

FINANCIAL EFFICIENCY AND INVESTOR BEHAVIOR ON THE EUROPEAN REAL ESTATE MARKET IN THE RISING INFLATION ENVIRONMENT

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Keywords: real estate market, inflation, financial efficiency, investor behavior	The pandemic, followed by the Russian aggression against Ukraine, caused rapid changes in the economy. European countries experienced unprecedented price increases, which resulted in a significant increase in the cost of capital. This resulted primarily in limited access to capital and a significant reduction in investments in the real estate market. In addition, investors began to withdraw capital from investments in the real estate market to other assets, encouraged by their rising rates of return. The article presents how the indicated circumstances translated into the financial efficiency of companies from the Real Estate sector. Listed companies of the European Economic Area in the years 2019-2022 were analyzed. Changes in the main accounting measures and market measures for individual countries as well as the characteristics of real estate market participants were analyzed.
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1. Introduction

According to Eurostat data, the average annual inflation in the European Union between 2019 and 2022 was 3.58%, ranging from a low of 0.75% observed in 2020 to a high of 9.16% recorded in 2022 (EUROSTAT, 2023). In the second half of 2022, the European Central Bank decided to raise refinancing rates from 0% to 2.5% (BANKIER, 2023). In Poland, the benchmark rate increased to 6.75% (NBP, 2023). These actions naturally result in a limitation of credit availability, which is a fundamental source of financing for real estate investments. According to a study conducted by the Credit Information Bureau, mortgage inquiries decreased by 72% from 2022 compared to the previous year, while the number of mortgage drawdowns decreased by 70% (BIK, 2023). The limitations in demand have direct consequences

on the number of real estate development projects being carried out, as well as the revenues and financial results of the real estate industry.

On the other hand, the increase in inflation leads to rising costs, including construction materials, energy, and labor. As a result, despite a decrease in demand and sales, property prices do not decline, in fact, they continue to rise. Analyses conducted by Eurostat have shown that property purchase and rental prices increased during the period of 2019-2022. Rental prices have been steadily increasing by an average of 1.5%, while the increase in housing prices is even higher. The largest increase was recorded in 2021, reaching 13% (EUROSTAT, 2023). Rental prices increasing at a rate comparable to the average price growth. The aim of the article is to analyze the co-occurrence of complex trends caused by inflation and the real estate market. The article assesses the

influence of inflation-induced perturbations on the behavior of real estate investors. It evaluates the changes over time in market-based measures of financial efficiency in the real estate market, linked to the returns achieved by investors. The article also examines whether the period of inflation growth has caused changes in the financial efficiency of real estate companies. The assessment includes accounting measures of efficiency, determined based on financial statements. The structure of the article has been adapted to the intended purpose of the study. It begins with a review of existing research on the co-occurrence of inflation and the real estate market, investor behavior and the financial situation of enterprises. The article then presents the research procedure undertaken in the data sources employed, and the analyzed sample. The achieved results are subsequently discussed in four research areas: (1) co-occurrence inflation and changes of financial efficiency, (2) co-occurrence inflation and the behavior of investors, (3) the level of inflation and the level of observed changes on the real estate market, (4) inflation on individual segments of the real estate market. The article concludes with a discussion of the obtained results, the formulation of conclusions, and potential directions for further research.

2. Literature review and research purpose

Research on the relationships between inflation and the real estate market has been a crucial area of study explored by many researchers. Obereiner et al. (2012) investigated the impact of inflation on the German real estate market from 1992 to 2009, revealing that real estate investments serve as a long-term hedge against inflation, while no significant relationship was observed in the short term. Building on this, Lee et al. (2014) examined the inflation-hedging properties of European real estate stocks from 1990 to 2011, discovering a positive hedging effect in developed markets, but not in emerging ones. Considering a different context, Alpha Kabine (2003) conducted research on the Malaysian market from 1991 to 2016, finding a positive long-term relationship between interest rates, the consumer price index, and housing prices, along with a negative relationship with GDP. However, in the short term, housing prices exhibited a positive association with both GDP and the consumer price index, while no significant relationship was found with the interest rate. Shifting the focus to Hong Kong's property market, Lee (2013) demonstrated the cointegration of residential property market returns

and inflation between 1980 and 2008, with changes in inflation preceding changes in property returns. The analysis of the Malaysian market indicated that real estate provides only a partial hedge against inflation and it is more advisable to invest in stocks and government bonds (Lee et al., 2019).

Examining inflation hedging across various assets, Salisu et al. (2020) showed that stocks and gold effectively hedge against inflation in the US, while gold investment contradicts Fisher's hypothesis. Toni et al. (2022) examined the effects of exchange rates, interest rates, inflation and GDP growth on property price indices and property shares listed on the Indonesian Stock Exchange between 2011 and 2019. Their results show that inflation has no significant impact on the real estate stock price index, while exchange rates, interest rates and GDP growth have a significant negative impact on the real estate stock price index. On the other hand, Rehman et al. (2020) emphasized that oil prices, interest and inflation rates, and income have an asymmetric relationship with housing prices in the US, UK, and Canada, but the extent and magnitude of this relationship varies. In the case of the United States, there is also a long-term asymmetric relationship between housing prices and inflation and GDP per capita, but their research indicated that interest rates influenced housing prices in the United Kingdom and Canada.

