Value vs. Price in Real Estate Valuation in Times of Uncertainty*

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Abstract

When considering the relationship between value categories and real estate prices in times of uncertainty, it is undoubtedly important to recognize that the analysis of the real estate market, its area and segregation, and ultimately the impact of external stimuli that disrupt its rhythm, is crucial. This stems from the fact that market assets, i.e., real estate, significantly influence the economic development of each country.

A significant gap has been noted in the literature on the subject, revealing a lack of consideration for threats resulting from diagnosed risks on real estate value. This essentially concerns real estate valuation, i.e., the mathematical approach to assessing real estate value, where threats are not assigned attributes and their value is not assessed. This is also evident in the literature review, which is sparse on the impact of threats, primarily those related to globalization, which can significantly impact the final real estate valuation. Therefore, it was deemed appropriate to attempt to identify a solution to optimize valuation, taking into account the state of threats to the property being valued.

The main purpose of this article is to present the value and price of real estate in the real estate valuation process in the context of initiating potential risks arising from operating in times of uncertainty. The research problem in this article is formulated as the question: „In today's times of uncertainty, should various types of risks be considered in real estate valuation, as they constitute a threat element that significantly influences the final valuation?" The study's research hypothesis is formulated as follows: "Different types of real estate risks should reflect the threat variable in their design, which influences the final valuation of real estate."

The study utilized secondary analysis of literature and legislative data in Poland and the European Union, allowing for an analysis of available definitions of location, including how it is incorporated into real estate valuation procedures, with particular emphasis on the directionality of application in appraisers' valuation reports. The use of a case study approach allowed for the use of an econometric model for real estate valuation that takes into account various types and categories of risks, assuming the continued operation of the real estate market under conditions of uncertainty.

The study outlines recommendations and conclusions related to the need to consider threats and risks not only in linear decision-making models under uncertainty, reflecting the state of threat, but also in situations where basic approaches are used in real estate market value valuation..

Keywords: real estate valuation, price, market threats, investment risk

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Introduction

When considering the categories of real estate value and price in times of uncertainty, it is undoubtedly necessary to begin by analyzing the market itself, its scope, and segregation, including the implementation of real estate as a fundamental research subject. This stems from the fact that market entities, i.e., real estate, are the source of the relationship between gross domestic product and inflation, where inflation is understood as the constant increase in the average market price of goods and services purchased by the population [1]. It is the mechanisms of the real estate market that inspire many economists to observe inflation measures, or the increase in the prices of consumer goods and services, due to their connection with the construction sector [2, 3]. However, it is worth noting that, in addition to observing real estate market behavior and existing threats in the form of risks, it is important to analyze the continuous variability of the socio-economic situation, which verifies individual behavior and inclinations at different times, for example, regarding investment [4]. This applies specifically to real estate purchase and sale transactions, i.e., initiating a contract between the parties to transfer ownership of real estate to another person, which constitutes an element of transaction risk [5]. One of the sources of knowledge necessary for real estate market analysis is the real estate valuation process, which is inextricably linked to properties with specific characteristics, generally referred to as real estate [6]. These properties, already subject to numerous individual risks, can be divided into physical characteristics, which include immovability, durability, and diversity, as well as economic characteristics, which include uniqueness, location, interdependence, and capital intensity, as well as the ability to meet specific needs and generate economic benefits [7]. These properties reflect a set of characteristics that have a decisive impact on their value [8], but also pose many challenges for appraisers, as they pose threats from both the demand and supply sides. Therefore, it is important to group them into appropriate classes according to adopted criteria [9, 10]. Therefore, given that various entities may hold rights to real estate, they can be divided into state, local government (divided into municipal, district, and provincial), and private. However, in the objective approach, certain groupings are used, recognizing them as elements of various official, administrative, and civil law activities. Therefore, real estate can be divided into land, buildings, and premises [11].

