# A method of estimating the Return on Housing Investment (ROHI)

## Arkadiusz J. Derkacz[1]

## Abstract

The aim of the study was to develop a method for estimating the profitability of housing investments. Market practice shows that the profitability of this type of investment is influenced by specific determinants that are absent in the classical approach to profitability analysis. The most commonly used method is the Return on Equity (ROE) ratio, which is dedicated to enterprises. However, housing investments are becoming increasingly popular among individuals, while the classical ROE method proved suboptimal for such ventures (i.e. those involving the purchase of residential property and its subsequent rental to third parties). In this context, we made an attempt to develop a method that would make the estimation of the profitability level of this type of investment possible. Through the decomposition of the ROE ratio, a model for the Return on Housing Investment (ROHI) was created. This model was verified using real market data. Ultimately, we found that the ROHI method allows the estimation of the profitability level while taking into consideration the most important determinants characteristic of this type of investment.

**Key words:** multiple equation models, multiple variables, verification of the ROE ratio, apartment rentals, Return on Housing Investment.

## 1. Introduction

Housing investments are becoming an increasingly popular form of capital investment for both real estate sector companies and private individuals (Christophers, 2022; Krulický & Horák, 2019). However, housing investments should be understood as the purchase of a residential property that is intended for rental to third parties (Davis & Van Nieuwerburgh, 2015). This is, of course, the most general definition of this form of investment. It is also possible for an investor to acquire a property in another way, such as through inheritance or donation (primarily applicable to private individuals). It is increasingly common for development companies to allocate some of their apartments specifically for rental rather than sale (Antczak-Stępniak,

---

[1] Institute of Management and Quality Sciences, University of Kalisz, Kalisz, Poland & National Bank of Poland, Poland. E-mail: a.derkacz@uniwersytetkaliski.edu.pl. ORCID: https://orcid.org/0000-0003-1363-9551.

2019; Tomal, 2017). Of course, there are various ways to get ownership rights to a property, but what is most important is that housing investments require the investor to make an investment decision involving risk in the real estate market. By owning a specific property, the investor rents it out to others. Each such investment requires some investment outlay (greater or lesser), but each investment is made to generate optimal income. As a result, every investor is interested in achieving the highest possible return on their investment.

Currently, there is no longer any doubt that the rental housing market is subject to the phenomenon of financialization (Gadowska-dos Santos, 2018; Piętka, 2023). The 'ideology of homeownership', which has been researched and described by R. Ronald, is considered being the root cause of this phenomenon. According to this concept, residential real estate went from being a good for satisfying housing needs to an investment good (Ronald, 2008). Thus, this type of good has become less and less a social function and more and more an asset to investment portfolios (Fernandez & Aalbers, 2017). In this context, it is important to state that housing-centered financialization is a phenomenon that involves the increasing role – and even dominance – of financial actors, markets, valuations and mechanisms that result in the real transformation of entire economies, companies and, perhaps most importantly, households. In this paper, we will not deal with the aspect of short-term renting (Simcock, 2023) treating only the aspect of investment for housing. In this context, a distinction must also be made between professional/institutional investors and private investors. In both cases, the purpose of the investment is the same, which is to rent one's own flat for a specific profit. However, there are more differences. Their common denominator seems to be the way these two groups of investors operate in the rental market (Byrne, 2020). An obvious difference is also the fact that professional investors are companies with the right knowledge, experience, and tools to optimize housing investments. Private investors entered the residential rental market because of the 'generational annuity' (Aalbers et al., 2021). The development of private housing investment has also been influenced by the privatization processes of public housing, as shown by G. Wijburg and M. Aalbers in the example of Germany (2017). Recent years also reveal a trend of increasing interest in the purchase of housing, which is regarded by private individuals as a form of capital investment. This makes, among other things, the question of the profitability of investments in the residential property market an important argument for making appropriate decisions. For private individuals, such investments are characterized by high capital intensity. Not infrequently, in order to realize their investments, they decide to take out a loan, which increases the real costs of the investment.

In this context, it should be stated that one of the most important indicators is the return on equity (ROE) for residential developments. It is an indicator whose main function is to reveal the efficiency of the business, which is based primarily on the principle of economy and rationality of operation (Almagribi et al., 2023; Dufrénot,

2023). From the perspective of professional or institutional investors, this knowledge is almost taken for granted. However, the situation is different among the Polish public. Here, economic and financial knowledge is at a very low level. Research results confirm that most of the population lacks knowledge of proper management of the household budget and sensible planning of their expenses (Koćwin, 2021). The low level of economic knowledge may cause suboptimal functioning in a market economy (Szczechowiak, 2020). This state of affairs may therefore affect Poles who become private investors in the residential property market. The low level of economic knowledge may cause their decisions being marked by bounded rationality (Lejarraga & Pindard-Lejarraga, 2020). These limitations are, in this case, the result of incomplete information and suboptimal data in investment management (de Clippel & Rozen, 2021). This can cause the expected profitability of housing investments to diverge significantly from the actual profitability. The housing investment profitability calculators that are available on the Internet are also not helpful in addressing this problem. This is one of the most important sources where individuals seek economic knowledge (Bączar et al., 2024). In residential investment, it should be noted that ready-made profitability calculators can be found on the Internet. In the table below, we have presented the range of variables that determine - according to the authors of the individual calculators - the level of profitability of the invested capital. Because of this experiment, it can be concluded that the estimated levels of profitability of investments in rental housing are very simplified. However, these are publicly available tools that most often provide private investors with knowledge in this area.

**Table 1:** List of selected residential investment calculators available on the Internet and variables determining the rate of return

| Sources/Internet address of calculators | Rental income | Fees/administrative rent | Monthly total/operating costs | Purchase price of the flat | Loan costs | Renovation/finishing costs | Furnishing costs | PCC tax | Flat tax 8.5% | real estate agency commission | Notary fees | Annual rental occupancy rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| realtytools.pl | X | - | X | X | - | X | - | X | - | X | X | X |
| eportal-nieruchomosci.pl | X | - | X | X | - | - | - | - | - | - | - | - |
| listaprzetargow.pl | X | X |  | - | - | X | X | X | X | X | - | X |
| calkoo.com | X | - | X | X | X | - | - | - | - | - | - | X |
| planhipoteczny.pl | X | X |  | X | X | X | - | - | X | X | - | X |
| infakt.pl | X | - | X | - | - | - | - | - | - | - | - | - |
| ftathub.pl | X | - | X | X | - | X | - | - | - | - | - | - |
| invest.rentujemy.pl | X | - | X | - | - | - | - | - | X | - | - | - |

*Source: own study.*

A key issue arises for the presented research - Return on Investment. If investments are made by companies, the situation seems straightforward. Every development company, deciding on investment rental of its own apartments, is based on detailed financial analyses (Laszek & Olszewski, 2015). Financial departments are created for this purpose, which estimates the optimal level of the ROE ratio. Analysis of the rental housing segment now suggests some observations. Is the classical method of estimating the ROE ratio optimal for the profitability of housing investments? The second question seems even more important. Does this method allow for the analysis of the profitability of this type of investment by private individuals? These questions became the basis of the main research aim. In this context, an attempt was made to verify the classical method of estimating Return on Equity and adapt it to housing investments. This verification aims to optimally adapt the profitability estimation method to market realities (Konowalczuk, 2018). This method should be useful also – or perhaps primarily – for private investors who do not have their own specialized financial departments.