In the Polish real estate market context, Melnychenko et al. (2022) conducted a study on the impact of inflation on property prices in eight major cities from 2009 to 2021. The study covered Warsaw, Katowice, Lodz, Wroclaw, Gdansk, Bialystok, Krakow, and Poznan. They found that a 1% increase in the inflation rate resulted in an increase in price per square meter ranging from 7.7% to 15.8%, depending on the city. Surprisingly, Poznan showed little sensitivity to changes in inflation. Importantly, Melnychenko and colleagues accounted for other factors, such as the Polish Central Bank's base rate, the number of dwellings built, and new mortgage loans, in their model (Melnychenko et al., 2022). However, Wolski (2022) did not find evidence of a correlation between real estate prices and inflation in Poland during the same period, highlighting the need to explore real estate's potential as an inflation hedge in the country. The unique event of the COVID-19 pandemic showed that initial waves led to a surplus of cash, which, combined with the subsequent rise in inflation, prompted many investors to boldly invest in real estate, considering it a stable asset (Kowalski et

al., 2023).

Examining the effects of macroeconomic factors on the real estate market, Ramli et al. (2022) discussed how price changes reflect the impacts of inflation on both the demand and supply sides. Additionally, Lee and Park's (2022) findings suggested that an interest rate shock could potentially trigger a global housing market recession, given recent significant increases in interest rates caused by inflation. Kisiala et al. (2021) emphasized that urban space's heterogeneity impacts the observed price changes in the real estate market, while Osadcha et al. (2022) discussed the strong inclination towards homeownership in Polish society due to historical events and relatively lower income levels compared to other European Union countries. This phenomenon is driven by the perception of real estate ownership as a symbol of household stability and economic security, with low-interest loans further encouraging credit-financed home purchases. Lastly, Augustyniak et al. (2021), Belej (2021) and Frodsham (2023) discussed various macroeconomic factors contributing to the significant increase in both supply and demand in the Polish real estate market in recent years.

The objectives of the article focus on four main areas:

- financial efficiency of real estate companies under conditions of rising inflation,
- behavior of investors on the real estate market under conditions of rising inflation,
- changes in market and accounting efficiency in the real estate market and the scale of inflation,
- tendencies in individual segments of the real estate market under conditions of rising inflation.

The first research goal is to recognize whether the inflation observed since 2021 co-occurrence with changes in the financial situation of real estate companies. This involves verifying whether changes in sales dynamics, profitability, the scale of investments made, and debt levels have been recorded. It also aims to determine whether these changes are of a consistent nature or if they reflect the industry's adaptation to evolving economic conditions.

The second cognitive goal is to recognize whether the increase in inflation and the cost of money observed after 2020 coincided with changes in the behavior of investors on the real estate market. It aims to determine whether there has been a capital outflow from the real estate sector resulting in a decline in stock prices due to inflation. Additionally, it seeks to

examine the returns on capital investments in the real estate market compared to the overall market. The objective is to assess whether the returns observed in the real estate market during periods of high inflation have changed compared to previous periods.

The third objective is to recognize whether there was a co-occurrence of the level of the observed changes in financial efficiency, both in terms of market performance and accounting measures, and the level of inflation. It involves evaluating whether the trends observed in economies with significantly high inflation are similar to those in markets with much lower inflation rates.

The fourth goal set by the authors is to recognize whether the observed co-occurrence of inflation and changes in financial efficiency and investor behavior are similar in different sectors of the real estate market. It aims to determine whether the effects are equally applicable to real estate development companies, property management firms, operational aspects, and the construction sector itself. The goal is to evaluate whether the consequences of inflation are uniform across these various sectors within the real estate market.

The cognitive goals formulated at the beginning, confronted with the analysis of temporary research, allowed to the following research hypotheses to be formulated:

H1: The increase in inflation coincided with the deterioration of the economic efficiency of companies operating in the real estate sector

H2: Inflation and the increase in the cost of capital co-occurred with changes in investor behavior affecting share prices and the rate of return on capital investments in the real estate market.

H3: The scale of changes in accounting and market financial efficiency co-occurred with to the scale of inflation H4: Individual segments of the real estate sector react with different sensitivity to the increase in inflation and the cost of capital.

3. Sample description and research methods

The conducted research procedure included the following steps: defining the research sample, obtaining data for research, grouping data into classes, calculating accounting and market financial efficiency ratios, and carrying out statistical inference in four fundamental areas, in accordance with the adopted research hypotheses.

The research focused on publicly traded companies operating in and classified under the real estate

sector. The classification of companies into this sector was based on algorithms used in the EquityRT system, from which a significant portion of the research's source data was obtained. The study covered the European Economic Area, encompassing a total of 26 countries, including Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Romania, Spain, Sweden, Switzerland, and the United Kingdom. The time horizon of the study spanned from 2019 to 2022, although financial data for the year 2022 was not available at the time of conducting the research. Therefore, the analyzed data also included results for the first half of those years. The analysis exclusively considered enterprises, excluding entities that did not prepare financial statements for enterprises and were classified under the financial sector.

The entities included in the study were classified into market sectors of the real estate (RE) industry in which they conducted dominant activities. The classification was based on the grouping adopted in EquityRT according to the Industry Group categories, identifying the following groups: Homebuilding, Development, General/Diversified, and Operations & Services.

