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THE IMPACT OF COVID-19 PANDEMIC ON VALUE MIGRATION PROCESSES IN THE REAL ESTATE SECTOR

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ARTICLE INFO	ABSTRACT
Keywords: COVID-19, real estate market, value migration *JEL Classification:* C58, R31, R51	The COVID-19 pandemic period brings huge uncertainty, especially for the real estate sector. On the one hand, restrictions on the mobility of a population, decline in travel demands, popularization of remote work and education models caused doubts among investors questioning the future of the sector and the functions of real estate. On the other hand, the large supply of cash after the first waves of the pandemic and the upcoming increase in inflation resulted in many investors boldly investing cash in real estate, considering them as assets of stable value. This research aims to analyze the processes of value migration among real estate companies listed on the Warsaw Stock Exchange during this turbulent process. We analyzed the changes in the main drivers of value and the migration rates of the real estate sector based on data for 2018, 2019, 2020 and Q3 2021. The first period of the pandemic is the time of the collapse of the main profitability factors, sales and profitability of sales decline in the entire sector. However, the financial pillars of the analyzed companies are stable and we are not seeing signs of liquidity problems or a significant increase in debt. The second year of the pandemic is a significant reflection of most of the drivers of value, often to levels higher than those observed before the pandemic. Investors seem to remain insensitive to turbulent changes in accounting measures of effectiveness. We observe the relative stability of market measures. The processes of the migration of values from and to the sector do not show significant changes when comparing the periods before and during the pandemic. We observe various intensities of the studied phenomena in various groups of the real estate segment.
Citation:	

1. Introduction

The COVID-19 pandemic period undoubtedly brought significant changes for the real estate sector from the perspective of its functioning. Restrictions on the mobility of a population, decrease in travels, popularization of remote work and education models caused changes in the demand for real estates. Many offices, restaurants or hotels remained empty during lockdowns (Srivastava et al., 2022; Tanrıvermiş, 2020). Urban socio-economic systems were under the process of reorganization and at a search for new ways of functioning during restrictions. Some of these solutions were temporary for the pandemic period while some occurred to be more efficient and could remain in the post-pandemic period. Such situations caused doubts among investors questioning the future of the sector and function of real estate. Furthermore, changes in socio-economic systems influenced the plans of many people in terms of their planned spending, such as limited options of

travelling or reconsiderations regarding the need for new vehicles due to the more common remote mode of work. This caused a large supply of cash after the first waves of the pandemic. Additionally, many countries have had to face the problem of increasing inflation (Echarte Fernández et al., 2022). This led to many investors boldly investing cash in real estate, considering them to be assets of stable value. Considering these two sides of the impact of COVID-19 on the real estate market, the open question is how this situation influenced decisions of investors and, ultimately, how financial value is distributed on the market.

To answer this open question, three sub questions need to be addressed:

1) impact of the pandemic on accounting and market value drivers of real estate companies;
2) impact of the pandemic on value drivers of real estate market group participants;
3) impact of the pandemic on value migration processes in the real estate market

We therefore aim to analyze the processes of value migration among real estate companies listed on the Warsaw Stock Exchange during the turbulent pandemic period. Changes of the main value drivers of companies in the sector will then be analyzed. Investors' behaviors and their impacts on the market will be presented. The results of migration of the real estate sector value will be compared based on data from 2018, 2019, 2020 and the third quarter of 2021. Taking into account differences in measures that have been applied by many countries to combat the COVID-19 pandemic, such an analysis should focus on areas regulated by uniform policy. Therefore, a national level will be considered in this study.

The research will then enable us to verify three hypotheses:

1) H1: the pandemic caused turbulent changes in the key value drivers of real estate companies,
2) H2: the pandemic affected different groups of real estate market participants in different ways,
3) H3: the pandemic did not cause significant value migration processes (inflow or outflow) to the real estate sector.

