

## The Application of the Multi Criteria Analysis in the Assessment of the Valuation of Real Estate

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### ABSTRACT

Assessment value of the real estate indicates a professional opinion about the value, which is the result of systematic approach in the procedure of estimating the value of real estate. In complex problems the use of individual standard methods of evaluation of the real estate is not giving an acceptable result, so it is mandatory to use multi criteria analysis, that is the use of combined standard methods of evaluation and correct assessment of given data.

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## 1. Introduction

The real estate assessment value is a responsible and complex task that involves a comprehensive analysis of market conditions and available information at the time of the appraisal (Đurić, 2009). The definition of market value requires the appraiser to reach the final market value. At the same time, in practice, it is considered acceptable that appraisers can express their opinion within a range of possible values. Therefore, various combinations of approaches and methods can be used in real estate valuation. The choice of method depends on the quality and availability of data as well as the purpose of the assessment (Alost et al., 2021). Theoretically, in the conditions of perfect information, the correct application of any method would lead to an identical result. However, in reality, and practice, where there is no perfect information, these methods should correspond to each other. Most often, estimates are made based on the application of at least two approaches. Also, investors, creditors and property owners must be familiar with the valuation techniques and assumptions that preceded the valuation.

Until recently, there was no binding legal and technical regulation in the field of real estate valuation that would regulate this area of business (Youssef and Webster, 2022). As a result, the assessment of real estate value is performed by court experts in the construction and geodetic profession or the commission of the tax administration without prior verification of their knowledge and abilities. The consequence of such a situation is that estimates are often obtained that do not match the task or assessment purpose.

The Ministry of Finance tried to introduce business rules in this area by passing the Law on Real Estate Appraisers (Službeni glasnik, 2016). This law regulates the conditions and manner of performing real estate appraisal by licensed appraisers, professional qualification of persons and conditions for obtaining a license

for real estate appraisal, the obligation to assess the real estate by this law, supervision of real estate appraisal, an inspection of licensed appraisers, disciplinary responsibility of licensed appraisers, establishment and competencies of the Expert Board, accredited associations of appraisers, as well as other issues related to the performance of real estate appraisal by licensed appraisers.

## 2. Basic Terms

**Market value** is the price that can be achieved at a given moment in the market. The price that can be achieved at a given moment in the market consists of the lower market value limit, the current expected market value, and the maximum expected market value.

- **The lower limit of the market value** of real estate is the price that can be achieved with great certainty in the market quickly with most buyers.
- Real estate's **real expected market value** is the price that can be achieved with certainty within a reasonable time with most potential buyers.
- Real estate's **maximum expected market value** is the price that can be achieved with little certainty in a short period with a small number of buyers who, for subjective reasons, are particularly interested in the real estate in question.

The supply and demand ratio defines in which part of the range of market value of real estate the achieved selling price will move.

- **If the supply is higher than the demand**, the period for achieving the selling price will be longer. The selling price will move mainly between the lower limit of the market value and the realistically expected market value of the real estate.
- **Suppose the supply is lower than the demand**. In that case, the period for achieving the selling price will be shorter. The selling price will move mainly between the real expected market value and the maximum expected market value of the real estate.

Real estate appraisal means an expert opinion on the value, as well as the procedure of determining the value, based on a systematic approach, which includes the following activities:

- Identification of the property to be assessed (physical and legal) - what is being assessed;
- Identification of rights over the assessed real estate - right of ownership, lease, disposal, existing restrictions;
- Determining the purpose of the assessment - why the assessment is done;
- Determining the valuation date - on which date the value of the real estate is determined;
- Choosing the appropriate assessment method - one or a combination of several methods;
- Collection, analysis and evaluation of data required for the chosen assessment method;
- Application of the chosen assessment methodology;
- Concluding the value and making a report.

The relationship between supply and demand defines how the market price will move in part of the real estate market value range.

- If the supply is higher than the demand, the period for achieving the selling price will be longer. The selling price will move mainly between the lower limit of the market value and the realistically expected market value of the real estate.
- Suppose the supply is lower than the demand. In that case, the period for achieving the selling price will be shorter. The selling price will move mainly between the real expected market value and the maximum expected market value of the real estate (Pavlović, 2008).

