

Estimating The Market Value Of Real Estate Using The Income Approach In Conditions Of Military Threat*

dr inż. Dariusz KLOSKOWSKI

University of Technology in Koszalin, Koszalin, Poland

Correspondence should be addressed to: Dariusz KLOSKOWSKI, dariusz.kloskowski@tu.koszalin.pl

*Presented at the 47th IBIMA International Conference, 29-30 June 2026, Madrid, Spain

Abstract

Estimating the market value of real estate is a process that forms the basis for assessing the value of a property intended for sale, primarily for sale purposes. This difficult task is undertaken by real estate appraisers, who, based on strict regulations, make forecasts and issue a verdict on the property's value. This forecast is subject to negotiation and dispute between the parties. In most cases, valuations are performed using a comparative approach, employing the paired comparison method, which is relatively simple and poses few challenges, provided there is a database of actual transactions involving comparable properties. Estimating the market value of real estate using the income approach is the least discussed. The literature on the subject tends to avoid this issue, and there are no examples that can be used in the real estate appraiser's practice. With this in mind, this study aims to present a methodology for estimating the market value of residential properties using the income approach, assuming that residential properties generate or have the potential to generate income for their owners, at least in the form of rent. In this study, the application of the income approach is presented in an innovative methodology, assuming a state of military threat related to the war in Ukraine.

The main goal of this article is to present a non-standard methodology for estimating the market value of real estate using the income approach in the face of military threats. The research problem in this article is formulated as follows: Can a situation of military threat to a neighboring country influence the conditions for determining the market value of real estate? The research hypothesis of this study is formulated as follows: residential properties are profit-generating assets for their owners and should be valued as income-generating properties, taking into account the threat risk aspect and geopolitical instability.

The study included a secondary analysis of literature sources and legislative data in Poland and the European Union – this method allowed for the analysis of available data on generating profits from business activities conducted on residential properties, as well as a case study method, which allowed for the analysis of methods of determining the market value of residential properties in conditions of military threats.

In the final part of the study, the material was synthesized and conclusions and recommendations were developed regarding the use of the income approach to the valuation of residential properties under conditions of uncertainty reflecting the state of threat.

Keywords: real estate valuation, income approach, military threats.

Introduction

One of the fundamental analytical processes related to the real estate market is estimating the market or replacement value of a property. Licensed real estate appraisers undertake these challenging tasks. Their task is, on the one hand, to present a methodology based on observed market prices for real estate, and, on the other, to estimate the value of the property, which is expressed in monetary terms. However, it is worth pointing out at this point that the price is not always expressed in monetary terms, as it may reflect, for example, a specific good acquired or a specific service. From the consumer's perspective, price is related to the measure of value¹. Therefore, the concept of price refers to ex post purchase and sale situations and is generally related to market exchange issues. When using this concept in an ex ante context, it should be accompanied by specific adjectives. We can then speak of prices such as: expected price, asking price, minimum price, maximum price, theoretical price, etc.². When considering real estate value, it can be viewed in relation to the future, present, or past. And the use of this economic category doesn't always have to apply to aspects related to the purchase and sale transaction³.

In Polish legislation, aspects related to real estate valuation, including the methodological scope related to determining the value of real estate, are regulated by the Real Estate Management Act⁴ and the implementing regulation regarding real estate valuation⁵. Additionally, in order to generate a procedure scheme, a team of professionals has developed Professional Standards for Professional Appraisers in Poland⁶.

The characteristics of valuation methods and techniques are presented in Figure 1.

¹ Bitner, A., (2022), *Factors shaping the value of real estate*, Geodetic Review, 94, doi: 10.15199/50.2022.4.2, (access: 06.02.2026 r.).

² Żróbek, S., Renigier-Biłozor, M., Walacik, M., (2022), *Legal definition of market value in the theory and practice of real estate valuation in Poland*, Studia Iuridica, 91, pp. 412-430, www.ceeol.com/search/article-detail?id=1096769, (access: 06.02.2026 r.).

³ Antczak-Stępnia, A., Grodzicka-Kowalczyk, M., Sobczak, M., Zaleczna, M., Żelazowski, K., (2021), *The Residential Real Estate Market – Contemporary Spatial, Legal, and Financial Aspects*. University of Lodz Publishing House, doi.org/10.18778/8220-423-0, (access: 06.02.2026 r.).

⁴ *Ustawa z dnia 21 sierpnia 1997 r. o gospodarce nieruchomościami* (Dz. U. 1997 Nr 115 poz. 741), www.isap.sejm.gov.pl/isap.nsf/download.xsp/WDU19971150741/U/D19970741Lj.pdf, (access: 04.02.2026 r.).

⁵ *Rozporządzenie Ministra Rozwoju i Technologii z dnia 5 września 2023 r. w sprawie wyceny nieruchomości* (Dz. U. 2023 poz. 1832), www.isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20230001832/O/D20231832.pdf, (access: 04.02.2026 r.).