The countries included in the study were analyzed and grouped based on the observed inflation indicators within them. Data regarding inflation were obtained from Eurostat resources (EUROSTAT, 2023). The sample of countries was divided into quartiles, assigning countries to four inflation groups each year. The classification of countries into inflation classes is

presented in Appendix 1.

The collected sample consisted of a total of 2514 unique observations, where a unique record in the created database was identified as an entity during a specific observation period. For each extracted record, analytical data were collected, including accounting data, market data, characteristics, and calculated measures of efficiency, which were subject to further inference. The sample size in the analyzed sectors is presented in Appendix 2.

Nine accounting measures were selected for the analysis, monitoring the financial condition of the companies. Detailed definitions and the adopted measurement principles of the analyzed financial efficiency indicators are presented in Table 1. The analyzed measures encompassed the classical areas of financial efficiency evaluation, including profitability, liquidity, indebtedness, productivity, and the scale of business development. Data from the EquityRT system derived from consolidated financial statements were used to calculate the accounting measures of efficiency. For each company, 28 financial parameters were collected, which were utilized in the calculation of the defined indicators.

For the analysis of investor behavior in the real estate market, market-based measures based on stock prices were utilized. The analyzed parameters and their definitions are presented in the table. In addition to market measures comparing stock prices to accounting parameters, such as the price-to-earnings ratio or market valuation to book valuation (Tobin's Q ratio), return indicators for investors CAR and BHAR were applied, as presented in Table 2.

Table 1

Definitions of accounting performance measures

Variable	Definition
dSales	Sales dynamic is defined as the relationship between sales in period (n) and sales in the same period of the previous year (n-1) reduced by one.
ROS Oper	Return on sales defined as profit/loss on operating activities divided by net revenue from sales.
Net Margin %	Return on sales defined as net profit after taxes divided by net revenue from sales.
ROA	Return on assets defined as income after taxes for the trailing 12 months (TTM) divided by the average total assets
ROE	Return on equity is defined as net income for the trailing 12 months (TTM) divided by shareholders' equity calculated as the difference between total assets and total liabilities.
dAssets	Assets dynamic defined as the relationship between assets in period (n) and assets in the same period of the previous year (n-1) reduced by one.
Asset Turnover	Annual sales total divided by average assets in the period, where the average assets were determined as the arithmetic mean of the value of assets at the beginning and end of the period
CR	Current ratio defined as sum of current liabilities and non-current liabilities divided by assets.
D/E	Debt to equity ratio calculated by dividing company's total liabilities by its stockholders' equity.

Source: own study.

Table 2

Definitions of market performance measures

Variable	Definition
P/E	The price-earnings ratio, the ratio of a company's share (stock) price to the company's earnings per share..
MV/BV	Market to Book Ratio calculated as equity market value (market capitalization) divided by equity book value, market capitalization is determined as the share price times the number of issued shares, the equity book value is determined as net assets, i.e. as the value of assets less total liabilities
CAR	The cumulative abnormal returns for the stock over the period under review
BHAR	The buy-and-hold-abnormal returns for the stock over the entire period under review

Source: own study.

The market data was derived from weekly quotes for the analyzed companies obtained from the EquityRT database. In total, the analyzed data comprised 74,000 observations. The data was aggregated into weekly data points, including opening price, closing price, and average stock price within the weekly time frame. To calculate return measures for investors, the returns for the analyzed companies were compared to the returns achieved in the corresponding period for the market. For this purpose, the values of stock market indices for the countries where the analyzed entity was listed were examined. Data regarding the values of stock market indices were obtained from the website (INVESTING, 2023). After calculating the changes in the market data, we examined not only accounting returns but also long-term stock returns. Specifically, we used two measures: cumulative abnormal return (CAR) and buy-and-hold abnormal return (BHAR), which were calculated as follows:

$$CAR_T = \sum_{t=0}^T (R_{it} - R_{Bt}) \quad (1)$$

$$BHAR_T = \prod_{t=0}^T (1 + R_{it}) - \prod_{t=0}^T (1 + R_{Bt}) \quad (2)$$

where:

R_{it} is the return on RE firm i in week t ,

R_{Bt} is the return on the benchmark portfolio in week t ,

t is the number of weeks.

Ultimately, after considering both accounting and market data, as well as efficiency indicators, the research database consisted of over 103,000 entries. During the data analysis process, atypical observations were rejected, following the assumption that non-representative data points are greater than $Q3 + 1.5 * (Q3 - Q1)$ or less than $Q1 - 1.5 * (Q3 - Q1)$, where $Q1$ represents the first quartile and $Q3$ represents the third quartile calculated for a given parameter.

In the analysis of the co-occurrence of inflation and the financial efficiency of real estate companies, we used elements of statistical inference. The analyses were conducted using Statistica software, version 13.1. We examined descriptive statistics for selected accounting and market measures in periods prior to

inflation growth (2019) and in the years 2020, 2021, and 2022, during which significant inflation increases were observed. To assess the statistical significance of the observed differences, we utilized both parametric (one-way ANOVA) and non-parametric (Kruskal-Wallis test) methods. We also conducted range tests to evaluate whether the examined financial parameters differed between the analyzed periods and the analyzed characteristics according to which the data was grouped.