## 3. Real Estate Assessment Methods

Three world-renowned valuation methods are used in real estate appraisal:

- **the cost approach**, actual value method, cost approach, statistical approach-cost method,
- **comparative method**, sales comparison method, direct sales price comparison method, and
- **income capitalization approach** is based on the assumption that the value of an asset depends on its ability to generate profit for the owner. In practice, two methods of this approach are most often used: the method of direct capitalization and the method of discounting cash flows.

The fourth method is the **residual value method**, which is called "backward pricing" in economic theory and has a specific area of application. This method gives the expected market value after the realization of

the facility reduces the cost of construction without the price of land to obtain the value that can be spent on land acquisition (Ćirović & Luković, 2005).

### 3.1. Cost approach

The application of the cost method implies the calculation of all costs to acquire and build the facility in a legal and technically acceptable way (calculation of the production price of the facility), it is assumed that the investor will not pay a higher price for the property than it would cost.

In the case of construction of a residential or business building, this includes:

- obtaining a location,
- preparation and certification of technical documentation,
- payment of all utility contributions and fees,
- obtaining a building permit,
- execution of works in compliance with all regulations,
- technical acceptance performed,
- obtaining a use permit and
- object registration.

The values obtained by applying the cost method are relatively constant over long periods and are in the lower range of the market price. Although of these parameters, the value of obtaining the location varies the most, representing 30% to 60% of the total real estate value, other parameters calculated in this method are relatively constant. If the location develops and becomes attractive for the existing urban purpose, the value can be multiplied, which is the case with the price of construction land in the central urban zones. On the other hand, if the location in question loses its attractiveness, which happens in parts of settlements that are becoming extinct, the market price of real estate may be below its production value.

When applying this method for older buildings, depreciation (physical and functional) must be calculated concerning the year of construction or last reconstruction.

It should be emphasized that the value of land is not depreciated. However, each building element has a different depreciation rate depending on the quality and duration.

Depending on the purpose of the assessment, the applicability of this method is different

- As an expropriation procedure, it is very applicable as a lower limit of value with a maximum depreciation of up to 30%,
- When estimating for a mortgage loan does not give reliable results,
- It is sometimes the only applicable method when assessing public and infrastructural facilities.

### 3.2. Sales comparison approach

The approach of direct comparison of sales prices is based on information from the market on sales transactions or prices from offers for real estate that is comparable to real estate whose value is estimated. In addition, comparable transactions need to be between unrelated parties and under normal market circumstances.

In the assessment procedure, it is necessary to evaluate the collected data and correct the obtained values for all significant deviations of the real estate for which the comparison is made, based on: location, proximity to roads, supporting infrastructure, building size and urban parameters, quality of construction, year of construction or adaptation, current and investment maintenance and additional investments made up to the date of valuation, the period from the transaction to the date of valuation.

The price per square meter is often formed for each comparable real estate to compare it with the market value of the real estate in question. The characteristics of comparable real estate, which are of better quality than the real estate in question, will correct the price per square meter downwards. In contrast, the price will be adjusted upwards for worse real estate. All upward or downward price adjustments are based on market knowledge and how specific characteristics may affect the price. This process is entirely subjective and requires the experience of an assessor; otherwise, serious mistakes can occur.

The calculation uses the equation for "weighted arithmetic mean" (1), which reads:

$$\bar{x} = \frac{\sum_{i=1}^n x_i \cdot p_i}{\sum_{i=1}^n p_i} = \frac{x_1 \cdot p_1 + x_2 \cdot p_2 + \dots + x_n \cdot p_n}{p_1 + p_2 + \dots + p_n} \quad (1)$$

$x_i$  – korigovani iznos u €/m<sup>2</sup>

$\bar{x}$  – ponderisana aritmetička sredina

$p_i$  – koeficijent pouzdanosti (težinski koeficijent)