Working on developing an optimal method for estimating the Return of Housing Investments, the availability of tools for this type of analysis was investigated. Currently, such instruments are mostly sought on the Internet. It turned out that practically these types of advice boil down to analyzing the relationship between profit and investment expenses or the value of the property. This means that the profitability of housing investments relies on calculating the Return on Investment (ROI) for the investor – which is the classic approach to the ROE ratio. The fundamental rules of financial analysis, of course, in terms of the Return on Equity ratio, allow us to answer the question – what profits does the company generate from the capital invested/equity in its operations? Thus, the Return on equity is calculated as the ratio of net profit to equity (Ichsani & Suhardi, 2015). The ROE ratio calculated in this way reveals how much profit the company's capital has generated. Of course, the method for estimating the ROE ratio presented here is very general. There are many sophisticated methods for calculating and interpreting levels of ROE in a company. It is possible to analyses the dynamics of changes in individual profitability determinants, relate net profits to changes in equity levels, or compare changes in profitability in different reporting periods. There are also methods that enable a very detailed decomposition of the ROE ratio, such as the DuPont decomposition model. For this study, a detailed analysis of these methods, which are used to manage the company, is not required. However, the fundamental assumptions of the ROE ratio method relate to the profits and equity of the company. In some tools dedicated to housing investments, the investment return ratio also appears (Gertsekovich et al., 2019). The most significant difference is that, in this case, the analysis suggests examining the level of net profits in relation to investment expenses. From the perspective of corporate finance management, this distinction seems quite obvious. However, the situation is slightly different when an

individual becomes an investor and the investment involves buying an apartment and renting it out to third parties.

Here, the key question regarding the level of profitability should be related to the realities of the real estate market (Gołąbeska, 2017; Haran et al., 2016) and adjusted to the level of usefulness of private investors. Therefore, a critical analysis of the profitability of housing investments should provide an answer to a slightly different question. What is the level of return on investment based on renting an apartment, even for a private investor who does not have their own financial analysis department? This means that the tool for analyzing this type of profitability should also have an educational character, which will enlighten private investors about the optimally wide range of factors that affect the final level of profitability of their investment. The method for estimating the profitability of housing investments should consider those phenomena that directly determine the level of costs and revenues of this type of investment. The statement that the profitability of this type of investment depends on the purchase price of the apartment and the level of rental income is at least suboptimal. It is regrettable that these types of approaches often appear on the Internet as "guides" for investors in the rental segment of apartments in Poland.

Other methods of assessing profitability are also used in financial management, including in housing market operators. What they have in common is that they are intended to inform the soundness of the housing investment. It is sufficient to mention just a few of them here. These methods are often based on a basic cash flow model and Net Operating Income (NOI) calculation, which is the difference between operating income and operating expenses. The Gross Rent Multiplier (GRM) method is based on this. According to the principles adopted here, the value of the investment is estimated by multiplying the projected potential rental income from the property annually by the gross rent multiplier value determined by the investor (Schmidt, 2014). Another method is the so-called direct capitalization. In this case, the investment result is calculated by dividing the Net Operating Income (NOI) by the capitalization rate (Cap Rate – CR). This one is usually determined by the investor (investment value – IRV) or is based on market value. However, the capitalization rate is not the same as the yield (YIELD) or return on investment (ROI). It is also worth mentioning the Cash-on-Cash Return Equity (ROI) method. For residential property investments, it is most often calculated by dividing the pre-tax cash flow forecast by the initial outlay. The value in the numerator most often refers to the first year of the investment. The initial outlay, on the other hand, determines the investor's share without external financing, such as an investment or housing loan (Crosby et al., 2020; Sherman et al., 1933). Another method worth mentioning here is the Internal Rate of Return (IRR). It reports the percentage return on the money invested over each of the investment periods. It is primarily based on the initial outlay, periodic flows, and sales income. The Net Present Value (NPV) method can also be used to evaluate residential investments. This can be

assumed to be the value of the investment, which is the sum of all cash flows minus the initial outlay. However, all these values are discounted values. An even more extensive method of analyzing an investment is the Capital Accumulation Comparison Method (CACM). Its main objective is to identify the investment that will provide the maximum level of accumulation of invested capital in the future. Each of these methods has its advantages and disadvantages. Some are simple, others are more complex. Some are based on a few elements, others are multifactorial (Brealey et al., 2014; Brueggeman & Fisher, 2018). The choice of one method is sometimes determined by external factors or non-financial arguments of investors. Although this is not the purpose of this article, a hypothesis can be made on this basis. We suppose that it would be very valuable if research could consist of comparing different methods of estimating the value/ profitability/justification for making investments in the residential property market. This opens up a new avenue for future research. In the research presented here, the return on equity ratio and its decomposition, according to the Du Pont concept, were chosen as the base method.

These observations have led to an attempt to verify and adjust the Return on Equity (ROE) indicator method to the real conditions prevailing in the rental housing market. Previous studies by real estate market experts reveal a huge diversity of factors influencing phenomena occurring in the housing and rental housing market segments (Laszek et al., 2021; Renigier-Bilozor et al., 2017). This causes defining a specific set of determinants for this segment, which also affects the profitability of housing investments (Wójcik, 2016). This attempt is significant because the results and analyses can create a tool that will optimize decision-making processes for private investors in this segment. This attempt is expected to optimize scientific research on the profitability of such investments. Market research exists that estimates profitability levels based on limited determinants and many theoretical assumptions. To some extent, this is because of difficulties in accessing statistical data. However, there are factors that can be estimated but are not considered in these studies. This attempt can also allow for more detailed and optimal scientific research in this area. These observations became the main determinants for conducting research and analysis that ultimately led to the definition of the Return on Housing Investments (ROHI) indicator.

## 2. Method

The classical approach to calculating the *ROE* indicator assumes a dependency:

$$ROE_t = \frac{NP_t}{CE_t} \times 100 \tag{1}$$

where:
$NP_t$ – net profit, $CE_t$ – capital expenditures.