When considering real estate value, it is worth noting that it is mostly associated with land, i.e., a plot or military training ground, taking into account geodetic nomenclature [12]. In reality, the value will be related to the definition of real estate, which constitutes a part of the earth's surface, separated as a result of separate ownership. This means that at the time of separation, the property was surrounded by land owned by persons other than the owner of the separated part. It should be noted that the separation of a part of the earth's surface as an object of separate ownership must be formal, documented, and consistent with ownership regulations, i.e., by a legal document [13]. A landed property may consist of multiple plots of land, even if they are located separately, provided that all these plots are connected by the same owner and are registered in a single land and mortgage register or, in the absence of a land and mortgage register, registered in a single legal document confirming their separation. A landed property itself is a continuous part of the earth's surface. However, it should be noted that buildings are often associated with the land, which are classified in different categories, creating a collection of building properties and residential properties, as is evident in every locality [14]. Therefore, with this in mind, a landed property is the land together with all components permanently attached to the land, whose ownership is not separated from the ownership of the land. A building property, on the other hand, is a building whose ownership is separated from the ownership of the land. A residential property is a separate unit within a multi-unit building whose ownership is separated from the ownership of the land [15]. This, of course, is related to the selection of attributes for property valuation [17, 18]. Analyzing the available literature, it can be concluded that the importance of one attribute is commonly considered – location [19]. The prevailing statement is that the price is influenced by the location attribute, secondly by location and thirdly also by location [20]. Locational determinants do not result from analytical research on a collected set of properties. However, accepting them as a given sometimes generates much controversy, which transforms into various types of explanatory proceedings and verification of the appraiser's work. However, by recognizing the tendencies of consumers, i.e., real estate buyers, preferences can be weighted and recognized as dominant attributes [21, 22]. These are adjusted to the possibility of verifying the market characteristics of the property. As a result, a gradation of 3-5 attributes that create the property's value is obtained [23]. Among them is always location, which is perceived differently in real estate valuations. The determinants here are the types of values that will be adopted as the basis for valuation under the Real Estate Management Act [24]. These include, for example, market value, replacement value, or cadastral value [25].

Research materials and methods

When analyzing the problem of presenting the value and price of real estate in a constantly changing environment affected by numerous threats, it should be noted that addressing this topic in times of uncertainty, especially geopolitical uncertainty, represents an innovative approach to valuation. All real estate analyses and estimates are performed in peacetime and do not take into account the risk aspect at all [26]. Investment risk is more often discussed [27], but this element is completely absent from the valuation report itself. Generally, the aspect of real estate value creation related to the occurrence of a specific crisis or related to risks affecting the functioning of the property is not considered.

The main objective of this article is therefore to present the value and price of real estate in the real estate valuation process in the context of potential risks arising from operating in times of uncertainty. The research problem in this article is formulated as follows: In these times of uncertainty, should various types of risks be considered in real estate valuation, as they constitute a threat element that significantly influences the final valuation? The research hypothesis of this study is formulated as follows: various types of real estate risks should be constructed to reflect the threat variable that influences the final valuation of real estate.

The following research methods and tools were used in this study.:

- Secondary analysis of literature sources and legislative data in Poland and the European Union – this method allowed for the analysis of available definitions of location, including the methods of incorporating it into real estate valuation procedures, with particular emphasis on the directionality of application in real estate appraisal reports.
- Case study method – this approach allowed for the analysis of the use of an econometric model for real estate valuation, taking into account various types and categories of risks, assuming the continuous operation of the real estate market under conditions of uncertainty..