Based on these research questions and research hypotheses, three research objectives are established. The first research objective is to assess how the circumstances related to the COVID-19 pandemic have affected the financial situation of companies in the real estate sector, whether the market situation associated with the pandemic affected the key value drivers of real estate companies, whether and how changes in restrictions observed during the pandemic, changes in investment sentiment, attitudes towards risk perception and the long-term economic impact of the pandemic interacted with the financial health of companies, whether there were observed and fluctuations in their main financial indicators during the pandemic, or whether there was a final decline in the main carriers of company value in relation to the values achieved before the pandemic.

The second objective is to analyze how the observed phenomena affected individual participants of the real estate market. The question is if the pandemic has triggered similar responses in real estate companies operating in different sectors and segments in this area.

The third objective of the study is to assess whether the pandemic-induced changes in the value drivers of real estate companies have shaped investor behavior and consequently affected the value of real estate companies. Did the pandemic have a significant impact on the valuations of companies in the real estate sector or did it cause significant changes in the processes of value migration to and from the sector?

2. Literature review

Due to the fact that the COVID-19 pandemic influenced worldwide systems in 2020 and measures applied by public authorities were introduced after that moment (Kazak et al., 2021), there is a relatively small amount of material which can be used for scientific purposes in such a short period of time. However, there are still some researchers who analyzed different aspects of COIVID-19 impact on real estate market and on stock exchange.

In real estate studies, different types of properties have been analyzed separately due to their different specific characteristics in the pandemic. In the case of residential properties, D'Lima et al. used micro-level data from the United States to analyze property transactions. They found that post-lockdown pricing changes not only depend on population density but also the size and structural density of properties. In densely populated areas (e.g., downtowns), the average price of a three-bedroom property declined by around 1.4 percent, but increased by about 1.5 percent in low-density areas (e.g., suburbs) when lockdowns were enforced. For properties with fewer bedrooms, the consequences are more pronounced. At the same time, they observed a large drop in sales for markets that are closed (D'Lima et al., 2022).

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Similar findings in the United States were noted by Li and Zhang. COVID-19 appears to have made Americans wary of purchasing property in densely populated urban downtowns with high levels of virus infection. As a result, housing price hot spots during the COVID-19 pandemic year of 2020–2021, were typically found in more affordable suburbs, smaller cities, and areas away from high-cost, high-density urban downtowns (Li & Zhang, 2021). In Australian conditions, Hu et al. showed a negative association between prior COVID-19 cases and daily housing returns using a daily hedonic housing price index for five cities. Every doubling of newly confirmed COVID-19 cases in a state reduced the daily housing return by 0.35 basis points, or 1.26 percentage points yearly. They also verified the impact of government lockdown measures on housing returns and discovered interestingly that these measures have no effect (Hu et al., 2021). Qian et al. explored the impact of the pandemic on housing price in China using data for monthly community-level confirmed COVID-19 cases and housing price. Using the difference-in-difference method, they calculated that the housing price in communities with verified COVID-19 cases will drop by 2.47 percent. The effect lasted for three months, and the magnitude of the effect increased as time goes on. Furthermore, COVID-19 had an effect on housing prices only in areas where the virus was more prevalent or where medical therapy was less effective (Qian et al., 2021). Moreover, COVID-19 had a considerable negative impact on the average price of urban residential land and dwellings in the Yangtze River Delta. Despite the fact that the glut of currency has caused real estate prices to grow in all cities in this area, the price of urban residential land fell by 13.7 percent for each extra unit of epidemic severity. The earlier the city's residential land prices recover, the better it will be able to withstand the pressures of the COVID-19 pandemic (Tian et al., 2021). A study conducted in Italy showed that, due to new situation associated with COVID-19, perceptions of potential residents when it comes to real estate features have changed. They are no longer connected only to location but also how apartments are equipped, allowing access to the outside, such as gardens, balconies, terraces, etc. (De Toro et al., 2021). Finally, COVID-19 had an impact on the number of transactions on the real estate market. In Poland, a significant drop was observed. In the case of single-family houses this drop was around 1/3 and in case of other residential premises around 50 percent of

transactions (Żabówka & Maciuk, 2022).