⁶ *Professional Standards for Property Appraisers*, (2004), Publishing House of the Polish Federation of Property Appraisers Associations, eighth expanded edition, Warsaw.

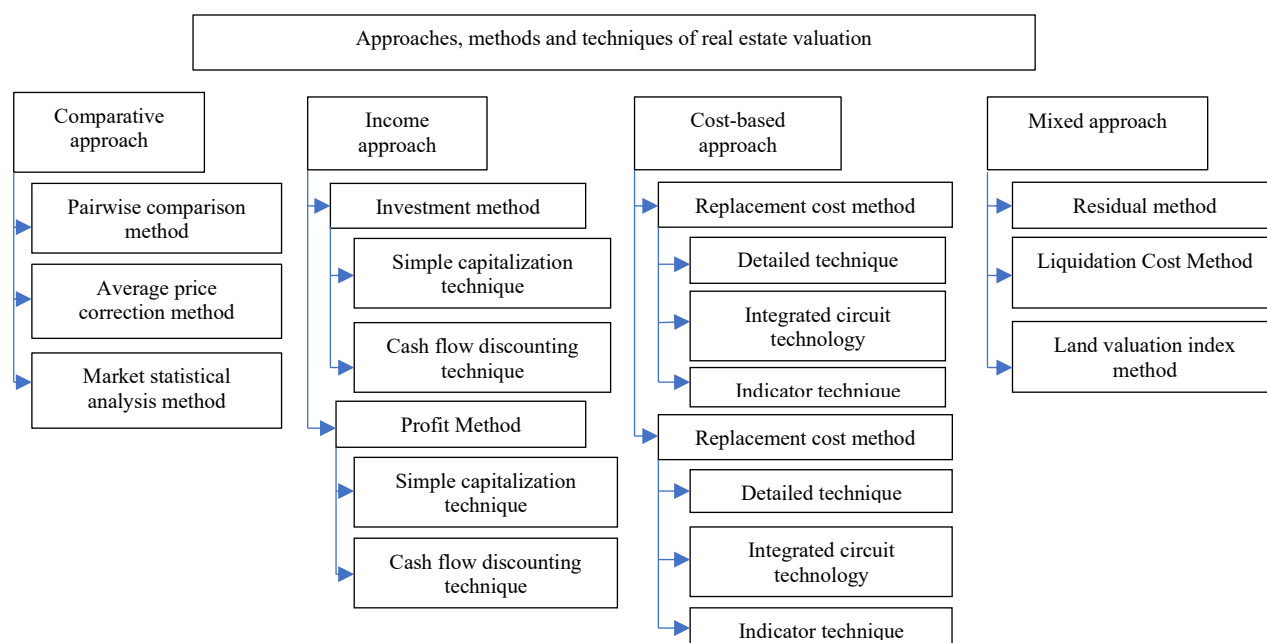


Figure 1. Classification of approaches, methods, and techniques in real estate valuation.

Source: own study.

When analyzing the valuation process in the Polish real estate market, one of the basic and recognized approaches in real estate valuation is the comparative approach. Due to its methodological simplicity, it is the most commonly used approach when determining the market value of real estate. This approach is based on identifying the attributes of real estate, identified by the appraiser, that have a significant impact on its market value. In order to relate the projected value of the appraised property to the prices of comparable properties, it is necessary to determine the extent to which individual attributes of the property influence the prices obtained in the market⁷. This methodological approach is considered the simplest when considering the calculation methodology. However, when, for example, we purchase a property, as is often the case, in order to later reap the benefits of renting it out, we should treat such a property as an investment. Therefore, such a property should be valued not as a home for our own comfort, but as an income-generating asset. Therefore, the valuation itself in this approach is based on the assumption that the buyer will not pay more for the property than the total cumulative income they expect to generate from it in the future⁸.

It's worth noting that the actual income generated from real estate activities doesn't always reflect the property's potential. It sometimes depends on the skills of the property manager, 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 determinable⁹. The above-mentioned premises determine the application of the investment method to valuation in this approach, as well as the possibility of choosing two estimation techniques: simple capitalization and discounted income streams. The former is used when a constant annual income from rents is expected in subsequent years, and when a capitalization rate can be established as the relationship between the transaction price obtained on the market and the annual income generated from rents. Here, the property value is estimated as the product of the income stream flow that can be obtained from the appraised property in a given

⁷ Czaja, J., (2001), *Methods of estimating the market and cadastral value of real estate*, Publisher: Department of Land Information, AGH University of Science and Technology in Krakow, Krakow, p. 125.

⁸ Hozer, J., (2001), *Real Estate, Enterprises, Valuations, Analyses Volume I – Real Estate*, University of Szczecin Publishing House, Department of Econometrics and Statistics, Institute of Economic Analyses, Diagnostics and Forecasts in Szczecin, Szczecin, p. 46.

⁹ Kucharska-Stasiak, E., (1998), *Lexicon of the Property Appraiser*, Publishing House of the Polish Federation of Property Appraisers' Associations, Warsaw, pp. 208-209.

year and the so-called capitalization rate, or the quotient of the annual income stream and the so-called capitalization rate¹⁰.