4. Results

4.1. The co-occurrence of inflation and economic efficiency of companies operating in the RE

The results are not unambiguous when it comes to changes in financial efficiency indicators in the real estate sector during the analyzed period (Table 3). There is a clear deterioration in the financial situation of the industry during periods of negative market movements associated with the initial signals of inflation growth and increasing cost of capital. In the first half of 2020 and 2021, the industry experienced declines in sales, which are also evident throughout 2020. However, the first half of 2022, which had the highest inflation rate within the observed range, is a period in which the entire analyzed industry shows a positive trend of accelerated sales. In the first half of 2022, sales increased compared to the same period in the previous year by an average of 6.8%, with a median of 6.8% across the entire analyzed sample. After a period of declining sales, there was an adjustment to the market situation and a revival in sales. The observed trends are clear and statistically significant at any low level of significance.

Similarly, a decrease in the scale of operations is observed in the recorded decline in the value of assets in the industry, particularly noticeable in 2020.

Similar conclusions can be drawn regarding profitability indicators. Declines in sales translate into profitability losses. In the entire sample, we observe deterioration in both net sales profitability and profitability of assets and equity in the periods of 2020

and 2021 as compared to 2019. These trends are evident when comparing the results of the first half of the year as well as annual data. However, somewhat surprisingly, the end of 2021 and the first half of 2022 indicate a sort of rebound. Companies in the sector not only experience improved profitability on all observed indicators but often achieve values higher than those observed before the inflation growth period in 2019. This may once again indicate the sector's high adaptability to changing market conditions. Adaptive measures and widely communicated restructuring changes have yielded results in terms of rebuilding profitability positions for

companies in the sector. Although the trends are clear, the observed changes in profitability indicators in the sector during the analyzed period are not as significant, and their statistical significance is not always confirmed. However, it should be noted that the improvement in profitability observed between the extreme periods, i.e., the first half of 2020 and the first half of 2022, is observed at $p < 0.01$.

The changes in profitability observed across the analyzed sector do not co-occur with the changes in cash-based financial efficiency indicators. Both liquidity ratios and debt levels did not show significant changes in the analyzed periods.

Table 3

Accounting measures of effectiveness in the period of inflation

Panel A RE Sector performance																
	dSales [%]		ROS Oper [%]		Net Margin [%]		ROA [%]		ROE [%]		dAssets [%]		CR		D/E	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
A - 2022/6M	6.81	6.76	34.37	32.14	29.87	20.91	4.20	4.23	9.31	9.57	3.58	2.87	1.48	1.22	0.64	0.65
B - 2021/6M	-0.31	1.74	34.36	35.44	25.97	18.84	3.30	3.47	8.11	8.10	3.71	4.02	1.47	1.21	0.64	0.63
C - 2020/6M	-2.89	-0.08	33.64	36.73	24.46	18.52	2.79	3.13	6.56	7.45	-0.07	0.05	1.48	1.23	0.68	0.64
D - 2019/6M	nd	nd	32.60	33.06	33.32	24.03	3.39	3.67	7.81	9.05	Nd	nd	1.52	1.29	0.68	0.68
K-W test	62.92	***	0.60		3.82		17.53	***	13.05	***	19.00	***	0.39		1.44	
Panel B: Range tests																
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
A>B	Yes	***	Yes		Yes		Yes	*	Yes		No		Yes		No	
A>C	Yes	***	Yes		Yes		Yes	***	Yes	***	Yes	***	No		No	
A>D	nd		Yes		No		Yes		Yes		Nd		No		No	
B>C	Yes		Yes		Yes		Yes		Yes		Yes	***	No		No	
B>D	nd		Yes		No		No		Yes		Nd		No		No	
C>D	nd		Yes		No		No		No		Nd		No		Yes	

Panel A presents the mean and median of the analyzed accounting measures. Presented are the average values of indicators and medians observed in the first half of 2019-2022. The one-way ANOVA and Kruskal-Wallis (K-W test) tests were used to compare periods. (*), (**), (***) indicate that the differences are significant at 10, 5 and 1 percent levels of significance, respectively. Panel B presents the results of range tests. The non-parametric Kruskal-Wallis test was used to indicate significant differences. Columns labeled signif. identify statistical significance in the same way as in Panel A.

Source: own study.

For the comparison of the global situation, selected parameters characterizing the real estate market were presented in tables 4 and 5, referring to stock market companies.

4.2. Co-occurrence of inflation, investor behavior and market efficiency of companies operating in the RE sector

The aim of the subsequent research was to verify

whether changes in the financial performance of real estate sector companies translate into investor behavior. The analysis focused on changes in market indicators reflecting the attractiveness of the real estate sector as an investment target during a period of increased inflation. Tables 4 and 5 present selected market measures for the analyzed semi-annual and annual periods.

Table 4

Market measures of effectiveness in the period of inflation – semi-annual periods

Panel A RE Sector performance								
	P/E		CAR [%]		BHAR [%]		MV/BV	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
A - 2022/6M	6.13	5.56	-3.49	-2.08	-17.62	-16.82	0.92	0.89

B - 2021/6M	6.85	7.84	-4.58	-5.20	-15.50	-13.57	0.95	0.93
C - 2020/6M	7.56	8.14	-0.48	0.00	-6.67	-2.84	0.93	0.93
D - 2019/6M	7.57	8.60	-4.11	-2.80	-6.59	-5.40	0.96	0.94
K-W test	15.15	***	5.69		33.26	***	1.75	

Panel B: Range tests

	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
A>B	No	***	Yes		No		No	
A>C	No		No		No	***	No	
A>D	No	**	Yes		No	***	No	
B>C	No		No		No	***	Yes	
B>D	No		No		No	***	No	
C>D	No		Yes		No		No	

Designations as in the previous tables.