Besides residential real estate, commercial real estate faced different challenges. Chong and Phillips focused in their research on commercial real estate in the United States. This real estate sector was especially influenced by lockdown and remote work systems. The reported decrease of returns were at the level of around -10 percent to -16 percent. However, the real estate market would have endured about -47 percent to -62 percent reductions in value due to the COVID-19 restrictions without the government's net interventions introduced at the same time as the lockdowns (Chong & Phillips, 2022). Allan et al. took into account several macroeconomic variables as well as city and property type fixed effects, which showed a 15 percent drop in rentals in the first half of 2020 across the Asia–Pacific commercial property market. They also noticed that the most significant rent decreases occur in areas where COVID-19 is more severe, as well as in the retail property sector, where continuous declines of over 30 percent were observed with little rebound in the second quarter of 2020. In addition, they evaluated capital values and found signs of capital flowing into the residential and industrial sectors, while capital targeting the retail property sector has been muted (Allan et al., 2021).

Aside from self-owned real estate, COVID-19 also influenced renting situations. As Nanda et al. noted, the traditional landlord-tenant relationship is characterized by opposing roles. Tenants concentrate on developing their businesses so that they can maintain a stable stream of income and pay their rent on time. Landlords' primary concerns are property maintenance and actions aimed at preserving capital. However, in the face of rapidly changing dynamics, the conventional, dichotomous partnership must give way to a symbiotic connection, in which common interests are recognized, risks and uncertainties are shared, and revenue-generating strategies are aligned. Both the renter and the landlord are increasingly likely to need to build a shared vision and take on shared duties. Such a partnership will be long-lasting and impervious to economic fluctuations (Nanda et al., 2021). Rosenthal et al. observed that, before COVID-19, commercial rent on freshly completed long-term leases drops 2.3 percent per mile from the city centre and climbs 8.4 percent with a doubling of zip code employment density. In transportation cities, the commercial rent gradient declines by around 15% when the pandemic appeared, and the bonus for proximity to transit stops also falls. In more car-

oriented cities, the commercial rent gradient does not fall in lockstep, but in all cities, the rent premium associated with job density falls sharply after the COVID-19 shock (Rosenthal et al., 2022). In Polish conditions, the influence of COVID-19 on property rents and prices was tested in the capital city comparing data from the period between March 2020 and December 2020. Hedonic indexes predict a little increase in prices (about 1.2 percent) and a significant decline in long-term rents (around -7.7 percent). The greatest drop in rentals happened in centrally situated neighborhoods, owing to an influx of new home supply from the short-term rental market (Trojanek et al., 2021).

Apart from studies focused on the impact of COVID-19 on the real estate market, there are also researchers who focused on analyzing the influence of COVID-19 on the stock exchange situation. Zhang et al. (Zhang et al., 2022) proposed a unique approach to assessing the robustness of stock price indices during the COVID-19 crisis. Specifically, they analyzed the ability of stock price indices to absorb COVID-19 shocks. The findings revealed that stock price absorptivity changes over time, by country, and by industry. The absorptive intensity of the US and Brazilian stock indices is rather high, despite their short length. Relatively few studies focus on the stock situation from the perspective of real estate sector besides one study carried out for the Korean Stock Exchange. Results indicated that the real estate investment trust industry index sector's stock rate of return is relatively less sensitive to impacts of COVID-19 compared to the construction industry sector index, and the real estate operating company industry index (Min et al., 2022). Furthermore, not all studies on the real estate companies' situation are based on the stock exchange. Chu et al. showed that, under Chinese conditions, the pandemic had a detrimental impact on real estate business returns and firms with a broader worldwide reach and more geographically diverse property allocations have been able to weather the storm better. They also discovered that, regardless of their geographic breadth, firms with more leverage report worse returns during the epidemic, but that larger firms can mitigate the pandemic's negative impact only if they have adopted a more diversified strategy (Chu et al., 2021). Therefore, studies on the situation of real estate companies due to the impact of COVID-19 stands in line with international scientific discussion and individual case studies should be supplemented from other national perspectives.