The technique of discounting income streams is used when estimating the market value of properties where the actual value of the established income will change in the future, as determined by the appraiser. A change in this income level may be caused by the property significantly meeting its assumed capacity plan, which takes into account the provision of services, such as rental or lease¹¹.

The income approach also uses the profit method to determine the market value of real estate. This method is used when properties generate income or are intended to be used as an investment vehicle. Valuation procedures in the profit method are similar to those in the investment method, considering the possible techniques, namely simple capitalization and cash flow discounting.

The income approach is very often associated with the use of discounted economic income methods, which is identified with: rents, dividends, cash flow and accounting profit in the form of net profit or operating profit¹². This is why it is not widely used by appraisers and is often relegated to the background. Nevertheless, when considering the geopolitical crisis, including the war in Ukraine, this approach should be applied. If only because, during the outbreak of the war, Ukrainian refugees residing in Poland frequently rented apartments, and these should be treated as a product generating income for the owner.

Research Materials And Methods

Analyzing the above, in particular, the fact that since mid-2022, demand for apartments in larger Polish cities such as Warsaw, Krakow, Gdańsk, Wrocław, and Poznań has practically exploded, thanks to the relocation of companies from Ukraine. Prices increased by 15-20% in 2023, driven primarily by the needs of relocated businesses and stable refugee families. Many cities have become magnets for the IT and logistics sectors, which has translated into higher developer turnover. Foreign buyers viewed Poland as a safe haven within the European Union¹³. As a consequence of the outbreak of war in Ukraine, the demand for housing for ordinary refugees also increased. According to data from the Ministry of Interior and Administration, at the end of 2022, there were approximately 1.5 million refugees in Poland, of whom over 0.5 million were employed¹⁴. In a short period of time, the demand for housing increased significantly, primarily due to Ukrainian citizens who decided to settle in Poland. This increased pressure on local housing markets and led to a dramatic price increase, which in turn led to overload in the rental sector. On the one hand, this led to changes in investment propensity, manifested by a desire to purchase residential properties for income generation purposes, and on the other, to maximize the use of existing properties for other purposes, including those that were sometimes unused for rental purposes.

With this in mind, it is important to present real estate, mainly residential premises, as an object of generating profit by its owner in a specific situation in which demand is dependent on negative effects, in this case on war, which has a positive impact on the market behavior in the country providing shelter.

The main purpose of the article is to present a methodology other than the standard one for estimating the market value of real estate using the income approach in conditions of military threat.

The research problem in the article was formulated in the form of a question: Can a situation of military threat to a neighboring country influence the change of conditions related to determining the market value of real estate?

¹⁰ Rozporządzenie Ministra Rozwoju i Technologii z dnia 5 września 2023 r. w sprawie wyceny nieruchomości (Dz. U. 2023 poz. 1832), www.isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20230001832/O/D20231832.pdf, (access: 04.02.2026 r.).

¹¹ *Professional Standards for Property Appraisers*, (2004), Publishing House of the Polish Federation of Property Appraisers Associations, eighth expanded edition, Warsaw.

¹² Czaja, J., (2001), *Methods of estimating the market and cadastral value of real estate*, Publisher: Department of Area Information of the AGH University of Science and Technology in Krakow, Krakow, p. 191.

¹³ www.eu-nieruchomosci.pl/ceny-nieruchomosci-a-wojna#wzrost-popytu-i-cen-w-duzych-miastach (access: 03.02.2026 r.).

¹⁴ Nowak, K., (2023), *Housing and social policies – summary of the research cycle of the Urban Policy Observatory of the IRMiR*, Urban Policy Observatory Research, Institute of Urban and Regional Development, Warsaw–Kraków, www.obserwatorium.miasta.pl/wp-content/uploads/2024/01/Mieszkalnictwo-i-polityki-spoeczne-podsumowanie-cyklu-badawczego-Obszerwatorium-Polityki-Miejskiej-IRMiR.pdf, (access: 02.02.2026 r.).

The research hypothesis of the study was formulated in the form of a statement that: residential properties are objects generating profits for their owners and they should be valued as income-generating properties, taking into account the aspect of threat risk, taking into account geopolitical instability.

The following research methods and tools were used in the study:

- secondary analysis of literature sources and legislative data in Poland and the European Union – this method allowed for the analysis of available data on generating profits from activities conducted on residential real estate;
- case study method – this approach allowed for the analysis of methods for determining the market value of residential properties in conditions of military threats.

Income approach – methodology in standard conditions

Valuing real estate using the income approach can be viewed as a form of forecasting. This approach assumes that the buyer will not pay more for the property than the total cumulative income they expect to generate from it in the future. At the same time, it's important to remember that the current owner theoretically won't sell the property for less than the value equivalent to the expected rental income over a given period¹⁵. It's worth noting that the actual income generated from a property doesn't always reflect its potential. This depends largely on the specialist skills of the property manager. Their work is particularly evident in the housing market, especially when looking at the functional and operational condition of buildings¹⁶.