The value and price of real estate in Polish legislation

The price and value of real estate are relatively well-regulated in Polish law, although a lack of professional understanding of their definitions sometimes leads to methodological errors in real estate valuation procedures. According to the Civil Code, price is a substantively significant element of a transaction, i.e., a sales agreement, and denotes a specific monetary amount, as to which the parties to the transaction have unanimously submitted an appropriate declaration of intent [28]. However, price does not always have to be expressed in monetary terms. For example, it can be a specific acquired good or a service. From the consumer's perspective, price is associated with a measure of value [29]. Therefore, the concept of price refers to the ex post sale and purchase situation and is most often associated with market exchange. Using this concept in an ex ante context should be formulated with appropriate adjectives. In such cases, one can speak of prices such as: expected price, starting price, minimum price, maximum price, theoretical price, etc. [30]. When considering the value of real estate, one can speak of its future, present, and past. This economic category does not always have to be used in purchase-sale transactions [31]. In Polish law, the legal issues and methodological scope of accepting and determining real estate value are defined by the Real Estate Management Act and its implementing regulation [25]. Additionally, to generate a procedural framework, a team of professionals in Poland has developed the Professional Standards for Professional Valuers [32]. These standards interpret and expand upon the regulations, adapting procedures to various situations occurring in the real estate market.

One of the basic approaches in real estate valuation in Poland is the comparative approach, which, due to its methodological simplicity, is the most commonly used approach in determining the "market value of real estate," i.e., the most likely price obtainable on the real estate market. The use of the comparative approach in assessing the market value of real estate stems from the provisions of Articles 152 and 153 of the Real Estate Management Act [24], as well as the provisions of §4 and §5 of the Real Estate Valuation Regulation [25] and Standard III.7 of the Professional Standards for Real Estate Valuers. This approach is based on identifying the attributes of real estate identified by the appraiser that significantly impact its market value. In order to compare the projected value of the appraised property to the prices of comparable properties, it is necessary to determine the extent to which individual property attributes influence the prices obtained in the market [33].

The comparative approach employs three real estate valuation methods [25]: the paired comparison method, the average price correction method, and the statistical market analysis method. However, the most commonly used method for estimating market value is the paired comparison method [24], which considers a minimum number of properties [33, 34].

The market value of a property can also be estimated using the income approach, which can be treated as a kind of forecasting problem [35]. It's worth noting that the actual income generated by a property doesn't always correspond to the property's actual potential. This depends on the property manager's skills, which means that properties assessed using this approach must generate income or have the potential to generate income in the future, and the amount of this income must be known or determinable [36, 37]. When considering the types of property value, it's important to note that the legal system also includes a "replacement value." This is determined by property appraisers using a cost approach, based on which the buyer will not pay more for the property than it would cost to restore the property to its current condition, taking into account the wear and tear of the property [38, 39].

In the broadly understood area of real estate valuation, in addition to the aforementioned market and replacement values, Polish law also cites the concept of "cadastral value." Pursuant to the Real Estate Management Act, this value is determined through a general property valuation process based on an assessment of properties representative of specific property types within a given municipality. In a market economy, real estate value is an important economic category. However, until the end of 1997, Polish legislation treated it very marginally.

The Act of April 29, 1985, on Land Management and Expropriation of Real Estate [40] did not define real estate value; it merely specified factors that should be considered when conducting a valuation. Furthermore, both the Act and its implementing regulations applied only to the valuation of real estate owned by the State Treasury or municipalities. In turn, the definition of the market value of assets and property rights applied to real estate was too general and inappropriate to the specific nature of real estate. Currently, the Real Estate Management Act discusses the three aforementioned types of real estate value: market value, replacement value, and cadastral value [35]. However, with the Act on Covered Bonds and Mortgage Banks in mind, the concept of "mortgage lending value" [41] was additionally introduced in the financial industry. The concept of "fair value" also appears, and is primarily used in accounting and bookkeeping. According to the Accounting Act [42], fair value is the amount for which a given asset could be exchanged, and a liability settled, in an arm's length transaction between willing, informed, and unrelated parties. Therefore, it is assumed that in most situations, fair value will be equivalent to market value..

The value and price of real estate in times of uncertainty – a model approach

When analyzing the problem of real estate value classification, it is undoubtedly necessary to refer to the provisions of the European Valuation Standards issued by the European Group of Valuers' Associations (TEGOVA) [43]. Although this document primarily addresses the financial market, it contains all definitions and terms consistent with European Union laws and regulations. Analysis of the document reveals that the most attention was paid to the "market value" of real estate, which is a key definition in the real estate valuation process. It was also noted that defining real estate is closely linked to the relationship between buyer and seller and the characteristics of the market in which the transaction takes place. Market conditions themselves will vary depending on supply and demand, knowledge about the transaction circumstances, location trends, lending expectations and terms, and expected profits. Market value in European standards is defined as the price on the valuation date for which land, buildings, or premises could be sold under specific terms between the seller and buyer. However, this is not a standard definition of market value [43, 44].