Source: own study.

Table 5

Market measures of effectiveness in the period of inflation – annual periods

Panel A RE Sector performance

	P/E		CAR [%]		BHAR [%]		MV/BV	
	Avg.	Med.	Avg.	Med	Avg.	Med	Avg.	Med
A - 2021/YE	6.69	7.94	-7.10	-7.36	-19.79	-17.61	1.00	0.99
B - 2020/YE	8.03	7.87	-2.54	-2.30	-11.67	-8.61	0.92	0.88
C - 2019/YE	8.38	9.23	0.25	0.00	-6.41	-5.28	0.97	0.98
K-W test	2.99		8.04	**	22.29	***	4.84	*

Panel B: Range tests

	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
A>B	No		No		No	**	Yes	
A>C	No		No	**	No	***	Yes	
C>B	No		No		No	*	No	

Designations as in the previous tables.

Source: own study.

The period of increased inflation appears to be challenging for investors investing in real estate market companies. All market indicators show significant declines in the analyzed period.

The price-to-earnings ratio (P/E) shows a clear downward trend, both in the analyzed semi-annual and annual periods. The P/E ratio decreases from 8.4 (median 9.3) observed in 2019 to 6.1 (median 5.3) in the first half of 2022. This means that investors are willing to pay less for each unit of earnings generated in the real estate sector. When comparing these results with the findings from previous studies, it can be concluded that despite maintaining profitability indicators, the generated profits are perceived by investors as less attractive and associated with higher risk. The statistical significance of these observed trends has been confirmed in the conducted tests.

Similarly, there is a downward trend in the comparison of the market and book value of companies in the real estate industry. The market-to-book value ratio (MV/BV) decreases during the analyzed period.

Not only are price-based indicators declining, but the relative declines are smaller, which is undoubtedly

related to the long-term nature of the indicator. The statistical significance of the observed differences has also been confirmed, although at a lower level of confidence.

Both CAR and BHAR indicators show negative values in the analyzed period, indicating that investments in real estate sector companies yielded lower returns for investors compared to expected returns based on average market returns determined by stock market indexes. While in 2019, investing in RE sector stocks provided investors with returns comparable to investing in the market portfolio, these returns fell below market levels as inflation increased. Similar trends can be observed in BHAR, which measures the profitability of investments in the time window by investing capital in RE sector stocks in 2019. By the end of 2021, the loss compared to investing in the market portfolio was found to average over 19.7% in the analyzed companies.

4.3. The relationship between the amount of inflation and the financial efficiency of RE companies

In Table 6, a comparison of selected financial

efficiency indicators of real estate sector companies in the first half of 2022 is presented, focusing on countries with different levels of inflation. The countries under study are divided into quarters based on the observed inflation levels in those countries.

The obtained results support the hypothesis that changes in the scale of inflation co-occur with changes in financial performance. The indicators of the scale of operations and profitability clearly deteriorate with the increase in the level of inflation.

Indicators measuring the scale of operations of companies, such as the sales delta and assets delta, compared to the corresponding period in 2021, undergo a significant decrease, reaching negative values observed in the group of companies operating in countries with the highest inflation rates. The statistical significance of the observed differences has been confirmed, and it is particularly pronounced between the extreme groups, namely the first and fourth quartiles of inflation.

Table 6

Financial accounting performance ratios in 2022/6M in inflation classes

Panel A RE Sector performance																
	dSales [%]		ROS Oper [%]		Net Margin [%]		ROA [%]		ROE [%]		dAssets [%]		CR		D/E	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
Q1	10.75	11.60	43.74	54.43	44.09	43.24	4.76	4.23	10.84	9.71	6.16	5.24	0.95	0.60	0.84	0.88
Q2	7.25	6.23	33.39	36.42	29.87	24.06	3.57	3.88	7.94	8.95	3.86	3.02	1.60	1.44	0.71	0.77
Q3	2.26	1.05	36.47	35.13	27.81	22.79	3.26	4.26	9.21	9.12	0.12	0.78	1.72	1.61	0.47	0.45
Q4	-6.49	-7.31	17.84	16.69	10.66	12.69	4.10	3.04	6.90	6.76	-0.55	-1.56	1.91	1.79	0.46	0.49
K-W test	12.78	***	22.73	***	9.71	**	4.94		5.88		13.11	***	41.19	***	25.65	***
Panel B: Range tests																
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
Q1>Q2	Yes		Yes		Yes		Yes		Yes		Yes		No	***	Yes	
Q1>Q3	Yes		Yes		Yes		Yes		Yes		Yes	*	No	***	Yes	***
Q1>Q4	Yes	***	Yes	***	Yes	**	Yes		Yes		Yes	***	No	***	Yes	***
Q2>Q3	Yes		No		Yes		Yes		No		Yes		No		Yes	
Q2>Q4	Yes		Yes	**	Yes		No		Yes		Yes		No		Yes	*
Q3>Q4	Yes		Yes	*	Yes		No		Yes		Yes		No		Yes	

The labels, Q1, Q2, Q3, Q4, in the previous tables represent the division of analyzed countries into quartiles of inflation.