To perform forecasts and analyses using the income approach, the following values should be verified: revenues, operating costs, and key interest rates: real interest rate, capitalization rate, inflation rate, rate of return, and discount rate. One of the most difficult factors to estimate here is the level of rental rates. Determining them in a given local market is relatively easy, but properly prepared financial projections require estimating a long-term rental rate forecast. For this reason, the use of the income approach is highly limited. Properties subject to valuation must generate income or have the potential to generate income in the future. Furthermore, this income must be known or determinable¹⁷.

Such conditions do not allow for the full application of this approach in the Polish real estate market. Therefore, its use is very limited and is used only by a few appraisers. This is primarily due to the limited real estate database and the fact that residential properties, agricultural land, and development land are primarily traded. These, in turn, are commonly treated as non-income-producing properties. However, considering the previous considerations, particularly the fact that in unusual situations, such as the outbreak of war in Ukraine, properties that provide daily home security in the vast majority of cases can generate income for the owner. The same applies to residential properties located by the sea. Very often, buyers, from the very beginning, aim for the additional apartment to generate income. Therefore, it can be concluded that when determining the market value of residential properties intended for rental purposes, a methodology appropriate to the income approach should be used, which can be performed using the investment method and the profit method.

The investment method is used to determine the value of properties that generate or have the potential to generate income from rental or lease payments. The amount can be determined based on an analysis of market rental rates. Rental income is predicted after analyzing market rental or lease rates for similar properties, their frequency of change, and the feasibility of obtaining them depending on the property's condition.

Two techniques can be used: the simple capitalization technique and the technique related to discounting income streams. The simple capitalization technique itself is used when a constant annual rental income is expected for at least five years, and when a capitalization ratio can be established as the relationship between the transaction price obtained on the market and the annual income generated from rents. Here, the property's value is estimated as the product of the income stream that can be obtained from the appraised property in a given year and the so-called capitalization ratio, or the quotient of the annual income stream and the so-called capitalization rate. The capitalization ratio here expresses the period in which the investment, which was incurred to purchase a property

¹⁵ Hozer J., (ed.), (2001), *Real Estate, Enterprises, Valuations, Analyses Volume I – Real Estate*, University of Szczecin Publishing House, Department of Econometrics and Statistics, Institute of Economic Analyses, Diagnostics and Forecasts in Szczecin, Szczecin, p. 46.

¹⁶ Dydenko J., (ed.), (2006), *Real Estate Valuation*, ABC Publishing House, Gdynia, p. 324.

¹⁷ Kucharska-Stasiak E., (ed.), (1998), *Lexicon of the Property Appraiser*, Publishing House of the Polish Federation of Property Appraisers' Associations, Warsaw, pp. 208-209.

similar to the property being valued, should generally be recouped from the income generated from similar properties¹⁸. The capitalization rate that appears in the real estate market is the ratio of the income from the property, i.e. the so-called net or gross operating income, to the price obtained on the market for a similar property, taking into account: the nature, location, standard and technical and operational condition, neighborhood, accessibility and communication convenience, as well as other features that significantly influence the price¹⁹.

The discounted income stream technique is used to estimate the value of properties whose actual income will change in the future, as determined by the appraiser. This change in income levels may be caused by the property significantly meeting its planned capacity plan, which includes the provision of services such as rental or lease. This change may also be a consequence of foreseeable market changes or may be caused by changes related to the property's profitability²⁰. The income stream is net operating income, which is projected for each year of the adopted forecast. Typically, the forecast period spans approximately five years. Assuming a longer period requires in-depth investment analysis and long-term forecasts, which contribute to the development of an appropriate income model (Table 1.).

Table 1. Revenue Models

No.	Model	Dependence
1.	permanent income for an unlimited period of time	$V = \frac{1 - \frac{1}{(1+r)^n}}{r};$ when $n \rightarrow \infty$, $V = D \cdot \frac{1}{R}$
2.	fixed income deferred over time	$V = \frac{D}{R(1+r)^n}$
3.	variable income over a limited period of time	$V = D_1 \frac{1}{(1+r)^1} + D_2 \frac{1}{(1+r)^2} + \dots + D_n \frac{1}{(1+r)^n}$
4.	variable income during the forecast period and constant income for an indefinite period	$V = D_1 \frac{1}{(1+r)^1} + D_2 \frac{1}{(1+r)^2} + \dots + D_n \frac{1}{(1+r)^n} + RV \frac{1}{(1+r)^n}$

Source: own study based on Trojanek M., „Capitalization rate and discount rate in theory and practice”, Teaching materials from the Central Seminar of the Association of Real Estate Appraisers in Koszalin, Koszalin 2004.

V - property value, r - capitalization ratio, R - capitalization determinant, RV - residual value.