3. Sample description and research methods

The research procedure includes the following steps: (1) obtaining data for research (3.1); (2) grouping data (3.2); (3) calculating accounting and market financial efficiency ratios and value migration ratios (3.3) and (4) conducting statistical inference for the three main research objectives (3.4).

3.1 Data collection

The research was conducted with reference to the Polish capital market and concerned companies listed on the Warsaw Stock Exchange. The analysis concerned the main market. The data used in the study came from the Equity RT system databases[1].

The basic sources for the research were consolidated financial statements and market quotations of share prices for the surveyed companies. The analysis covered only companies; banks, insurers and other financial institutions were excluded from the database. The data used in the study covered the years from 2016 to 2021. The data for 2021 concerned the period from January to September, which for most entities meant using financial data from reports for the third quarter of 2021. Additionally, data for the period from January to September 2020 was used as comparable data.

The database originally created for the purposes of the study, after deleting the data from the financial sector and incomplete data of enterprises, contained 3035 entities. Of this, data from 2016 (413) and for the period from January to September 2020 (425 observations) was used exclusively as the basis for calculating financial ratios for a comparable period, which ultimately left us with a sample of 2197 observations.

The ultimately selected sample companies included in the real estate sector accounted for 200 observations, which means that they constituted 9.1% of the entire analyzed sample. The classification of companies as belonging to the real estate sector was based on a grouping used in the Equity RT database.

3.2 Sample classification

The collected sample of real estate companies was grouped into classes. Companies were divided based on three criteria: (1) **sectors** by distinguishing *rental*, *sales* and *others* classes, and the assignment to sectors was made based on data in Equity RT (category: RasSecuritySectorName), (2) **Activities** by

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[1] https://equityrt.com

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distinguishing Home building, *Owners & Developer* and *Services* classes, and the assignment was made based on data in Equity RT (category: RasSecurityPeerGroupName), (3) **Markets** by distinguishing *residential*, *commercial*, *diversified* and *others* classes.

Assignment to classes was made firstly on the basis of descriptions of the companies' objects of activity (RasSecurityInfo categories) and then on the basis of an analysis of the structure of income made on the basis of financial statements and associated notes. Companies were assigned to a given class if revenue from a given activity constituted at least 80% of total revenue. The *commercial* class included activities in the area of office space, hotels, commercial and public utility space, such as shopping centers or amusement parks. In a situation where the analyzed entity earned revenues in separate objects of activity, but none of them reached the assumed share in total revenues, the observation was assigned to the diversified class. On the other hand, when no revenue from separate activities was identified, the *others* class was assigned.

Also, data for different periods were grouped into classes for the purpose of selected analyses, assuming that data for 2017, 2018 and 2019 represent the period before the pandemic. This separation was made due to the fact that the analysis of the financial statements in the collected sample did not show a significant impact of the pandemic on the 2019 statements.

Table 1 presents the characteristics of the sample compiled for the research. Panel A indicates the total number of companies analyzed and the number of companies in the real estate (RE) sector, together with the counts of the different classes identified. Panel B presents selected descriptive statistics for key accounting and market data.

The analyzed sample represents companies of various sizes and scales of operations. It can be seen that the data on sales, assets, and profits vary significantly based on the comparison of the mean/median and standard deviation. For this reason, in the further part of the work, relative parameters, independent of the size of the companies, such as profitability, financing structure or BV/MV, were analyzed. The sample accepted for the research was cleaned of outliers and atypical data to ensure the possibility of making statistical conclusions.

3.3 Ratios calculation

For each entity, 36 items of financial statements were selected for analysis, covering the components of the balance sheet, income statement and cash flow statement. Additionally, data concerning average market capitalization in the analyzed period was used. On the basis of the extracted financial data, selected financial ratios were calculated. A total of 30 ratios were calculated, comprising mainly accounting measures of sales, profitability, working capital and debt. Furthermore, market measures based on market capitalization were calculated. Finally, the research presented results for selected 10 value carriers. Detailed definitions of the variables adopted and the calculation measures used have been presented in Table 2.