Source: own study.

Similar conclusions are indicated by the analysis of profitability indicators. Profitability declines are evident with increasing inflation and are observed in all analyzed sales profitability indicators, including operating income, net income, as well as return on assets and return on equity. Tests conducted on these observations have confirmed statistical significance, particularly for sales profitability indicators. The differences observed in ROE and ROA are apparent but were not confirmed as statistically significant in the analyzed sample.

The results observed for liquidity and leverage indicators are somewhat surprising. These indicators tend to increase in liquidity with the scale of inflation, assuming high values for Q4 companies. This may indicate a certain degree of excess liquidity or, in the case of companies in the real estate industry, the accumulation of funds' involvement in current assets, including ongoing investment projects. The limitation of sales is also likely to have a direct impact on the demand for financing. Reduced sales and increased cost of funds lead to a limitation in the demand for financing. Companies in high inflation countries, with

a limited scale of operations, have disposed of their loans and borrowings. For comparison, the analysis also examined the situation in other periods. The conclusions observed for the entire year 2021, where inflation levels were already significant, are similar to those observed in the first half of 2022. In earlier periods, where inflation had been gradually increasing, the differences observed between countries with different inflation levels diminished. Selected data for the year 2019 are presented in Table 7.

Observations conducted under conditions of relatively low inflation in 2019 do not indicate clear trends. Groups that showed noticeable differences under high inflation conditions do not exhibit significant inflation-related differences in stable price conditions.

The next goal of the research was to analyze the formation of market indicators among countries with different inflation levels. The results for market indicators of financial efficiency during the period with the highest inflation in 2022/6M are presented in Table 8, comparing them to quartiles of inflation as in the case of accounting measures.

Table 7

Financial accounting performance ratios in 2019 in inflation classes

Panel A RE Sector performance										
	dSales [%]		ROS Oper [%]		ROA [%]		CR		D/E	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
Q1	-5.76	-1.00	34.66	41.20	2.55	2.62	1.23	1.04	0.79	0.87
Q2	-1.68	-0.28	29.92	33.55	3.20	3.01	1.62	1.41	0.59	0.52
Q3	0.39	2.59	36.58	38.78	4.25	4.59	1.24	1.13	0.84	0.90
Q4	-3.72	-0.62	36.84	41.68	4.38	5.04	1.75	0.68	0.53	0.50
K-W test	1.07		3.55		15.01	***	7.22	*	15.18	***
Panel B: Range tests										
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
Q1>Q2	No		Yes		No		No		Yes	
Q1>Q3	No		No		No	***	No		No	
Q1>Q4	No		No		No		No		Yes	
Q2>Q3	No		No		No	**	Yes	*	No	***
Q2>Q4	No		No		No		No		Yes	
Q3>Q4	No		No		No		No		Yes	

Designations as in table 8.

Source: own study.

Table 8

Market financial efficiency ratios in 2022/6M in inflation classes

Panel A RE Sector performance								
	P/E		CAR [%]		BHAR [%]		MV/BV	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
Q1	6.74	5.21	-5.11	-4.33	-19.12	-18.38	0.98	0.98
Q2	5.95	5.78	-12.19	-13.81	-23.57	-21.35	0.91	0.83
Q3	5.98	6.33	-6.24	-3.81	-20.51	-14.87	0.83	0.77
Q4	4.57	3.64	1.93	19.31	-13.03	-11.19	0.82	0.81
K-W test	2.81		4.24		11.73	***	5.85	
Panel B: Range tests								
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
Q1>Q2	Yes		Yes		Yes		Yes	
Q1>Q3	Yes		Yes		Yes		Yes	
Q1>Q4	Yes		No		No	**	Yes	
Q2>Q3	No		No		No		Yes	
Q2>Q4	Yes		No		No	***	Yes	
Q3>Q4	Yes		No		No	*	Yes	

Designations as in the previous tables.

Source: own study.

Measures based on stock prices show a downward trend with increasing inflation, similar to accounting measures. Both P/E (Price-to-Earnings) and MV/BV (Market Value-to-Book Value) ratios exhibit lower values for companies operating in higher inflation quartiles. It is worth noting that this trend does not occur during periods where inflation was not observed, as seen in the data presented in Table 9 for the year 2019. Additionally, when presenting the results, it should be noted that companies operating in countries affected by inflation experienced the largest declines in stock price-based indicators, including both P/E and MV/BV ratios, during the analyzed period.

When observing the results regarding direct investor benefit indicators, CAR (Cumulative Abnormal

Returns) and BHAR (Buy-and-Hold Abnormal Returns), it is difficult to identify clear trends. Lower than market returns on investments in the real estate (RE) sector were recorded in all analyzed inflation groups. This suggests that decreases in RE stock prices were observed in all analyzed countries, making it challenging to pinpoint a definitive trend regarding the relationship between inflation levels and investor benefit indicators. It is worth noting the positive CAR values for Q4 observed in 2022/6M. This result can be interpreted as a signal of a reversal of the downward trend observed in earlier periods.