Analyzing the principles of the profit method, it should be noted that it is used to determine the value of properties that generate income or those intended to be used as an investment vehicle. Unfortunately, income in this method is quite difficult to determine, considering, for example, the investment method. Therefore, this method assumes that the property owner's share of the generated income is a function of the profits generated from the business activity conducted in the area of operation of the property. This method is applicable to the valuation of properties that generate income, but in large numbers are not available on the market for lease or trade. Therefore, one of the most important elements in the valuation is determining the owner's share of the user's net income. The valuation techniques in this method are the same as before: simple capitalization and cash flow discounting.

Taking the above into account, it can be assumed that the task of forecasting and judging the market value of a residential property is easy to implement, but it requires a lot of involvement of a real estate appraiser in matters of preparing data for the final valuation, in particular:

1. *Defining the purpose of the valuation* – which should result from legal provisions and should be very specifically defined.

¹⁸ § 11 section 3 of the Regulation of the Minister of Development and Technology of September 5, 2023, on real estate valuation (Dz. U. z 2023 r. poz. 1832).

¹⁹ Trojanek M., (2004), *Capitalization rate and discount rate in theory and practice*, Teaching materials from the Seminar of the Central Pomeranian Association of Property Appraisers in Koszalin, Koszalin, p. 3.

²⁰ Standard III. 6 point 5. Professional Standards for Property Appraisers, Publishing House of the Polish Federation of Property Appraisers Associations, eighth expanded edition, Warsaw 2004.

2. *Defining the legal basis and sources of substantive data* – sometimes it is necessary to present data sources, such as property inspections or information from the client that has a significant impact on the valuation, as well as data obtained from the Internet with access on a given day and at a specific time.
3. *Description of the condition of the property* – including the legal status, description of the property in terms of the neighborhood and surroundings, the building itself and the residential premises, as well as the mandatory technical condition of the building and the premises with the ongoing renovation and preventive maintenance, the condition of the property surroundings, communication accessibility, availability of utilities, access to services, cultural facilities, etc..
4. *Specification of the intended use in the spatial development plan* – also describing the vicinity and intended use of the areas and facilities adjacent to the plot on which the multi-unit building is located, in which the residential unit being valued is located.
5. *Indication of the type of value being determined* – for example, for the current method of use.
6. *Determining the choice of valuation approach, method and technique* – determined on the basis of legal provisions and standards of property appraisers.
7. *Presentation of a market analysis* – adequate for the real estate being valued, showing the following aspects: supply and demand for a given property, rental rates on the monitored real estate market, market trends, capitalization rate for the local real estate market, based on the following relationship:

$$CR = \frac{NOI}{P/V}$$

where:

CR – capitalization rate,

NOI – net operating income,

P/V – price/value.

8. *Presentation of transactions* – related to properties similar to the property being valued and located in a similar location, preferably the same.
9. *Collecting data on the rental or lease rates* – usually presented in tabular form (Table 2), for several to a dozen or so premises, specifying the features influencing these rates, with established percentage criteria (e.g. general location, specific location, location in the building, neighborhood, transport accessibility, technical condition of the building, technical condition of the premises, finishing standard, functionality, equipment, etc.), with establishing the variability range, as in the case of the comparative approach.

Table 2. Sample table for determining rental/lease rates.

no.	location	description of the property	area [m ²]	rent rate [PLN/m ² /]
1.				
2.				
...				

Source: own study.

$$\Delta C = C_{max} - C_{min}$$

where:

ΔC – range of variation of rental/lease rates [PLN/m²/],

C_{max} – maximum rent/lease rate [PLN/m²/],

C_{min} – minimum rent/lease rate [PLN/m²/].

10. *Determination of market features* – determined on the basis of market research for the property being valued, specifying the gradation of the feature and, if applicable, describing the assigned rating, as shown in Table 3.

Table 3. Sample table for determining market characteristics

no.	market feature	evaluation	description
1.	general location	very good	location on the main streets, very good public transport (distance to the bus stop of line no. 42 50m), the property is located close to the forest and the city park, there are commercial and service facilities in the vicinity.
		satisfactory	location on the main streets, good public transport (distance to the bus stop of line no. 42 500m), the property is located near a forest and a city park (approx. 1km, there is a general store nearby).
		unfavorable	location far from the main streets, very poor public transport (distance to the nearest bus stop no. 42 is 1 km), the property is located next to a company producing fries, about 2 km to the forest and a local park, no commercial and service facilities in the vicinity.
2.			
...			

Source: own study.

11. *Determining the rent rate for the premises in question* – based on the previously determined base rent, taking into account the features adopted through market analysis, including a list of market features, calculation of corrections for the premises being valued.
12. *Determining the market value of the property* – based on the established approach, method and estimation technique, for example using: the income approach, the investment method and the simple capitalization technique, indicating specific assumptions, for example:
 - *The rental rate* – reflects the functionality, standard of finishing and equipment, general and specific location, transport accessibility, technical condition of the building and the residential premises.
 - *Level of operating expenses* – determined based on market research, shown in point 7, for example 12% of the rental rate ($W_o=0.12$).
 - *The degree of utilization of the rented space* – for example 88% ($K_p=0.88$).
 - *Capitalization rate* – determined on the basis of market analysis, specified in point 7, for example 10.5%.
 - *The rent/lease rate is set at a specific level* – as set out in point 11.
 - *Value of commercial real estate* – determined on the basis of the following relationship:

$$V = NOI \cdot W_k$$

where:

V – market value of the property,
 NOI – annual net operating income derived from real estate,
 W_k - Capitalization determinant ($W_k=1/CR$),
 CR – Capitalization rate.