This method assumes that investment expenditures consist only and only of equity capital. In the situation where a portion of investment expenditures comes from external financing sources, the value of $CE$ should be adjusted by a coefficient of $1 - LTV$; $LTV \in \{0,1\}$, where $LTV$ denotes the percentage of external capital involvement in financing investment expenditures. Aspects characteristic of housing investments are introduced into the classical method of estimating the $ROE$ indicator. Therefore, from this point on, the term "Return on Housing Investment – ROHI" will be used. In economic reality, expenses related to this type of investment do not concern only the cost of purchasing an apartment ($PD$). Additional costs arise for finishing the apartment, its renovation, or adaptation for final use ($PFD$). The first group of costs usually applies to apartments in a developer state. The following types of costs concern apartments from the secondary market. The process of implementing residential investments requires other costs as well. Therefore, initial costs ($IC$) were also introduced into the analysis of the ROHI indicator, which may include costs such as a notary or commission for an intermediary. The cost of insuring the apartment ($IP$) should also be included in the analysis. However, these types of costs are usually financed with equity capital. Nonetheless, they constitute real costs that should be treated as part of investment expenditures. In this context, it is also necessary to introduce a value that is significant from the perspective of financing investments. This is the equity contribution, which is often a condition for obtaining external financing ($MLC$). At the same time, this is capital that can be treated as a potential source of income from alternative investments.

From this, a portion of total investment outlays ($CE$) is the sum of capital associated with financing a housing loan ($CEFL$) and capital not related to external financing ($CE''$). It should be emphasized that this division is not equivalent to the division into internal and external capital. This is because $CEFL$ is the sum of the loan value ($LV$) and the amount of equity ($MLC$). The latter value will be referred to as $MLC = CEFL \times (1 - LTV)$. Therefore, the value of equity ($CE'$) allocated to housing investment should be determined as:

$$CE'_t = MLC_t + CE''_t = CEFL_t \times (1 - LTV) + IC_t + IP_t =$$
$$= (PD_t + PFD_t) \times (1 - LTV_t) + IC_t + IP_t \qquad (2)$$

The value of $CE'_t$ determined in this way will represent the total investment expenditures that have been covered by the investor's own capital. This also means that the total value of external financing is $LV = (PD_t + PFD_t) \times LTV_t$, and the amount of own contribution to the loan is $MLC = CEFL - LV$. Therefore, equation (2) can be written as:

$$CE'_t = MLC_t + IC_t + IP_t \qquad (3)$$

The final form of equation (1) for residential investments will be:

$$ROHI_t = \frac{NP_t}{MLC_t + IC_t + IP_t} \times 100 \tag{4}$$

In the analysis, we can move on to decomposing the net profit value ($NP$). In the most general form, it can be written as:

$$NP_t = GP_t - TAX_t \tag{5}$$

where:
$GP$ – gross profit, $TAX$ – value of taxes.

Next, it is necessary to analyze the detailed factors determining the value of gross income ($GP_t = EBIT_t - FC_t$), which is the difference between the value of operating profit ($EBIT$) and financial costs ($FC$). This can be presented as a set of successive detailed dependencies:

$$
\begin{aligned}
EBIT_t &= EBITDA_t - DV_t \\
DV_t &= RIV_t \times \%dv_t \\
EBITDA_t &= NOI_t - HOC_t \\
NOI_t &= EGI_t - OC_{t_t}^- \\
EGI_t &= PGI_t \times \%rei_t \\
PGI_t &= GRI_t + OC_{t_t}^+
\end{aligned}
\tag{6}
$$

where:

$EBITDA$ – operating profit before deducting interest on borrowed interest-bearing liabilities, taxes, amortization; $DV$ – the value of amortization; $RIV$ – the value of the residential investment subject to amortization; $NOI$ – net operating income; $HOC$ – housing operating costs; $EGI$ – effective gross income; $OC^+/OC^-$ – operational/administrative costs as payable ($+$) or investor's obligation ($-$); $PGI$ – potential gross income; $\%rei$ – rental efficiency ratio; $GRI$ – gross rental income.

A comment on the introduced variable of housing operating costs is required. This variable replaced the value of the company's operating costs, which appear in the classical decomposition of $ROE$. This is because the profitability of residential investments usually concerns individual investors, and it is difficult to speak in this context about the costs of a company. However, it seems reasonable to introduce such a cost item that will reflect the result more realistically. Based on this, the value of operating profit before tax ($EBIT$) can be decomposed as follows:

$$
\begin{aligned}
EBIT_t &= EBITDA_t - DV_t = EBITDA_t - RIV_t \times \%dv_t = NOI_t - HOC_t - RIV_t \times \%dv_t = \\
&= EGI_t - OC_{t_t}^- - HOC_t - RIV_t \times \%dv_t = PGI_t \times \%rei_t - OC_{t_t}^- - HOC_t - RIV_t \times \%dv_t = \\
&= \left(GRI_t + OC_{t_t}^+\right) \times \%rei_t - OC_{t_t}^- - HOC_t - RIV_t \times \%dv_t
\end{aligned}
\tag{7}
$$

where:

$\%dv$ – depreciation rate per year, $RIV$ – initial value of assets subject to depreciation.

After simplifying equation (7), we get the following form:

$$EBIT_t = GRI_t \times \%rei_t + OC_{t_t}^+ \times \%rei_t - OC_{t_t}^- - HOC_t - RIV_t \times \%dv_t \tag{8}$$

The next value to be decomposed concerns financial costs ($FC$). In simplified calculations of Return on Housing Investments, the cost of a housing loan is assumed in this case. However, in reality, this aspect is not so simple. The cost of a mortgage loan, which is intended for the purchase of a property ($LTV_t^{PD}$), is obviously present. There are also situations where the buyers of a property obtain external capital for the renovation or finishing of a rental property ($LTV_t^{PFD}$). One should also not forget about the so-called own contribution, which also generates certain costs ($LTV_t^{MLC}$). On the one hand, these may be costs of equity. On the other hand, there are situations where equity capital also comes from external sources of financing. In this context, it is assumed that investment expenditures financed by a loan are equal to:

$$CEFL_t = PD_t + PFD_t + MLC_t = LV_t + MLC_t \tag{9}$$

This implies that the share of external capital in financing a housing investment should be defined as:

$$LTV = LTV_t^{PD} + LTV_t^{PFD} + LTV_t^{MLC} = 1 \tag{10}$$

The above equation requires some explanation. This concerns the situation when investors get external financing from several loans. That $LTV = 1$ should therefore refer to the total amount of loans. The value of $LTV_t^{PD}$ in equation (10) will therefore be the share of the value of the loan intended for the purchase of the apartment in relation to the total debt of the investor. Similarly, the value of $LTV_t^{PFD}$ should be interpreted. The value of $LTV_t^{MLC}$ will determine the share of equity in the total debt amount. In this context, the decomposition of the financing costs of the housing investment can be continued.

$$FC_t = CEFL_t \times \%lv_t = (PD_t + PFD_t + MLC_t) \times LTV \times \%lv_t =$$
$$= (PD_t \times LTV_t^{PD} \times \%lv_t^{PD}) + (PFD_t \times LTV_t^{PFD} \times \%lv_t^{PFD}) + (MLC_t \times LTV_t^{MLC} \times \%lv_t^{MLC}) \tag{11}$$

where:
$\%lv$ – the interest rate of the loan or the cost of own contribution.