**Table 1.** Collected data evaluation table

No.	Data source	Amount €/ m <sup>2</sup>	Correction coefficient	Adjusted amount €/ m <sup>2</sup>	Reliability coefficient
1	Statistical data	1.500 €/m <sup>2</sup>	10%	1.650 €/m <sup>2</sup>	0,3
2	Tax Administration	1.700 €/m <sup>2</sup>	-6%	1.598 €/m <sup>2</sup>	0,8
3	RGZ database	1.350 €/m <sup>2</sup>	20%	1.620 €/m <sup>2</sup>	0,5
4	Public auction	1.680 €/m <sup>2</sup>	-5%	1.596 €/m <sup>2</sup>	1
5	Transport Agency	1.800 €/m <sup>2</sup>	5%	1.890 €/m <sup>2</sup>	0,9
6	LPA decisions	1.750 €/m <sup>2</sup>	7%	1.873 €/m <sup>2</sup>	0,7
7	Public announcements	2.000 €/m <sup>2</sup>	-10%	1.800 €/m <sup>2</sup>	0,7
8	Contracts	1.200 €/m <sup>2</sup>	20%	1.440 €/m <sup>2</sup>	0,6
9	Expert findings	1.680 €/m <sup>2</sup>	6%	1.781 €/m <sup>2</sup>	0,9
10	Notarized contract	1.700 €/m <sup>2</sup>	0%	1.700 €/m <sup>2</sup>	1
<b>WEIGHTED AVERAGE VALUE</b>					<b>1.705 €/m<sup>2</sup></b>

Application of the above method:

- Suppose there are relevant data on appropriate real estate turnover in the crucial period. In that case, this method is the easiest to apply, and reliable results are obtained.
- In most cases, not all conditions are met, so the appraiser must evaluate (weigh) each of the collected data to determine the actual value of the subject property.
- For some types of real estate, there is no data on the achieved turnover, so this method is not applicable (production, public, infrastructure facilities, areas where expropriation is carried out)

### 3.3. Income capitalization approach

This method in real estate valuation is based on the assumption that the property's value depends on its ability to generate profit for the owner. In practice, two methods of this approach are most often used: direct capitalization method, and cash flow discounting method.

**The direct capitalization method** uses a static approach, first calculating Net Operating Income (NOI) for comparable real estate at the time of sale, which is the amount obtained by deducting current expenses from gross real estate income from rental rent and other income on an annual basis. Then, by comparing the thus determined net operating income with the selling price (C), the capitalization rate (R) of equation (2) is obtained:

$$R = \frac{NOI}{C} \quad (2)$$

Real Estate for comparison	Selling price [C]	Net Operating Income [NOI]	Capitalization rate [R]
Real Estate 1	100.000 €	9.500 €	0,095
Real Estate 2	80.000 €	7.250 €	0,091
Real Estate 3	120.000 €	10.200 €	0,085
Real Estate 4	72.000 €	6.800 €	0,094
Real Estate 5	135.000 €	11.600 €	0,086
Real Estate 6	68.000 €	6.520 €	0,096
Real Estate 7	75.000 €	7.200 €	0,096

Real Estate 8	90.000 €	6.400 €	0,071
Real Estate 9	58.000 €	5.500 €	0,095
Real Estate 10	63.000 €	6.000 €	0,095
<b>Average capitalization rate <math>[\bar{R}]</math></b>			<b>0,090</b>

The real estate value subject to assessment is obtained by dividing the expected net operating income of the real estate by the capitalization rate, which is obtained from data on comparable real estate transactions (in the previous example in the table, the average capitalization rate is 0.09).

The expected net operating income at the annual NOI level = € 15,000. By applying the formula, the possible market price is obtained (3):

$$C = \frac{NOI}{\bar{R}} = \frac{15.000}{0,090} = 165.919,20 \text{ €} \quad (3)$$

The adopted market price according to this methodology is 166,000 €.

Using this method does not guarantee the investor that the real estate purchase is a good investment.

However, it only ensures that the property is not paid more than the competitive price on the market, i.e., the amount paid by other investors for similar real estate.

**The method of discounting cash flows** uses a dynamic approach. It is based on the assumption that the investor will not pay more for the property than the present value of future income that the property can generate during its operation (Ćirović & Luković, 2005).

As a rule, the discount rate reflects the price of the capital from which the project is financed. With the help of the discount rate, all values in the future (in this specific case: inflows and outflows realized by using the real estate in question) are reduced to the present value, i.e. to the actual value at the time of making the investment decision.

Based on experience, knowledge of the market, supply and demand, rental conditions, and the structure of income and costs, the appraiser projections future results or annual net income that can be expected from the property.

Discounting of cash flows is performed by determining the net present value of cash flow for each year of the project, and then by adding the values thus obtained, the total net present value of the project is obtained (4).

$$NPV = \sum_{i=1}^n \frac{NP_i}{1 + \frac{d}{100}} \quad (4)$$

NPV - Net Present Value

$NP_i$  - net income in the  $i$ -th year of operation

$d$  - discount rate

$i$  - year of real estate exploitation

$n$  - real estate lifetime

IRR - Internal Rate of Return

The internal rate of return is the discount rate that reduces the present value of the project's net cash flow to zero during the period of exploitation of the real estate in question. In terms of its content, the internal rate of return and the profitability of the project also shows the highest interest rate on loans that the project can accept without incurring a loss.