EU legislation contains numerous references to market value, a significant portion of which relate to financial aspects or the total capitalization of companies. These are typically based on the issue of real estate profit, which in Polish law refers to the income approach, which is crucial for real estate related to the owner's profits from the property. This, of course, does not rule out the validity of the valuation procedure itself, as each property typically has a unique character, both legally and physically, and sellers and buyers are guided by different motives [45].

Another definition found in European standards is "fair value," which should be used as the basis for real estate valuation in the event of an actual or potential transaction between specific, identified parties. Fair value in European standards means "the price that would be received for the sale of the property in an ordinary transaction between identified, willing market participants, possessing full knowledge of all relevant facts and making decisions in accordance with their own objectives" [46].

Under EU regulations, it is also possible to distinguish investment value, which can be identified as the maximum price that a bidder would propose, guided by their own specific requirements regarding return on investment. Such a focus is inextricably linked to the lending process, which in turn necessitates another definition related to "mortgage lending value" [25, 47, 48].

The value and price of real estate in times of uncertainty – a model approach

When analyzing value and price categories in the context of real estate valuation, the aspect of uncertainty undoubtedly proves crucial, requiring definition. This stems from the fact that in most situations, uncertainty is identified with a crisis or a crisis situation. In crisis management terminology, this would be a situation related to systemic changes in a given territory, or a set of external and internal factors that destructively impact a given system, leading to an imbalance in many areas of human functioning [49]. When analyzing today's catalog of threats, it is important to be aware that, although it is quite extensive, new threats may emerge that have not been considered so far [50, 51]. Therefore, based on the available literature, key risk factors can be grouped into:
- Macroeconomic
- Environmental,
- Legal and administrative,
- Market and investment,
- Technical

Analyzing the above, it should be stated, it should be noted that active participants do not consider the threat aspect, i.e., the types of risks cited. In these circumstances, it can be seen that the market value of real estate depends on the transaction prices quoted on the real estate market, which can be written as follows: [1.1]:

$$Wr_i = f(C_{t_i}) \tag{1.1}$$

gdzie:

W_{r_i} – market value of the i-th property,
C_{t_i} – transaction price of the i-th property.

By rewriting the above equation taking into account the influence of attributes, we get [1.2]:

$$Wr_{it} = f(C_{j_1 t-1} \cdot A_{m_1 t-1}, C_{j_2 t-2} \cdot A_{m_1 t-1}, \dots, C_{j_i t-n} \cdot A_{m_z t-n}, U_{R_r}) \tag{1.2}$$

where:

Wr_{it} – market value of the i-th property determined at the time of valuation t,
$C_{j_i\text{t-n}}$ – prices of properties similar to the property being valued from the period *t-n*, for *n=0,1,2,3,...,24* (monthly view),
j – number of properties similar to the property being valued, *i=1,2,3,...,k,* (in practice, from several to a dozen or so properties with known characteristics are used for valuation, usually from 3 to 5),
$A_{m_i\text{t-n}}$ – attributes of the property that influence the value of the property from the period *t-n*, for *n=0,1,2,3,...,24*, (monthly view), whereby 3 to 5 attributes are usually taken into account, which can be verified in each of the valued properties,
m – attribute gradation, which is the value closest to the attribute of the property being valued, for *z=1,2,3,..., w*, constituting a measurable, numerical value with an appropriate measurement scale,
U_{R_r} – a random variable reflecting a specific type and category of risk affecting the value of real estate during the monitoring of transaction prices.