Based on equations (8) and (11), the gross revenue ($GP$) can be expressed as follows:

$$GP_t = GRI_t \times \%rei_t + OC_{t_t}^+ \times (\%rei_t - 1) - HOC_t - RIV_t \times \%dv_t -$$
$$-(PD_t \times LTV_t^{PD} \times \%lv_t^{PD} + PFD_t \times LTV_t^{PFD} \times \%lv_t^{PFD} + MLC_t \times LTV_t^{MLC} \times \%lv_t^{MLC}) \tag{12}$$

At this stage of the analysis, it is possible to move on to a detailed decomposition of equation (5) in terms of tax values ($TAX$). Assuming that $TAX_t = NOI_t \times \%tax_t$, where $\%tax$ represents the tax rate, and using some of the dependencies from equations (6), the decomposition of tax values takes the following form:

$$TAX_t = \left(EGI_t - OC_{t_t}^-\right) \times \%tax_t = \left(PGI_t \times \%rei_t - OC_{t_t}^-\right) \times \%tax_t =$$
$$= \left(\left(GRI_t + OC_{t_t}^+\right) \times \%rei_t - OC_{t_t}^-\right) \times \%tax_t =$$
$$= \left(GRI_t \times \%rei_t + OC_{t_t}^+ \times \%rei_t - OC_{t_t}^-\right) \times \%tax_t =$$
$$= (GRI_t \times \%rei_t + OC_{t_t}^+ \times \%rei_t - OC_{t_t}^-) \times \%tax_t \tag{13}$$

Using equations (2), (12), and (13), it is possible to determine the value of $ROHI$. Equation (4) takes the form:

$$
\begin{aligned}
ROHI_t = {} & GRI_t \times \%rei_t + OC_t^+ \times \%rei_t - OC_t^- - HC_t - RIV_t \times \%dv_t \\
& - PD_t \times LTV_t^{PD} \times \%lv_t^{PD} - PFD_t \times LTV_t^{PFD} \times \%lv_t^{PFD} \\
& - MLC_t \times LTV_t^{MLC} \times \%lv_t^{MLC} - (GRI_t \times \%rei_t \\
& + OC_t \times (\%rei_t - 1)) \times \%tax_t \\
& \times \frac{1}{(PD_t + PFD_t) \times (1 - LTV_t) + IC_t + IP_t} \times 100
\end{aligned}
\tag{14}
$$

To simplify the above equation, the following relationships can be introduced:
- actual gross rental income: $GRI_t^r = GRI_t \times \%rei_t$;
- actual operating costs: $OC_t^b = OC_{t_t}^+ \times \%rei_t - OC_{t_t}^-$;
- actual depreciation: $RIV_t^r = RIV_t \times \%dv_t$;
- actual gross rental income tax: $GRI_t^{tax} = GRI_t \times \%rei_t \times \%tax_t$;
- actual operating costs tax: $OC_t^{tax} = (OC_t^+ \times \%rei_t - OC_t^-) \times \%tax_t$;
- actual costs of financing the purchase of the housing: $FC_t^{PD} = PD_t \times LTV_t^{PD} \times \%lv_t^{PD}$;
- actual costs of financing the finishing/renovation of the housing: $FC_t^{PFD} = PFD_t \times LTV_t^{PFD} \times \%lv_t^{PFD}$;
- actual costs of financing the own contribution: $FC_t^{MLC} = MLC_t \times LTV_t^{MLC} \times \%lv_t^{MLC}$.

Based on this, equation (14) can be written as:

$$
ROHI_t = \frac{GRI_t^r - GRI_t^{tax} + OC_t^r - OC_t^{tax} - HOC_t - RIV_t^r - FC_t^{PD} - FC_t^{PFD} - FC_t^{MLC}}{(PD_t + PFD_t) \times (1 - LTV_t) + IC_t + IP_t} \times 100
\tag{15}
$$

Further simplification of the above equation is possible. Two new dependencies have been introduced:
- $GRI_t^r - GRI_t^{tax} = GRI_t \times \%rei_t - GRI_t \times \%rei_t \times \%tax_t = GRI_t \times \%rei_t \times (1 - \%tax_t) = GRI_t^r \times (1 - \%tax_t)$;

- $OC_t^r - OC_t^{tax} = OC_{t_t}^+ \times \%rei_t - OC_{t_t}^- - (OC_{t_t}^+ \times \%rei_t - OC_{t_t}^-) \times \%tax_t = (OC_{t_t}^+ \times \%rei_t - OC_{t_t}^-) \times (1 - \%tax_t) = OC_t^b \times (1 - \%tax_t)$

Based on the above, it is possible to present the final form of the equation that determines the value of $ROHI$:

$$
\begin{aligned}
& ROHI_t \\
& = \frac{GRI_t^r \times (1 - \%tax_t) + OC_t^b \times (1 - \%tax_t) - HOC_t - RIV_t^r - FC_t^{PD} - FC_t^{PFD} - FC_t^{MLC}}{(PD_t + PFD_t) \times (1 - LTV_t) + IC_t + IP_t} \\
& \times 100
\end{aligned}
\tag{16}
$$

In this way, an equation has been derived that determines the level of Return on Housing Investments, taking into account optimal factors drawn from the reality of the real estate market.

## 3. Research

The proposed method of calculating the Return on Housing Investment in residential properties was verified using statistical data from the Polish economy. To this end, the following dataset was used:

- the average transaction rate per 1 sqm of purchased apartment on the secondary market in Q4 2022, source: NBP;
- interest rate on new housing loans, on average from 2022, source: NBP;
- interest rate on new consumer loans, on average from 2022, source: NBP;
- notarial fees according to the real estate purchase cost calculator[2];
- apartment insurance costs according to the adopted criteria[3];
- average rental prices for apartments with an area of 40−59 sqm in February 2023, source: Otodom Analytics.

Additionally, the following assumptions were adopted for the calculation:

- apartment size of 50 sqm;
- share of the loan for purchasing the apartment in three options, LTV=0%, LTV=60%, and LTV=80%;
- costs of finishing/renovating the apartment based on city groups:
  - Warsaw – 3000 PLN/year;
  - group of 5 cities[4] – 2500 PLN/year;
  - group of 10 cities[5] – 2000 PLN/year;
- costs of maintaining the apartment based on city groups:
  - Warsaw – 1500 PLN/year;
  - group of 5 cities – 1200 PLN/year;
  - group of 10 cities – 1000 PLN/year;
- cost of equity – 0% (excluded from the calculation);
- tax rate on rental income – 8.5% annually;
- number of months of renting the apartment – 12 months;
- value of operating costs based on city groups:
  - Warsaw – 1200 PLN/year;
  - group of 5 cities – 1000 PLN/year;
  - group of 10 cities − 800 PLN/year;
- apartment depreciation coefficient – 1.5% annually.

Based on the above, the level of Return on Housing Investments was estimated for individual voivodeship cities in Poland using equation (16). Calculations were performed for three options based on the level of involvement of a housing loan (see Figures 1–3).