Table 1

Sample characteristics		2017/YE	2018/YE	2019/YE	2020/YE	2021/9M
Panel A						
Total number of companies		448	450	443	438	418
Total number of RE Sector companies		42	43	41	38	36
by Sectors						
Rent		20	20	19	18	15
Sales		21	22	21	20	18
Others		1	1	1		3
by Markets						
Residential		15	16	15	15	14
Commercial		14	14	14	14	11
Diversified		7	7	7	6	5
Others		6	6	5	3	6
by Activities						
Home building		5	5	5	5	5
Owners & Dev.		16	18	16	15	15
Services		21	20	20	18	16
Panel B						
Revenues from sales	Mean	502	543	564	686	475

	Median	252	269	254	356	191
	Std dev	632	702	738	863	647
Profit/loss on sales	Mean	112	124	147	151	105
	Median	33	23	59	21	56
	Std dev	209	236	267	266	156
Assets	Mean	3 255	3 447	4 118	4 968	4 626
	Median	1 388	1 335	1 390	1 373	1 498
	Std dev	6 018	6 345	7 741	9 593	8 970
Operating profit/loss	Mean	131	160	228	96	133
	Median	37	62	103	19	43
	Std dev	299	302	435	242	174
MCap	Mean	1 201	1 192	1 242	1 239	1 267
	Median	322	353	250	346	362
	Std dev	2 419	2 477	2 758	2 358	1 718

Note: All finance dates are expressed in millions of Polish zloty (mPLN), MCap stands for market capitalization adopted in Table 2, Std dev means standard deviations.

Source: Warsaw Stock Exchange.

Table 2

Variable definitions and calculation measures

Variable	Definition and calculation measures
dSales (YtY)	Sales dynamic year by year is defined as the relationship between the sales dynamic in year n and n-1.
GProfit [%]	Gross profit margin is calculated as gross profit divided by net revenue from sales.
ROS	Return on sales is defined as profit/loss on operating activities divided by net revenue from sales.
ROA	Return on assets is 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 TTM divided by shareholders' equity calculated by the difference between total assets and total liabilities.
D/E	Debt to equity ratio is calculated by dividing the company's total liabilities by its stockholders' equity.
CCC	Cash conversion cycle is defined as the difference between the sum of days sales of inventory (DSI), days sales outstanding (DSO) and payable turnover (PT).
CR	Current ratio is defined as the sum of current liabilities and non-current liabilities divided by assets.
DIO	Days Inventory Outstanding is calculated as the average inventory divided by net revenue from sales and multiplied by the days in a period
MVA	Market value added is defined as the number of company's shares multiplied by price per share.
dMVA	Delta market value added is defined as the difference between MVA in the t period and MVA in t-1.
MVA/IC	Market value added divided by invested capital is calculated as the sum of fixed assets and net working capital.
SIMV	Synthetic index of value migration is a measure of value migration in a given market, calculated according to Siudak's approach (2013)

Source: own study.

In our study, we analyzed migration phases based on the model by Siudak (Siudak, 2013). The measurement of value migration processes proposed by this author is based on the linear ordering method taking into account the Kowalski and Bilski amendment (Kowalski & Biliński, 2018). We used the Siudak model because it allows us to analyze the processes of value migration using a synthetic quantitative measure in a given population of enterprises (in our case, companies listed on WSE). According to this approach, three diagnostic variables were established: MVA, dMVA, MVA/IC, which were normalized in subsequent calculation steps and a synthetic variable was calculated to assign companies and sectors to the value migration phase. Finally, we calculated the synthetic index of value migration (SIVM) for each company in a sample and assigned companies into three migration phases: destroy (D), stability (S) and build (B). We classified companies

separately for each year using Siudak's approach.

3.4. Statistical inference

At the next stage, the collected research material was subjected to statistical inference. The analysis was conducted using the Statistica package version 13.1.

When analyzing the impact of the pandemic on measures of financial efficiency of real estate companies, we examined descriptive statistics for selected accounting and market measures in the period before the pandemic and in 2020 and 2021. To assess the statistical significance of the observed differences, we used a parametric one-way ANOVA and non-parametric Kruskal-Wallis test. We conducted range tests to assess whether the financial parameters examined differed between the periods analyzed.