In the current situation, failing to consider a risk-related variable may lead to problems related to poor value estimation. The resulting value may be either underestimated or overestimated. Typically, if risk exists, we will likely encounter an overestimation problem. And if so, it will be difficult, for example, to sell the property or obtain a bank loan against it. In this situation, the threat itself, or in real estate market terminology, the element of risk affecting the property's value, should be treated separately.

Therefore, let's assume we need to build a model representing the relationship between the threat, defined as the endogenous variable Y, and certain exogenous (explanatory) variables x_1,x_2,...,x_k, which constitute specific types of risk for a given property. In a general form, such a model will be written as follows [1.3]:

$$y = f(x_1, x_2, \dots, x_k) + \xi \tag{1.3}$$

The symbol f denotes a specific analytical form of a function of variables $x_1, x_2, ..., x_k$, which constitute specific types and categories of risk, taking into account the triggering factors included in Table 1. It should be noted that their inclusion depends on the time point for which the value of the property will be estimated. ξ in the formula is a random component of the model, which represents the total effect of all factors that were *explicitly* included as explanatory variables in the model on the endogenous variable *y*. Random element ξ in this case it is a measure of the deviation of the values of the empirical distribution from the theoretical distribution.

Analyzing the above, the problem seems easy to determine based on quantitative methods, when we know the strength of the influence of the explained variables on the explanatory variable. One can point to the solution of the problem of the regression model for *k* - variables [51], which can be written using the following equation [1.4]:

$$y_i = \alpha_0 + \sum_{i=1}^{k} \alpha_i x_i + u_i \qquad [1.4]$$

where:

y_i- risk function,
α_i- parameter of the explanatory variable of the model,
k- number of explanatory variables (types of real estate risk),
u_i- random variable of the model.

The regression model in the case of two explanatory variables, i.e. two risks that have been identified in the real estate being valued, can be presented in the following form [1.5]:

$$y_i = \alpha_0 + \alpha_1 x_{1i} + \alpha_2 x_{2i} + u_i \qquad [1.5]$$

Considering the above, the most desirable situation is when both explained variables influencing the value of the explanatory variable are uncorrelated. Then, in a mathematical sense, it is possible to determine the percentage influence of both variables on the total variability of the explanatory variable (value) under the *ceteris paribus* assumption. This means that the model parameters α_1, α_2 are equal to the parameters β_1, γ_2 equations estimated separately for each of the explanatory variables [1.6], [1.7]:

$$y_i = \beta_0 + \beta_1 x_{1i} + u_i \qquad [1.6]$$

$$y_i = \gamma_0 + \gamma_2 x_{2i} + u_i \qquad [1.7]$$
$$\beta_1 = \alpha_1$$
$$\gamma_2 = \alpha_2$$

The square of the linear correlation coefficients is a measure of the percentage influence of explanatory variables on the total variability of the explained variable: $r^2_{(x,y)} \times 100\%$. Unfortunately, such situations will be very rare for various types of risk, so they can only be considered theoretically. It most often turns out that explanatory variables are correlated with each other. An extreme case, however, is when the explanatory variables prove to be collinear. Therefore, it turns out that classic econometric methods often do not provide a satisfactory answer to the question about the strength of the influence of explanatory variables on the explained variable. Therefore, a different model is proposed, one that accounts for the influence of multiple variables at a time, because we determine the value at a given moment in time, and at a given moment, there are several risks that should be considered in the property valuation. Therefore, a model that takes into account the time variable seems optimal. It is created by introducing the time variable t, which characterizes the moment of the crisis occurrence, into equation [1.3]. This then yields a single model of the local community's safety [1.8]:

$$y_{1t} = \alpha_{11} x_{1t} + \alpha_{12} x_{2t} + ... \alpha_{ij} x_{it} + \xi_{1t} \qquad [1.8]$$

where:

y_t - time dependent variable t ,
x_{it}- time-defined exogenous variable t ,
α_{ij}- structural parameter of the model,

ξ_{it}- a random component reflecting a specific level of risk at a given moment for a specific property being valued.