---

[2] https://www.bankier.pl/narzedzia/kupno-nieruchomosci
[3] https://www.ubezpieczeniemieszkania.pl
[4] The group of 5 cities included Gdańsk, Kraków, Łódź, Poznań and Wrocław.
[5] The group of 10 cities included Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów, Szczecin and Zielona Góra.
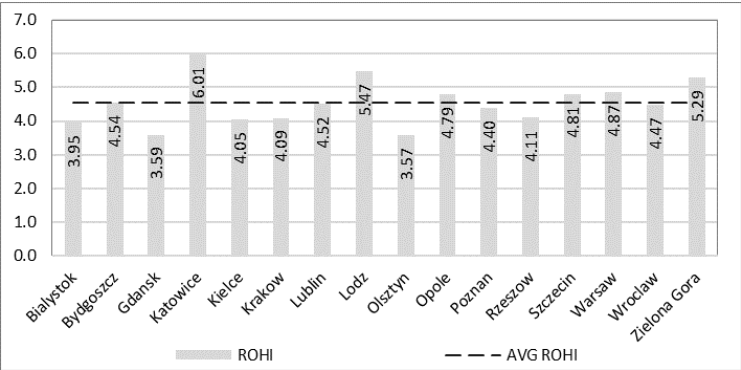
**Figure 1:** Levels of Return on Housing Investment by cities in %, LTV=0%.
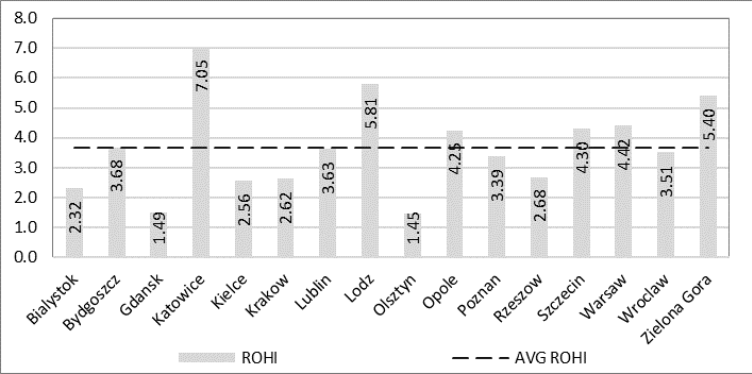
*Source: own study.*



**Figure 2:** Levels of Return on Housing Investment by cities in %, LTV=60%.
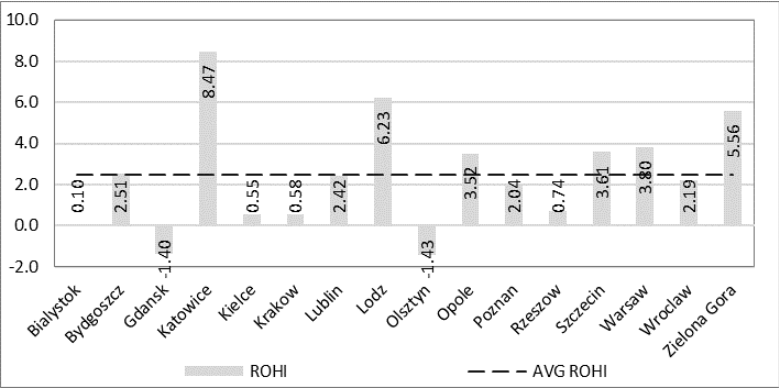
*Source: own study.*



**Figure 3:** Levels of Return on Housing Investment by cities in %, LTV=80%.

*Source: own study.*

The presented method for estimating the Return on Housing Investments also allows for diagnosing the strength of the impact of individual determinants that appear on the right-hand side of equation (16). For this comparison, the expression from the denominator of the equation (16), $(PD_t + PFD_t) \times (1 - LTV_t)$, was adopted as the value of $MLC_t$ in accordance with equations (2) and (3). In addition, independent variables were standardized within individual voivodeship cities. This made it possible to compare the impact of 10 determinants of the Return on Housing Investments under specified assumptions (see Figures 4–6). It should be emphasized that $MLC_t$ values were plotted on the right-hand axis.
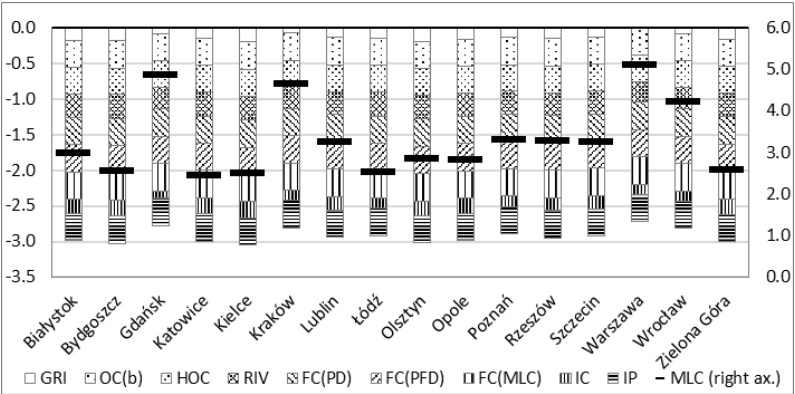


**Figure 4:** Strength of the determinants' impact on the level of Return on Housing Investments (ROHI) by cities in %, LTV=0%.
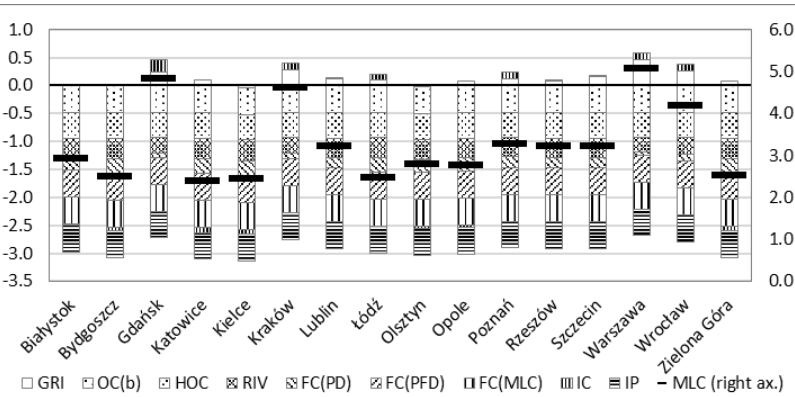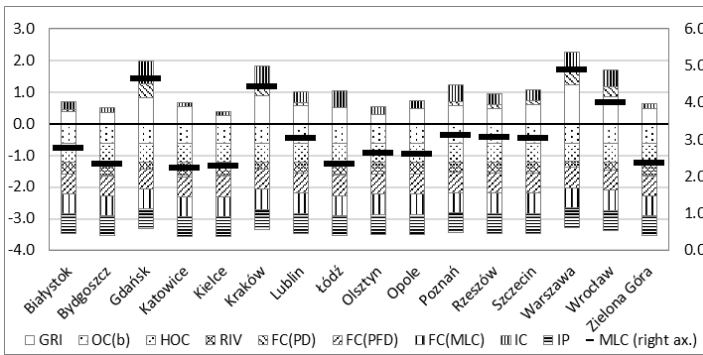
*Source: own study.*



**Figure 5:** Strength of the determinants' impact on the level of Return on Housing Investments (ROHI) by cities in %, LTV=60%.