4.4. Influence of inflation on individual segments of the RE market

The final objective of the research was to analyze the differences between trends observed for different participants in the real estate market. The analyses were conducted in relation to distinct segments of the RE market: Homebuilding, Development, General/Diversified, and Operations & Services. We examined how the values of all analyzed financial efficiency indicators changed during the period of highest inflation compared to a period when the market was not influenced by atypical factors such as inflation, the Russian invasion of Ukraine, or the pandemic. Therefore, we analyzed the changes in indicators in the first half of 2022 compared to the

data observed in the first half of 2019. Table 10 presents a comparison of selected accounting efficiency indicators. The differences between sectors are noticeable. It is noteworthy that the financial situation of all market segments, except for the Diversified segment, appears to be deteriorating. Particularly unfavorable is the situation of developers (Dev), who are experiencing significant declines in both sales levels and profitability. Companies operating in the Operations & Services and Homebuilding segments show sales growth, albeit at lower profit margins. An exception is the segment that exhibits significant increases in profitability with the same level of revenue. It is significant that this segment largely includes real estate investment funds.

Table 9

Market financial efficiency ratios in 2019 in inflation quarters								
Panel A RE Sector performance								
	P/E		CAR [%]		BHAR [%]		MV/BV	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
Q1	8.21	10.16	-4.88	-5.50	-7.90	-7.47	0.86	0.91
Q2	8.25	9.21	-10.02	-9.06	-14.46	-13.06	1.02	1.05
Q3	8.13	8.32	6.00	4.48	-2.08	-0.31	0.98	0.94
Q4	7.14	8.96	-2.35	-2.69	-1.64	-0.70	0.69	0.65
K-W test	1.57		28.92	***	15.48	***	19.66	***
Panel B: Range tests								
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
Q1>Q2	No		Yes		Yes		No	
Q1>Q3	Yes		No	**	No		No	
Q1>Q4	Yes		No		No		Yes	
Q2>Q3	Yes		No	***	No	***	Yes	
Q2>Q4	Yes		No	*	No	*	Yes	***
Q3>Q4	Yes		Yes		No		Yes	***

Designations as in the previous tables.

Source: own study.

Table 10

Changes in accounting financial performance ratios 2022/6M to 2019/6M in RE market segments								
	dSales [%]		d Net Margin [%]		d ROA [%]		d ROE [%]	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
HB	13.55	16.89	-4.25	-6.96	-1.71	-4.25	-10.28	-14.34
Dev	2.52	-0.85	-20.87	-8.56	-10.06	-13.97	-8.18	-10.33
Div	-1.76	0.00	21.71	17.90	29.91	16.56	10.88	12.35
O&S	14.83	6.59	-7.73	-5.99	-2.32	-2.34	-5.28	-6.26
K-W test	3.95		6.87	*	4.72		2.41	
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
HB>Dev	Yes		Yes		Yes		No	
HB>Div	Yes		No		No		No	
HB>O&S	No		Yes		Yes		No	
Dev>Div	Yes		No	*	No		No	
Dev>O&S	No		No		No		No	
Div>O&S	No		Yes		Yes		Yes	

Row markings: HB - Homebuilding, Dev - Development, Div - General/ Diversified, O&S - Operations & Services, other markings as in the previous tables.

Source: own study.

The recent analyses focused on observing market-based financial efficiency indicators within specific sectors of the RE industry. Similarly, we examined changes in P/E and MV/BV ratios between the periods of the first half of 2022 and the values observed in the first half of 2019. Additionally, we presented data on BHAR and CAR for the first half of 2022. The results are presented in Table 11. The data indicate negative investor sentiment across all market segments. In all segments, BHAR remains negative, indicating that

investors who invested in RE companies at the beginning of 2019 have experienced significantly lower returns on their investments compared to the values they would have achieved by investing in alternative investments represented by stock market indices. Positive signals may be reflected in the positive CAR values and the positive delta MV/BV observed between 2022/6M and 2019/6M for companies in the Development and Diversified segments.

Table 11

Changes in market financial efficiency ratios 2022/6M to 2019/6M in RE market segments.

Panel A RE Sector performance								
	d P/E [%]		CAR [%]		BHAR [%]		d MV/BV [%]	
	Avg.	Med.	Avg.	Med.	Avg.	Med.	Avg.	Med.
HB	-24.07	-24.67	4.57	4.51	-14.81	-11.66	-8.95	-6.25
Dev	-34.96	-33.80	-0.19	5.18	-16.78	-19.19	2.77	1.33
Div	-35.35	-35.36	4.25	8.53	-4.94	-8.67	1.23	-4.40
O&S	-41.74	-44.42	-7.28	-6.06	-21.11	-19.03	-10.28	-11.34
K-W test	13.92	***	9.01	**	6.47	*	2.12	
Panel B: Range tests								
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
HB>Dev	Yes		Yes		Yes		No	
HB>Div	Yes	***	Yes		No		No	
HB>O&S	Yes	*	Yes		Yes		Yes	
Dev>Div	Yes	*	No		No		Yes	
Dev>O&S	Yes		Yes	*	Yes		Yes	
Div>O&S	Yes		Yes		Yes		Yes	

Designations as in Table 12.

Source: own study.