By writing down the equation taking into account the time delay resulting directly from the late detection of the risk affecting the value of the real estate being valued, we can write the relationship as follows [1.9]:

$$y_t = \alpha_{11}x_{1\hat{t}} + \alpha_{12}x_{2t-1} + \xi_{1t}$$
$$x_{2t-1} = \alpha_{21}x_{2\hat{t}} + \alpha_{22}x_{3t-1} + \xi_{2t}$$
$$x_{3t-1} = \alpha_{31}x_{3\hat{t}} + \alpha_{32}x_{4t-1} + \xi_{3t}$$
$$.$$
$$x_{it-1} = \alpha_{ij}x_{i\hat{t}} + \alpha_{ij}x_{it-1} + \xi_{it}$$

[1.9]

where:

y_t - dependent variable,
$x_{i\hat{t}}$- explanatory variable, recorded at time t (time t is not necessarily the same for all variables),
x_{it-1}- explanatory variable with time delay,
α_{ij}- structural parameter of the model,
ξ_{it}- random component.

The estimation of structural parameters occurring in the model equation, both individual [1.12] and with respect to the time lag, consists in assigning them numerical values for which the model is fitted to the empirical data with a specified probability. The estimation of parameters can be performed using the least squares method, which involves finding such estimates α_ij of structural parameters for which the sum of squared deviations of the actually recorded values of the endogenous variable y from the value of this variable determined by the model is the smallest.

In individual cases, the values of this variable will deviate from the mean value by the amount of the random component ξ. The order of magnitude of these deviations will be found by calculating the variance of the expression [1.10]:

$$D^2[y - f(x_{1t}, x_{2t}, \ldots, x_{it})] = D^2(\xi_{1t})$$

[1.10]

Equation [1.14] shows that the variance of the deviations of the endogenous variable y from its mathematical expectation is equal to the variance of the random component. Therefore, it should be stated that the square root of y plays a particularly important role $D^2(\xi)$, i.e. the standard deviation of the random component (the real type of risk for a given property being valued). This parameter informs how much the total risk function deviates on average (positively or negatively) from the function of explanatory variables in the model, influencing the general analytical form of y. Of course, the stronger the influence of factors not explicitly included in the model, the greater $D^2(\xi)$. However, a small value of this parameter means that the effect of various random factors on the variable y is negligible.

Summary and conclusions

To summarize, the application of various types of real estate risks in legislative terms is not discussed, which does not mean that property appraisers do not consider them in practice. Analyzing the impact of factors identified as potential threats on property value reinforces the knowledge that this is quite significant and that their condition decisively influences property value, taking into account, of course, the basic attributes in property valuation. This trend likely determines the consideration of risks in arriving at a property value judgment, where innovative valuation methods should be used, enriched with elements of threats in the form of analyses, hazard maps, or materials verifying photogrammetry of the surroundings.

Based on the above, it can be concluded that in the work of property appraisers, quantitative methods are used only in specific cases, where mass valuations are involved. This is largely due to the different approach to analysis, where multiple attributes and their impact on the property being valued must be highlighted, taking into account a large database of properties. However, in the case of the comparative approach, the main approach in property valuation, this type of approach is rarely used. Moreover, considering multiple aspects in a single valuation is time-consuming. Simplicity in real estate valuation is preferred. It should also be emphasized that valuation reports rarely address real estate risks or threats, and in the case of globalization threats, they are generally not mentioned at all. Therefore, one of the key conclusions from the research is that all valuations, both mass-scale

ones using econometric models and very simple ones using a very small database of real estate properties for comparison, are conducted under peacetime conditions, meaning no real estate risks are considered. Therefore, the proposed solution, which includes a catalog of risk types and incorporates them into the valuation process at every stage of value determination, is a novelty that undoubtedly fits the current situation of global, ongoing threats, not only those related to the armed conflict in Ukraine.

Analyzing the above, it should also be noted that conventional econometric models do not always produce satisfactory results. This is due to issues such as multicollinearity of explanatory variables, nonlinearity of relationships between variables, and the lack of interpretability. All of this leads to the constant emergence of new econometric-statistical real estate valuation proposals. One such proposal is the approach presented in this article.

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