13. *Determining the capitalization rate* – based on market data taking into account the rental rate and the capitalization rate, assuming operating expenses and the space utilization factor.
14. *Calculation of net operating income* – which is the difference between effective gross income and operating expenses, according to the following relationship:

$$EGI = A \cdot RR \cdot F$$

where:

EGI – effective gross income,
 A – area of the premises,
 RR – rental rate,

F – residential premises space utilization factor.

15. *Calculation of the value of the residential premises in question* – i.e. the residential real estate, based on the product of net operating income and the capitalization ratio according to the following relationship:

$$V = NOI \cdot W_k$$

where:

NOI – net operating income (the difference between effective gross income and operating expenses),

W_k – Capitalization rate.

Real estate valuation using the income approach in conditions of military threat

Considering the above, it is worth noting that, from a legal perspective, real estate valuations always take place in conditions of complete stability, i.e., peace. Neither the Real Estate Management Act, the implementing regulation regarding the application of valuation methodology, nor the Professional Standards for Real Estate Appraisers mention any crisis. In principle, any attractiveness analyses supported by real estate valuations do not reflect geopolitical tensions, including military threats. An example is the simulation of threats from Poland's eastern flank (Figure 2.).

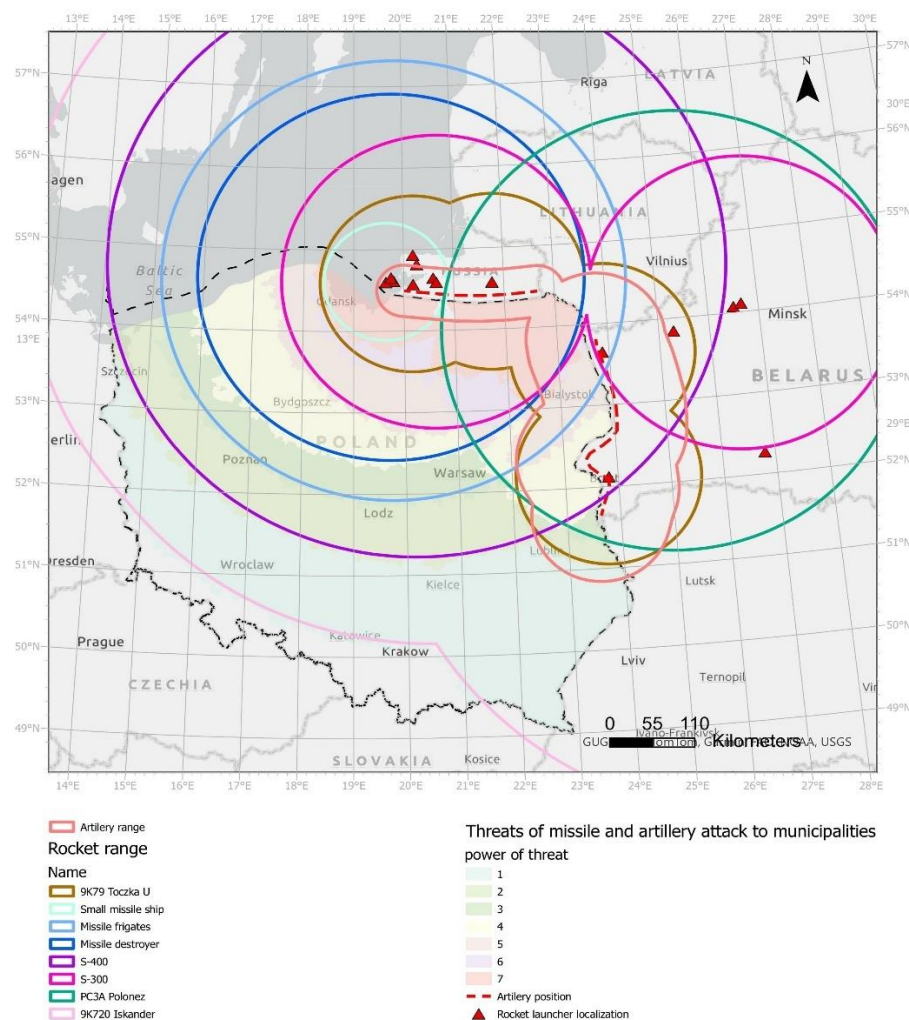


Figure 2. Simulation of missile use from Poland's eastern flank.

Source: own work.