5. Discussion and conclusions

The conducted research indicates that the trends observed among European stock companies operating in the real estate sector are not definitive. The initial signals associated with increasing borrowing costs observed in 2020 and 2021 seem to trigger a slowdown in industry growth or even stagnation. The years 2020 and 2021 were a period during which sales and asset values declined across the entire analyzed sample. The decrease in activity directly translates into declining profitability. The observed declines in sales, assets, and equity profitability during these years are clear and statistically significant. However, the most recent period analyzed in the study, the first half of 2022, when inflation indicators reached extreme values, paradoxically became a turning point for key financial efficiency indicators. The industry experienced sales growth and improved profitability indicators to levels higher than those observed in pre-inflation years. This suggests an exceptionally high adaptability of the industry to changing market conditions. The industry can respond flexibly to sales

declines by adjusting its activity and cost levels to market requirements. Reports of suspended activities in the RE sector, including even delayed development projects, seem to confirm this. It is worth noting that we observed a similar adaptability in studies regarding the impact of the pandemic and the disruptions it caused in the RE markets (Kowalski et al., 2023). It is also worth noting that fluctuations in sales dynamics, while impacting operational efficiency, do not significantly affect the pillars of industry activities related to liquidity or debt levels. We did not observe significant changes in liquidity or debt indicators across the entire analyzed sample during the period of heightened inflation. Similar conclusions regarding high stability and resistance to turbulence were observed by Min et al. (2022), who researched the impact of COVID-19 on the real estate market.

The trend regarding market-based efficiency indicators appears to be clear and unambiguous. The period of inflation, as observed in the conducted research, is unfavorable for investors in the real estate industry. We observe a clear downward trend in all stock price-based indicators. This decline becomes

more pronounced over time and with increasing inflation indicators. Similarly, the direct benefits indicators for investors, CAR and BHAR, are negative during the analyzed period. Investors investing in RE companies achieve significantly lower returns on their investments compared to the average returns observed in stock market indices. That corresponds with other studies proving that real estate performs lower as regards effectiveness in inflation hedging properties than stocks and gold (Salisu et al. 2020). In the observed time window from January 1, 2019, to June 30, 2022, we do not observe any signals indicating a possible reversal of the negative trend. The research indicates that capital is flowing out of the industry. Two main reasons can be identified for this: the increasing attractiveness of alternative investment forms to real estate and the limitation of access to debt capital, which finances a significant portion of RE investments. The trend is clear and statistically confirmed.

The conducted studies clearly indicate that the scale of inflation is of great importance for the financial efficiency of companies in the real estate industry. While we observed signs of improvement in the financial situation in the entire analyzed sample during the last analyzed period - the first half of 2022, analyzing the same period in companies operating in countries with different levels of inflation reveals additional tendencies. In countries with relatively low inflation levels, we observe clear increases in sales and improved profitability, whereas in countries operating in economies affected by the highest levels of inflation, the trend is exactly the opposite. We observe that the higher the inflation, the lower the activity indicators of real estate companies and the lower the achieved profitability. In companies operating in countries classified in the fourth quartile of inflation, significant sales declines are still observed in the first half of 2022. At the same time, these enterprises clearly show symptoms of scaling back operations in the analyzed financial indicators, including suspending ongoing investments. Liquidity indicators observed in the first half of 2022 increase with inflation. In companies operating in countries with the highest inflation, we can clearly speak of excess liquidity, manifested by significant engagement of funds in suspended projects presented under the inventory position. Importantly, in similarly grouped companies in the pre-inflation years, we do not observe such tendencies. Regarding available financial resources it is worth mentioning the conclusion of Frodsham, who

stated that a period of distress will benefit those with access to capital at the expense of those unable to refinance (Frodsham, 2023).

At the market level, the relationship between the strength of inflation and the scale of capital outflows is not clear-cut. Unlike in accounting efficiency, we do not observe a trend indicating that higher inflation leads to greater declines in the stock prices of real estate companies or that higher inflation translates into lower returns for investors. Investors investing in real estate industry companies seem to be losing equally, regardless of whether their investments in the real estate market are conducted in countries with a significant and pronounced inflation or in countries where the inflation remains relatively low. Similarly, studies carried out in South Africa, which covered almost a decade period of analysis, revealed that there is no indication of a long-term association between inflation and REIT returns (Mpofu et al., 2023).

Research on trends observed in the conditions of rising inflation in individual segments of the real estate market indicates that the conducted studies can contribute to the discussion on real estate market trends. One may wonder whether, after a period of declining financial efficiency and decreased investor interest, the industry will attempt to recover the recorded losses and regain capital inflows. How will the restriction of supply resulting from a limited operational scale affect the real estate market. Will it lead to the predicted increase in property prices, as some suggest, or will the trend be completely opposite, with observed trends in financial efficiency heralding price corrections in the real estate markets.

Undoubtedly, further analysis of financial efficiency in subsequent periods can provide interesting insights. The conducted studies signal trends in the first period of increased inflation, but further observation and changes occurring in the real estate market can provide additional conclusions. It is certainly worth expanding the conducted research to a broader sample of real estate companies, going beyond the main markets of the European Economic Area or including non-publicly traded companies as well. The conducted research is limited to the largest companies with the strongest financial positions. In particular, conclusions regarding financial efficiency may differ when considering smaller entities. When interpreting the presented results, it is essential to consider that the analyzed period is a time of unique phenomena, including COVID-19 pandemic, which may affect the observed trends.

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