When assessing the impact of the pandemic on the value carriers in different groups of the real estate market participants, we examined the value carriers

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obtained in three separate criteria. We analyzed changes in ratios during the pandemic by RE subsectors, activities and markets. We used a parametric one-way ANOVA and non-parametric Kruskal-Wallis range test to assess the statistical significance of differences in the parameters observed in each class.

Statistical research on the impact of the pandemic on value migration processes in the real estate market included (1) assessment of the number of companies qualified to separate value migration classes in the period before the pandemic and in the years 2020 and 2021, as well as (2) formation of SIVM in these periods. Analyses were conducted using multivariate tables, multiple response tables and dichotomies and tests for the analysis of variance. The results of the selected analyses were presented using interaction plots to summarize the counts occurring in the multivariate table. The analysis of the relationship between variables was tested using Pearson's chi2 statistic and chi2 of highest reliability, with Yates corrections for lower expected counts. In addition, the assessment of the strength of the relationship between variables was identified by Yule's fi coefficient, Pearson's convergence coefficient and Spearman's rank correlation coefficient. Parametric and non-parametric tests were used to assess SIVM formation as in previous analyses.

4. Results

4.1. The impact of the pandemic on accounting and market value drivers of real estate companies

Table 3 presents the changes in the profitability ratios of real estate (RE) companies during the pandemic period. Most of the value drivers with a direct impact on profitability have collapsed in the first pandemic period, in 2020 relative to the pre-virus state.

We observe a significant drop in sales in the first year of the pandemic. The median change in sales YtY in 2020 is -6.75%, while in the period before the pandemic it was + 2.75%. Both parametric and nonparametric tests confirmed the statistical significance of the observed relationships with a high degree of significance (p<0.05). The decrease in sales is in line with the significant decreases in profitability in the first year of the pandemic. The profitability of sales falls at all levels of the financial result. We observe a decrease in gross profit margin, although it is relatively small by about -9% (from 23.8% to 21.8%) in comparison with the pre-pandemic period. It should be noted that only some of the companies in the

sample report their financial results in a way that measures this indicator, which undoubtedly influences the obtained results. This is also the reason why the tests do not confirm strong statistical significance of this dependence. On the other hand, significant and observed with very high statistical significance is the decrease in operating profitability, which in the observed sample falls by an average of 76%, i.e. from 11.6% in the period before the pandemic to 2.74% in 2020. Relationships are clear and observed at a low confidence level of about 0.02. Decreases in profitability are observed at the level of the result on sales, albeit at a slightly lower level, mainly due to the fact that they do not take into account the significant write-offs of assets practiced by some of the RE market players during the period. It is noteworthy that, despite the decline in financial efficiency, on average companies in the analyzed sample have maintained positive financial results.

The second pandemic period is a completely different time for the RE sector. An increase in value drivers affecting financial performance is observed. The median sales dynamics YtY reaches the value of 2.6% once again. The significance of the acceleration in sales growth is confirmed by statistical measures. Significant increases are observed in sales profitability ratios, and the gross profit margin increases in the three quarters of 2021 compared to the same period of the previous year by 18.5%, from 21.8% to 25.9%, whereas ROS increases more than sixfold. The tests confirm these relationships with high statistical significance. It is noteworthy that the profitability ratios reach higher values in the three quarters of 2021 than the average values before the pandemic. The verification carried out indicates that the fact of using data for an incomplete financial year is not relevant for this observation, and the comparisons to values for three quarters in pre-pandemic years indicate identical conclusions. Gross profit margin increases in Q3, 2021 by around 8.8% as compared to the 2017-2019 average, and ROS by as much as 42%,with this change being statistically confirmed at p<0.1.

Decreases in 2020 and a rebound in the following year are also observed in relation to ROE and ROA indicators, although the changes are evidently smaller than those observed in the case of return on sales. The conducted tests do not allow us to claim that the pandemic led to significant changes in the returns on assets or equity of RE companies.