The presented simulation indicates that real estate valuations in individual generated sectors, i.e., areas constituting missile ranges, should be treated differently. Merely considering location should create an element of risk, which is crucial from an investment perspective. Of course, the entire risk analysis should identify key risks that could reduce, rather than increase, the property's value. Intuition, common sense, and extensive experience

can be helpful here and are crucial in making final valuation decisions. However, a thorough market analysis will indicate the appropriate course of action. The simulation shown in the figure is one possible approach, for example, in the context of considering the risk radius associated with air attack assets. An example is the Ukrainian real estate market, which is divided by similar radii separating individual real estate sectors, for which the key parameter is security and missile launch from Russia (Figure 3).

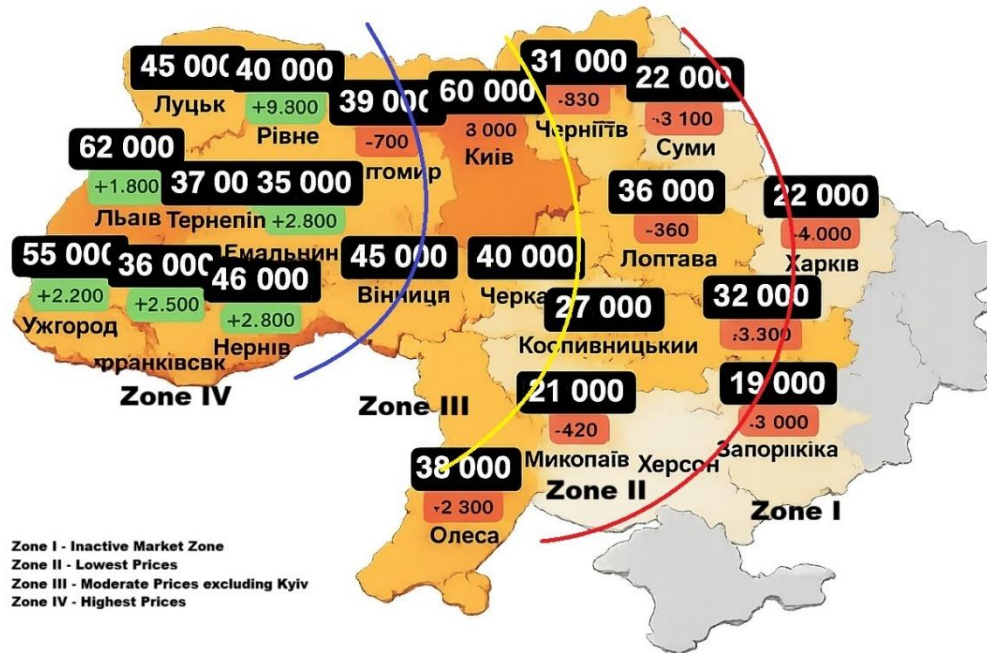


Figure 3. Simulation of missile use from Poland's eastern flank.

Source: own work based on: www.fxmag.pl/nieruchomosci/ceny-nieruchomosci-na-ukrainie-liczba-transakcji-tapnela-ale-zainteresowanie-rosnie.

Therefore, analyzing the convergence of simulated threats in Poland and the actual division of the market due to the ongoing military operations in Ukraine, it can be assumed that real estate valuation may be related to the decision-making system based on operational research, which uses a decision-making model that constitutes an optimal image of the analyzed strategic situation²¹. Therefore, considering the use of the income approach to determining the market value of real estate, the process used in peacetime conditions can be considered valid. However, the final result, based on the product of net operating income and the capitalization rate, should be adjusted for the radius value in the threat area, which is related to the existence of certain limiting attributes, which include: distance from the main front line, energy autonomy, security, and the building's resistance to missile and air attack.

Therefore, the final value of the property in the conditions of actual military threats will be related to the decision-making model, which can be determined according to the following formula:

$$D = \sum_{j=1}^n R_j^{(n)} \cdot V_j$$

where:

D – a decision-making model for determining the value of a residential property in the event of military threats,
 R_j – the value of the hazard radius in a given hazard area Z_j , ($j=1,2,...,n$), where n - means the danger zone,
 V_j – the value of the property determined using the income approach.

Discussion and Conclusions

To summarize the previous discussion, it should be stated that the use of the income approach to real estate valuation in the face of military threats is highly recommended, especially considering the Polish real estate market

²¹ Krzysztofciak, M., (ed.), (1978), *Econometrics*, State Economic Publishing House, Warsaw, p. 231.

after the outbreak of war in Ukraine, which has seen continued interest and progress. Therefore, it can be argued that a military threat to a neighboring country may change the conditions related to determining the market value of real estate. This is, of course, indicative of the market in a neighboring country where military operations are ongoing. Analyzing the impact of location factors on real estate value reinforces the knowledge that location is the most important factor influencing real estate value, but not the only one, as confirmed by the literature review and the presented threat simulation, as well as the state of the real estate market in Ukraine. This trend likely dictates the inclusion of spatial visualization of the real estate market, where innovative valuation methods, enriched with decision-making models, should be used, reinforcing the belief that the decision was made correctly.