*Source: own study.*

**Figure 6:** Strength of the determinants' impact on the level of Return on Housing Investments (ROHI) by cities in %, LTV=80%.

*Source: own study.*

The scope of the research should not only be limited to measurements using the new ROHI index. It is also important to compare these results with measurements according to the simplified method. This will reveal discrepancies in profitability results that may mislead investors. For this purpose, the profitability of the investment was estimated by rejecting the individual components that were entered the HRAI index model. One by one, the items that were rejected were (1) the costs of finishing/renovating the flat, (2) the costs of insuring the flat, (3) the costs of operating the flat, (4) the taxation of rental income and (5) depreciation. Finally, a level of profitability was achieved, which was referred to as simplified profitability. The following three figures show the results. It turned out that the simplified profitability is on average approximately 10% higher than the profitability estimated according to the ROHI method. This means that the real income for tenants per year is several thousand zloty lower than that calculated according to the simplified profitability. These differences, especially for individual tenants, are significant from the perspective of their budgets.
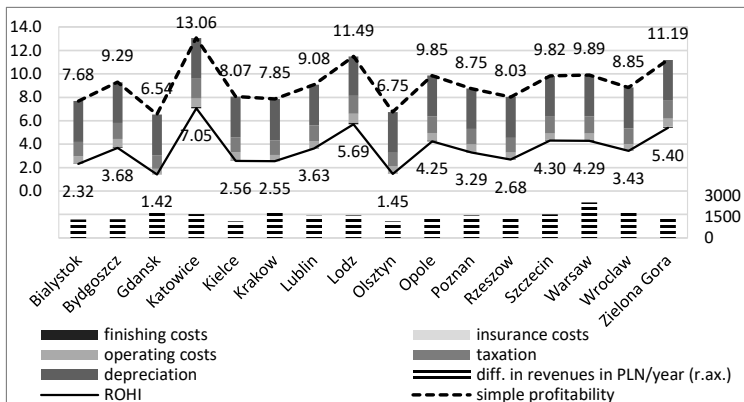


**Figure 7:** Comparison of ROHI index values with simple profitability by city in %, LTV=0%.
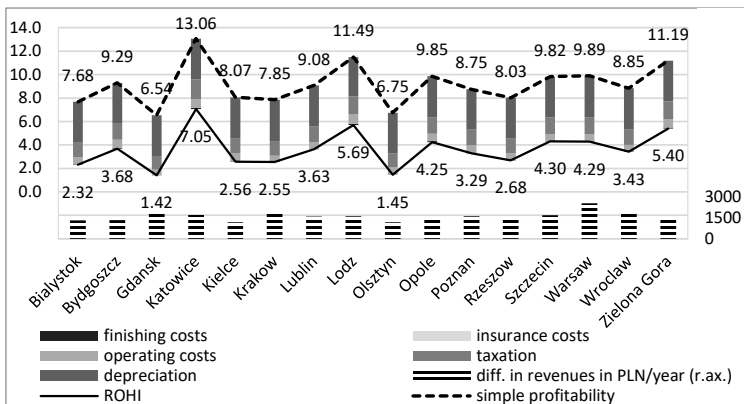
*Source: own study.*

**Figure 8:** Comparison of ROHI index values with simple profitability by city in %, LTV=60%.
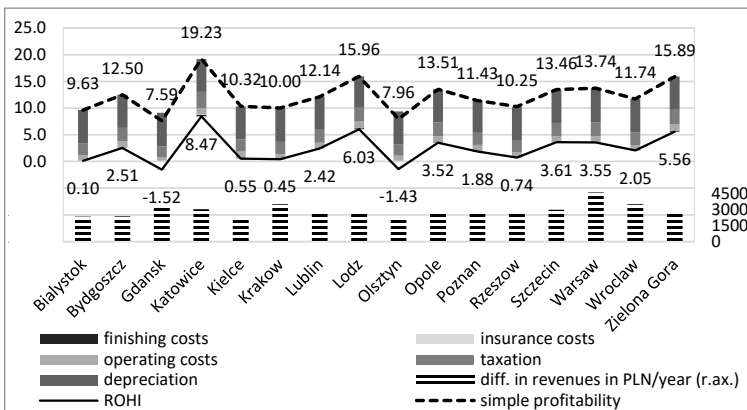
*Source: own study.*



**Figure 9:** Comparison of ROHI index values with simple profitability by city in %, LTV=80%.

*Source: own study.*

## 4. Discussion

The results of the decomposition of the *ROHI* index should be discussed. This requires, first and foremost, the interpretation of equation (16) along with the disclosed determinants. The value in the denominator determines the level of equity capital involvement in the implementation of the housing investment. Some of this capital is treated as a contribution to the loans taken out, while the remaining part is investment expenditures solely derived from own capital. In this context, the value in the denominator of equation (16) can be expressed in the following form:

$$\frac{1}{CE'_t} = \frac{1}{(PD_t + PFD_t) \times (1 - LTV_t) + IC_t + IP_t} \tag{17}$$

This shows that an increase in external capital involvement ($LTV_t$) results in a decrease in equity capital involvement ($CE'_t$), which appears to be a favorable relationship. An increase in investment expenditures in the $IC_t$ and $IP_t$ areas directly increases the investor's equity capital involvement, reducing the value of $ROHI$ index.

Equation (16) also requires interpretation in terms of the values that have emerged in its numerator. Here, seven factors appear that affect the final value of $ROHI$ in different ways, some of which are corrected by the tax rate ($\%tax_t$). First, the actual net rental income value needs to be described. It takes the form of $NRI_t^r = GRI_t^r \times (1 - \%tax_t)$, which represents the actual rental income adjusted for the rental efficiency ratio and tax costs.

The second factor increasing the level of ROHI is the real value of net operating costs, which can be expressed as $NOC_t^b = OC_t^b \times (1 - \%tax_t)$. This is the value of operating/administrative costs also adjusted for the rental efficiency ratio and tax costs. However, this variable requires further explanation. Operating costs are defined as costs that arise in the relationship between the owner of the apartment and the community or cooperative housing administration. In the case of renting an investment apartment, this type of cost is usually passed on to the tenant. However, two options may arise, which are revealed in the rental efficiency ratio. If the apartment is rented for the whole year, the $\%rei$ ratio equals 1. This means that the value of $OC_t^b = 0$ and thus $NOC_t^b = 0$. However, a different situation arises when the investment apartment is rented for, for example, 10 months a year. This means that the $\%rei$ ratio equals $10/12 = 0.83$. This means that the real value of operating costs becomes negative. This results in the owner of the investment apartment being obliged to cover them from their own capital. The occurrence of an additional operating/administrative cost directly and negatively affects the level of investment profitability. It should also be emphasized that in reality, the $\%rei$ ratio can take values from 0 to 1.

