pairs to ensure the accuracy of estimates. $X_i$ is a price ratio of objects per square meter.

Table 2-6 show the coefficient values for all districts of Krasnoyarsk city for beginning of 2019. Table 2 is about commercial real estates, tables 3-5 are for residential real estate for different number of rooms in apartments and table 6 is for lands in Krasnoyarsk location.

**Table 2.** The coefficient for the effect of the location of commercial real estate in Krasnoyarsk for the first quarter of 2019.

| № | Districts | Address | Square (м²) | The purpose of the construction | The material of the construction | The cost for 1 square meters | The source of information | The date of updating |
|---|-----------|---------|-------------|-------------------------------|---------------------------------|----------------------------|---------------------------|----------------------|
| 4 | Kirovsky  | st. Aralskaya, 1 145 | Any purpose | concrete | 12 414 | 1 800 000 | www.krasnoyarsk.ci an.ru | 20.03.19 |
| 5 | Railway   | st. Menchginskogo, 12 62 | Any purpose | concrete | 80 645 | 5 000 000 | www.sibd om.ru | 24.03.19 |

Table 3. The coefficient for the effect of the location of residential real estate in Krasnoyarsk for the first quarter of 2019 (single-room).
As can be seen from the tables 2-5 the values of the coefficients for different types of objects don’t differ much (less than 15%). But in table 6 the values of the coefficients are very significant. It can be explained by varying demand for land. Also the prices of the land are very depending of the infrastructure on the location. Besides, the number of objects from data sets with free access is very poor.

| Districts | Railway | Kirovsky | Leninsky | Oktyabrsky | Sverdlovsky | Sovetsky | Central |
|-----------|---------|----------|----------|------------|-------------|---------|---------|
| Railway   | 1       | 0.87     | 0.85     | 0.94       | 0.86        | 0.89    | 1.16    |
| Kirovsky  | 1.15    | 1        | 0.89     | 1.20       | 1.18        | 1.18    | 1.29    |
| Leninsky  | 1.17    | 1.12     | 1        | 1.25       | 1.18        | 1.19    | 1.24    |
| Oktyabrsky| 1.06    | 0.84     | 0.80     | 1          | 0.83        | 0.89    | 1.22    |
| Sverdlovsky| 1.17 | 0.85     | 0.85     | 1.20       | 1           | 1.11    | 2.22    |
| Sovetsky  | 1.12    | 0.85     | 0.84     | 1.12       | 0.90        | 1       | 1.22    |
| Central   | 0.87    | 0.78     | 0.81     | 0.82       | 0.82        | 1       |         |

**Table 4.** The coefficient for the effect of the location of residential real estate in Krasnoyarsk for the first quarter of 2019 (one bedroom).

| Districts | Railway | Kirovsky | Leninsky | Oktyabrsky | Sverdlovsky | Sovetsky | Central |
|-----------|---------|----------|----------|------------|-------------|---------|---------|
| Railway   | 1       | 0.86     | 0.91     | 0.91       | 0.86        | 0.98    | 1.12    |
| Kirovsky  | 1.14    | 1        | 0.90     | 1.17       | 1.14        | 1.12    | 1.45    |
| Leninsky  | 1.09    | 1.11     | 1        | 1.15       | 1.11        | 1.11    | 1.20    |
| Oktyabrsky| 1.10    | 0.85     | 0.87     | 1          | 0.85        | 0.94    | 1.03    |
| Sverdlovsky| 1.17 | 0.88     | 0.91     | 1.17       | 1           | 1.06    | 2.22    |
| Sovetsky  | 1.02    | 0.89     | 0.91     | 1.07       | 0.94        | 1       | 1.08    |
| Central   | 0.89    | 0.69     | 0.84     | 0.97       | 0.82        | 0.93    | 1       |

| Districts | Railway | Kirovsky | Leninsky | Oktyabrsky | Sverdlovsky | Sovetsky | Central |
|-----------|---------|----------|----------|------------|-------------|---------|---------|
| Railway   | 1       | 0.86     | 0.84     | 0.91       | 0.94        | 0.92    | 1.20    |
| Kirovsky  | 1.16    | 1        | 0.88     | 1.13       | 1.17        | 1.17    | 1.35    |
| Leninsky  | 1.20    | 1.13     | 1        | 1.13       | 1.14        | 1.17    | 1.65    |
| Oktyabrsky| 1.10    | 0.88     | 0.89     | 1          | 0.90        | 0.90    | 1.38    |
| Sverdlovsky| 1.07 | 0.86     | 0.88     | 1.11       | 1           | 1.11    | 2.26    |
| Sovetsky  | 1.08    | 0.86     | 0.85     | 1.11       | 0.90        | 1       | 1.31    |
| Central   | 0.84    | 0.74     | 0.61     | 0.73       | 0.79        | 0.76    | 1       |

**Table 5.** The coefficient for the effect of the location of residential real estate in Krasnoyarsk for the first quarter of 2019 (three room flat).

| Districts | Railway | Kirovsky | Leninsky | Oktyabrsky | Sverdlovsky | Sovetsky | Central |
|-----------|---------|----------|----------|------------|-------------|---------|---------|
| Railway   | 1       | 0.18     | 0.08     | 0.17       | 0.20        | 0.17    | 0.52    |
| Kirovsky  | 5.57    | 1        | 0.39     | 2.25       | 3.08        | 0.63    | 2.74    |
| Leninsky  | 12.10   | 2.60     | 1        | 1.31       | 8.81        | 3.17    | 5.89    |
| Oktyabrsky| 6.00    | 0.46     | 0.77     | 1          | 0.38        | 1.43    | 2.27    |
| Sverdlovsky| 5.25 | 0.33     | 0.13     | 4.07       | 1           | 0.74    | 2.37    |
| Sovetsky  | 6.53    | 1.62     | 0.33     | 1.01       | 1.40        | 1       | 1.69    |
| Central   | 1.97    | 0.37     | 0.19     | 0.44       | 0.42        | 0.61    | 1       |

**Table 6.** The coefficient for the effect of the location of lands in Krasnoyarsk for the first quarter of 2019.
In addition, the values of the coefficients for the effect of the location, which were calculated in 2019, were compared with data from 2016-2018 years [10-11]. The comparison showed the continuation of the trend.

4. Conclusions
In this study, we have proposed to use the method of paired estimates for the evaluation of real estate. The results of this study were compared with the results of 2016-2018 years. Also the problem of lack of information was discussed. The estate market in Krasnoyarsk region is not very big. The collected dataset makes up the majority of the entire market of Krasnoyarsk city.

However, as we see in the last table, the coefficient for the effect of the location is not useable for assessment the land. For this task, we will provide special methods in further studies.

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