Based on the above research, it can be concluded that the income approach is not a frequently used approach by property appraisers, similar to the use of econometric methods. This is largely due to the different approach to analysis, which requires the identification of multiple attributes and their impact on the property being valued, taking into account a large database of properties, unlike the comparative approach, the paired comparison method, which essentially uses only a few from a very narrow geographical area. Furthermore, considering several thematic layers, which constitute a collection of attributes ultimately influencing the final valuation, is time-consuming, which consequently leads to a preference for the simplicity of property valuation.

One of the key conclusions from the research is that the income approach should be applied when a given residential property is actually used to generate income for the owner. This is indicated by regulations, which stipulate that the main comparator should be rent, not real estate transactions. This leads only to simplicity and limitations in the use of the arithmetic mean, rather than to a true analysis. After all, valuation is a judgment of the property's value, not a quick price calculation. Therefore, the proposed solution, which takes into account the threat radius, is a pioneering solution that undoubtedly fits the current situation of uncertainty, not only those related to the armed conflict in Ukraine but also extending to other, even distant, global markets. The research hypothesis of the study, emphasizing that residential properties are objects of generating profits for their owners and should be valued as income-generating properties, taking into account the threat risk aspect, taking into account geopolitical instability, was confirmed, while simultaneously achieving the main goal of the study.

A specific decision-making model for determining property value under threat conditions is a mathematical reflection of the decision-making situation at a given moment in real space. It reflects the conditions resulting from the limited activity of the decision-maker, who has no influence on the environment, but has the ability to respond to disruptions that are diagnosed or identifiable by considering crisis situations in various areas of human functioning.

Literature

- *Act of 21 August 1997 on real estate management* (Dz. U. 1997 Nr 115 poz. 741), www.isap.sejm.gov.pl/isap.nsf/download.xsp/WDU19971150741/U/D19970741Lj.pdf, (access: 04.02.2026 r.).
- Antczak-Stepniak, A., Grodzicka-Kowalczyk, M., Sobczak, M., Zaleczna, M., Żelazowski, K., (2021), *The Residential Real Estate Market – Contemporary Spatial, Legal, and Financial Aspects*. University of Lodz Publishing House, doi.org/10.18778/8220-423-0, (access: 06.02.2026 r.).
- Bitner, A., (2022), *Factors shaping the value of real estate*, Geodetic Review, 94, doi:10.15199/50.2022.4.2, (access: 06.02.2026 r.).
- Czaja, J., (2001), *Methods of estimating the market and cadastral value of real estate*, Publisher: Department of Area Information of the AGH University of Science and Technology in Krakow, Krakow.
- Dydenko J., (ed.), (2006), *Real estate valuation*, ABC Publishing House, Gdynia.
- Hozer, J., (2001), *Real Estate, Enterprises, Valuations, Analyses Volume I – Real Estate*, University of Szczecin Publishing House, Department of Econometrics and Statistics, Institute of Economic Analyses, Diagnostics and Forecasts in Szczecin, Szczecin.
- Krzysztofik, M., (ed.), (1978), *Econometrics*, State Economic Publishing House, Warsaw.
- Kucharska-Stasiak E., (ed.), (1998), *Lexicon of the Property Appraiser*, Publishing House of the Polish Federation of Property Appraisers' Associations, Warsaw.
- Nowak, K., (2023), *Housing and social policies – summary of the research cycle of the Urban Policy Observatory of the IRMiR*, Urban Policy Observatory Research, Institute of Urban and Regional Development, Warsaw-Kraków, www.obserwatorium.miasta.pl/wp-content/uploads/2024/01/Mieszkalnictwo-i-polityki-spoleczne-podsumowanie-cyklu-badawczego-Obszerwatorium-Polityki-Miejskiej-IRMiR.pdf, (access: 02.02.2026 r.).

- *Professional Standards for Property Appraisers*, (2004), Publishing House of the Polish Federation of Property Appraisers Associations, eighth expanded edition, Warsaw.
- *Regulation of the Minister of Development and Technology of September 5, 2023, on real estate valuation* (Dz. U. 2023 poz. 1832), www.isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20230001832/O/D20231832.pdf, (access: 04.02.2026 r.).
- Trojanek M., (2004), *Capitalization rate and discount rate in theory and practice*, Teaching materials from the Central Seminar of the Association of Real Estate Appraisers in Koszalin, Koszalin.
- www.eu-nieruchomosci.pl/ceny-nieruchomosci-a-wojna#wzrost-popytu-i-cen-w-duzych-miastach, (access: 03.02.2026 r.).
- www.fxmag.pl/nieruchomosci/ceny-nieruchomosci-na-ukrainie-liczba-transakcji-tapnela-ale-zainteresowanie-rosnie, (access: 02.02.2026 r.).
- Żróbek, S., Renigier-Biłozor, M., Walacik, M., (2022), *Legal definition of market value in the theory and practice of real estate valuation in Poland*, *Studia Iuridica*, 91, www.cceol.com/search/article-detail?id=1096769, (access: 06.02.2026 r.).