In this context, it is important to describe a situation where the owner of a rental property charges the tenant for operating costs ($OC$) higher than their obligations to the community administration or property manager. If the landlord generates a real value of balanced operating costs ($OC_t^r > 0$), it will increase real income. This follows from the decomposition of the $EBIT$ indicator (formula 8). This value will increase the taxable income base (formula 13). This way, a real value of balanced net operating costs will appear, which will increase the value of the $ROHI$ index.

The remaining values in the numerator of equation (16) seem to be significantly less complicated. It is characteristic that each of them is preceded by a minus sign, showing that an increase in their value would cause a decrease in the level of Return on Housing Investments. In the above considerations, equation (16) can be written in its final form:

$$ROHI_t = \frac{NRI_t^r + NOC_t^b - HOC_t - RIV_t^r - FC_t^{PD} - FC_t^{PFD} - FC_t^{MLC}}{(PD_t + PFD_t) \times (1 - LTV_t) + IC_t + IP_t} \times 100 \qquad (18)$$

The results of calculating the Return on Housing Investments according to the proposed method generate two main benefits. First, it should be emphasized that the estimated ROHI ratio provides an optimal picture of profitability due to a wide range of interacting factors. The presented research results clearly show that financial costs are only a part of the factors that affect the level of profitability of this type of investment. These costs are usually the only ones taken into account in simplified calculators of the profitability of housing investments. Second, the unquestionable advantage of using this type of method is that a detailed analysis of the factors affecting the final level of Return on Housing Investments is possible. Such knowledge at the stage of planning or investment decision-making can be a source of additional benefits for investors and investment optimization. These are among the elements that have sparked interest in the business of the real estate sector in the proposed method of estimating the ROHI ratio. Currently, the implementation of the described method in the form of a profitability calculator for housing investments, which will be publicly available on websites, is planned.

The proposed method also has its limitations. Firstly, it can be mentioned that ROHI is a static measure. This means that it does not take into account the change in the time value of money. Although this is a factor that is often analyzed in the investment decision-making process, to present the ROHI method, this approach has been abandoned. This is due to two assumptions. On the one hand, the future value can be estimated in a simplified manner based on an annual interest rate. In such situations, the present value can also be estimated based on the discount rate and the effective interest rate. These issues, although statistically and economically sound, give rather general results. To calculate the time value of money in a very precise manner, one would have to take into account many factors that influence this value. Suffice it to mention macroeconomic factors, i.e. inflationary processes or currency exchange rate changes, and microeconomic factors, i.e. investors' consumption preferences, risks or opportunity costs. These types of factors are numerous. It does not seem reasonable to include them in the proposed method. This would make the ROHI method very complicated. It should be emphasized at this point that the method was primarily developed as a decision support tool for individual investors and not for specialized think tanks.

Another limitation of the presented method is the accrual perspective used. This leaves the cash flow perspective, which is relevant to the cash method, out of consideration. This limitation, however, is the consequence of having to choose one of the possible options. Of course, it is possible to create two ROHIs separately for each financial perspective. However, would such a solution generate additional added value? At the same time, it should be made clear that the accrual method and the cash method have their advantages and disadvantages. The main advantage of the second method is

that it shows the result based on real money flows. Another advantage often mentioned by accounting experts is that it is simpler than the accrual method. However, the most important disadvantage of the cash method is its limitation in the long-term analysis of the financial health of a business. This may be the main argument for choosing the accrual method. This method provides the opportunity for this type of analysis. In addition, the accrual method reveals a broad picture of assets and liabilities, provides an analytical view of formal accounting records and is favored in International Accounting Standards (IAS). This kind of argumentation can give rise to a very wide debate on the subject. Which method is better and in which situations should they be used? For the development of the ROHI method, no such discussions were held. It was decided that return on equity and the Du Pont decomposition would be the foundation. This makes the accrual method a far better choice here.

As the issue of return on investment is very broad and multifaceted, many other limitations of this method can be written about. Certainly, there may be criticism that the estimation of the return on investment does not take into account the possibility of reselling the flat in the future, which will increase the capital inflow for the owner. Full agreement. There will certainly also be proponents of the claim that the sale of investment flats is no longer an investment in itself, but a mere disposal of fixed assets. It is a mere sale and not a rental investment. Such behavior is closer to the profit-making activity of 'buying cheaper and reselling more expensively'. In addition, it can be noted that the ROHI is estimated for a specific time horizon and does not take into account rolling profitability, albeit on a compound interest basis. Furthermore, the proposed method does not take into account alternative/potential profits and costs, the investor's income issues and the investor's creditworthiness. According to it, the anchoring aspect and the investor's perspective are also not taken into account. Is, for example, 15% profitability a lot or a little? For which investor is this the optimal level? Does the answer to this question lie in the perspective of, for example, the investor's income or perhaps in economies of scale? If an individual investor owns only one flat, for example, he expects a 15% yield. If he already owns five flats, 5% of each might be enough for him. Discussions on this and similar topics can be held for a very long time. One thing is certain. It is not possible to create a one-size-fits-all ROHI that will include 'the whole world' on the 'right side of the equation'. The proposed ROHI method was intended to allow individual investors to estimate their residential investments more optimally. More optimal is one that takes into account a larger catalogue of factors than the simple models we wrote about earlier. On the other hand, it cannot be a method that, with its above-average complexity, becomes inaccessible to this group of investors. This is one of the reasons why it was decided that return on equity and the Du Pont decomposition method would be its substantive foundation.

The method of calculating the ROHI indicator also allows for examining changes in the profitability of residential real estate investments in the long run. However, the results of such research were not presented in this paper, as it was not the aim of the analyses. The proposed method can fill an analytical gap or optimize existing research on the profitability of this type of investment. By optimization, we mean expanding the catalog of significant determinants affecting changes in the ROHI level. This may cause result in such research more realistically showing the levels of profitability of housing investments. The proposed method can create a profitability calculator for housing investments. From the investor's point of view, such an analysis has the potential to reveal various factors that ultimately affect the level of investment profitability. This, in turn, can enable more conscious investment decision-making.

The proposed method for estimating the ROHI indicator can also facilitate further research on the rental housing segment. By analyzing the identified factors, which are recorded as independent variables, it can be assumed that they "hide" institutions that affect the level of Return on Housing Investments. It seems that research into social, economic, and legal-political institutions could be a source of new valuable insights from the perspective of economics, private investors, or even the legislature, which co-shapes the environment of such investment instruments in the real economy.

## Acknowledgement

## References

Aalbers, M. B., Hochstenbach, C., Bosma, J. and Fernandez, R., (2021). The Death and Life of Private Landlordism: How Financialized Homeownership Gave Birth to the Buy-To-Let Market. *Housing, Theory and Society*, *38*(5), pp. 541–563. https://doi.org/10.1080/14036096.2020.1846610.