<b>Investment</b> <b>166.000 €</b>	<b>Annual net income</b> <b>15.000 €</b>	<b>Percentage of investment value</b> <b>9,04%</b>
Diskontna stopa [d]	Period povraćaja investicije	IRR za period od 30 godina
6%	18 godina	9,23%
8%	28 godina	
10%	100 godina	

In this example, for a period of exploitation of 30 years, the internal rate of return on investment is 9.23%, which means that an investment of € 166,000 is profitable if a net annual income of € 15,000 and a discount rate not exceeding 9.23% for a period of exploitation of 30 years.

#### 4. Conclusion

Depending on the purpose of the assessment, the approach to the problem and the choice of optimal combinations of real estate assessment methods will depend.

Several characteristic types of real estate valuations have been singled out:

1. Estimates for mortgaging existing real estate;
2. Estimates for obtaining mortgage loans for the construction of the real estate in question;
3. Assessment for the payment of unpaid compensation for previously expropriated real estate;
4. Assessment of the value of the real estate in current expropriation proceedings;
5. Valuation of real estate in court criminal, litigation and enforcement proceedings

1. Estimates for mortgaging existing real estate.

For standard types of real estate (apartments, business premises, warehouse space), when there are relevant data on turnover, the comparative method is applied, and the cost method is used as a control method. In such assessments, special attention should be paid to the legal status of the property being assessed.

2. Estimates for obtaining mortgage loans for constructing the real estate in question.

It is most often a matter of project financing, so the yield method is relevant, and the sales comparison method and the cost method are used as control methods.

3. Assessment for the payment of unpaid compensation for previously expropriated real estate.

It is the most complex problem because it is required that the assessment be performed according to the property's condition on the day of the expropriation (which is often several decades ago) and according to the prices on the day of the assessment. The biggest problem is obtaining relevant data on prices from the required period and their evaluation (weighting). Therefore, a combination of comparative and cost methods is applied.

4. Assessment of the real estate value in current expropriation proceedings.

In expropriation proceedings, the appraiser should be guided by the principle that similar real estate can be obtained at an appropriate location for the amount paid. There is often no data on real estate transactions in areas where extensive expropriation procedures are carried out, so the cost method is applied. In such procedures, the depreciation rate is usually limited to 30%, although these are often very old and devastated buildings. Special attention should be paid to the value of acquiring the location because it attracts a large percentage of the value of the investment. As a control method, the comparative method (for real estate in the surrounding settlements) is used as the upper limit of the market value.

5. Real estate valuation in court criminal, litigation and enforcement proceedings.

In assessments in court proceedings, especially in criminal proceedings, the expert assessor has a great responsibility because the court's decision depends on his report. Therefore, particular attention should be paid to the relevance of the data collected, and a clear explanation of each parameter adopted. It is most often about production facilities, the yield method is used as the basic method and the control production method as the control method. Any unsubstantiated presumption and use of unverified data must be avoided in court proceedings because the assessor may be criminally liable for negligent work.

## References

- Alosta, A., Elmansuri, O., & Badi, I. (2021). Resolving a location selection problem by means of an integrated AHP-RAFSI approach. *Reports in Mechanical Engineering*, 2(1), 135-142. <https://doi.org/10.31181/rme200102135a>
- Ćirović, G., Luković, O. (2007). Finansijsko poslovanje i investicije u građevinarstvu. Visoka građevinsko-geodetska škola.
- Đurić, Z. (2009). Metode procene vrednosti nekretnina. Kraljevo, Kvark, 5.
- Jovović, S. (2012). Metode procene vrednosti građevinskog zemljišta. MSc thesis, Banja Luka.
- Pavlović, M. (2008). Metodi procene vrednosti nekretnina. AG Nekretnine.
- Službeni glasnik, Zakon o proceniteljima vrednosti nepokretnosti, broj 108/16, (2016).
- Youssef, M. I., & Webster, B. (2022). A multi-criteria decision making approach to the new product development process in industry. *Reports in Mechanical Engineering*, 3(1), 83-93. <https://doi.org/10.31181/rme2001260122y>