Almagribi, M. K., Lukviarman, N. and Setiany, E., (2023). Financial Determinants of Corporate Cash Holdings: Evidence from Property and Real Estate Companies in Indonesia. *Review of Integrative Business and Economics Research*, *12*(3), pp. 251–260.

Antczak-Stępniak, A., (2019). *Determinants of Development Activity in the Polish Housing Market*. Wydawnictwo Uniwersytetu Łódzkiego.

Bączar, A., Dąbrowska, A., Polak, M. and Sekścińska, K., (2024). *Poziom wiedzy finansowej Polaków 2024. VII.*

Byrne, M., (2020). Generation rent and the financialization of housing: A comparative exploration of the growth of the private rental sector in Ireland, the UK and Spain. *Housing Studies*, *35*(4), pp. 743–765. https://doi.org/10.1080/02673037.2019.1632813.

Christophers, B., (2022). Mind the rent gap: Blackstone, housing investment and the reordering of urban rent surfaces. *Urban Studies*, *59*(4), pp. 698–716.

Davis, M. A., Van Nieuwerburgh, S., (2015). Housing, Finance, and the Macroeconomy. In G. Duranton, J. V. Henderson, & W. C. Strange (Eds.). *Handbook of Regional and Urban Economics,* Vol. 5A, pp. 753–811. Elsevier. https://doi.org/10.1016/B978-0-444-59531-7.00012-0.

de Clippel, G., Rozen, K., (2021). Bounded rationality and limited data sets. *Theoretical Economics*, *16*(2), pp. 359–380. https://doi.org/10.3982/TE4070.

Dufrénot, G., (2023). Interest Rates, Financial Markets, and Macroeconomics. In G. Dufrénot, New Challenges for Macroeconomic Policies. S*pringer International Publishing*, pp. 195–257. https://doi.org/10.1007/978-3-031-15754-7_5.

Fernandez, R., Aalbers, M. B., (2017). Housing and Capital in the Twenty-first Century: Realigning Housing Studies and Political Economy. *Housing, Theory and Society*, *34*(2), pp. 151–158. https://doi.org/10.1080/14036096.2017.1293379.

Gadowska-dos Santos, D., (2018). Istota i skala finansjalizacji rynku nieruchomości mieszkaniowych w Polsce w latach 2000–2015. *Studia i Prace Kolegium Zarządzania i Finansów*, *165*, pp. 111–140. https://doi.org/10.33119/SIP.2018.165.7.

Gertsekovich, D., Gorbachevskaya, L., Grigorova, L. and Peshkov, V., (2019). Return on investment in REIT real estate funds. *IOP Conference Series: Materials Science and Engineering*, *667*(1), 012025. https://doi.org/10.1088/1757-899X/667/1/012025.

Gołąbeska, E., (2017). Współczesne trendy na rynku nieruchomości mieszkaniowych. In E. Broniewicz (Ed.), Gospodarowanie przestrzenią w warunkach rozwoju zrównoważonego. *Oficyna Wydawnicza Politechniki Białostockiej,* pp. 85–106.

Haran, M., McCord, M., Davis, P., McCord, J., Lauder, C. and Newell, G., (2016). European emerging real estate markets: Re-examining investment attributes and framing opportunities. *Journal of Property Investment & Finance*, *34*(1), pp. 27–50. https://doi.org/10.1108/JPIF-04-2015-0024.

Ichsani, S., Suhardi, A. R., (2015). The Effect of Return on Equity (ROE) and Return on Investment (ROI) on Trading Volume. *Procedia – Social and Behavioral Sciences*, *211*(25), 896–902. https://doi.org/10.1016/j.sbspro.2015.11.118.

Koćwin, J., (2021). Ethics in the financial services market. Knowledge, consumer education and morality. *Wrocławsko-Lwowskie Zeszyty Prawnicze*, *12*(1), pp. 37–52.

Konowalczuk, J., (2018). Households Investments in the Residential Real Estate Market. *Świat Nieruchomości*, *1*(103), pp. 21–28.

Krulický, T., Horák, J., (2019). Real estate as an investment asset. *SHS Web of Conferences*, *61*(010011). https://doi.org/10.1051/shsconf/20196101011.

Laszek, J., Augustyniak, H. and Olszewski, K., (2021). The development of the rental market in Poland. In Real Estate at Exposure. New Challenges, Old Problems, *Oficyna Wydawnicza SGH*, pp. 263–274.

Laszek, J., Olszewski, K., (2015). The behaviour of housing developers and aggregate housing supply. *NBP Working Paper*, *206*. http://dx.doi.org/10.2139/ssrn.2642756.

Lejarraga, J., Pindard-Lejarraga, M., (2020). Bounded Rationality: Cognitive Limitations or Adaptation to the Environment? The Implications of Ecological Rationality for Management Learning. *Academy of Management Learning & Education*, *19*(3), pp. 289–306. https://doi.org/10.5465/amle.2019.0189.

Piętka, A., (2023). Residential private rental market in Poland – prospects and challenges. *Studia BAS*, *4*, pp. 9–25.

Renigier-Bilozor, M., Wisniewski, R. and Bilozor, A., (2017). Rating attributes toolkit for the residential property market. *International Journal of Strategic Property Management*, *21*(3), 307–317. https://doi.org/10.3846/1648715X.2016.1270235.

Ronald, R., (2008). *The ideology of home ownership: Homeowner societies and the role of housing.* Palgrave Macmillan. https://books.google.com/books?hl=pl&lr=&id=gCuHDAAAQBAJ&oi=fnd&pg=PR1&dq=R.+Ronald,+The+Ideology+of+Home+Ownership.+Homeowner+Societies+and+the+Role+of+Housing,+Houndmills,+Palgrave+Macmillan,+UK+2008&ots=h73qvHBfjv&sig=5psTs31ue8t3Y2xJ0Ve6cKz25kg.

Simcock, T., (2023). Home or hotel? A contemporary challenge in the use of housing stock. *Housing Studies*, *38*(9), pp. 1760–1776. https://doi.org/10.1080/02673037.2021.1988063.

Szczechowiak, E., (2020). Economic education and the entrepreneurial attitudes of students. Report on research on saving and spending money. In W. Truszkowski (Ed.), *Uwarunkowania budowy bezpieczeństwa prawnego, ekonomicznego i społecznego w Polsce* (p. 89), Uniwersytet Warmińsko-Mazurski w Olsztynie.

Tomal, M., (2017). Identifying the factors that significantly influence decisions to make housing development investments in the communes of Małopolska province. *Folia Pomeranae Universitatis Technologiae Stetinensis*, *88*(337), pp. 67–76.

Wijburg, G., Aalbers, M. B., (2017). The alternative financialization of the German housing market. *Housing Studies*, *32*(7), pp. 968–989. https://doi.org/10.1080/02673037.2017.1291917.

Wójcik, A., (2016). Residential Real Estate as an Investment Instrument. *Annales Universitatis Mariae Curie-Skłodowska*, *L*(3), pp. 195–203.