Table 3

Value drivers during the COVID-19 pandemic (1) (*Source*: own study)

Panel A RE Sector performance										
	dSalesYtY [%]		ROS [%]		GProfit [%]		ROE [%]		ROA [%]	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
A: 2016-2019	-2.41	2.75	11.58	11.91	23.80	23.71	3.67	3.76	1.44	1.65
B: 2020	-13.21	-6.75	2.74	3.35	21.84	20.91	2.06	0.90	0.47	0.46
C: 2021_9	-0.82	2.66	16.47	18.48	25.89	25.36	3.05	2.37	1.38	1.20
F	*3.612*	*	*2.152*	*	*1.100*		*1.982*	*	*1.581*	
K-W test	1.667	**	7.495	**	3.848	*	1.950		2.801	

Panel B: Range tests										
	YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.		YES NO/sign.	
A>B	Yes	**	Yes	**	Yes		Yes		Yes	
A>C	No		No	*	No		Yes		Yes	
C>B	Yes	*	Yes	***	Yes	*	Yes		Yes	

Note: Panel A presents the mean and median of the analyzed value carriers. Data of average values of indicators observed in 2017-2019, data from 2020 and data for three quarters of 2021 (2021_9). One-way ANOVA and Kruskal-Wallis (K-W test) tests were used to compare groups. (*) , (**), (***) 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.

Source: own study.

Table 4 brings together the value drivers related to debt (D/E), liquidity management (DSI, CCC, CR) and market valuation (MV/BV). The debt ratios show an increase in the share of debt in the financing structure during the first period of the pandemic. This is undoubtedly due to the previously recorded decline in profitability. The median D/E ratio increased in 2020 by 25% and then decreases in 2021, but the debt level no longer reaches the values observed in the pre-pandemic period. However, the statistical tests performed do not allow us to claim that the pandemic contributed to the increase in indebtedness of RE companies. The observed correlations were not confirmed in the range test conducted with pairwise comparisons of results from different periods. The pandemic did not significantly affect the liquidity situation of companies in the sector. Days inventory outstanding, which can undoubtedly be associated with the timing of investments in the RE sector, even decreased in the subsequent years of the pandemic. There was a slight increase in the current ratio relevant for and observed in 2020, but at a very low level and only in relation to the median. There was a clear improvement in liquidity as measured by CR in Q3 2021, while statistical tests do not indicate that liquidity changes significantly during the pandemic. Market measures reflected investor concerns. The year 2020 saw the MV/BV median ratio decline by 16.7% in 2020. The year 2021 reversed this trend, and the market valuation to book ratio increased at the median level by 4.7%, which was below the pre-pandemic levels. Fluctuations in market valuations were pronounced, although tests do not confirm their statistical significance, which means that the RE market has defended itself against the COVID-19 pandemic.

Table 4

Value drivers during theCOVID-19 pandemic (2) (*Source*: own study)

Panel A RE Sector performance										
	D/E [nd]		DIO [days]		CCC [days]		CR [nd]		MV/BV [%]	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
A: 2016-2019	51.38	50.61	316.11	345.92	204.64	208.04	1.37	1.31	56.23	59.59
B: 2020YE	55.04	63.31	312.33	241.64	863.58	219.49	1.40	1.30	45.89	49.58
C: 2021/9M	52.08	60.58	324.70	215.06	780.66	251.53	1.55	1.67	53.21	51.89
F	*1.311*		*1.037*		*2.702*	**	*1.291*		*1.100*	
K-W test	0.337		0.116		0.728		1.302		3.902	*

Panel B: Range tests										

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

Source: own study.

4.2. Impact of the pandemic on groups of real estate market participants

This part of the paper presents results concerning the formation of value carriers in separate groups of the RE market. Results concerning two parameters, i.e. ROS and MV/BV, are presented. The selection of variables was made on the basis of conclusions presented in chapter 4.1. ROS showed the highest variability in the whole sample, and is a key indicator of operational efficiency. MV/BV, as one of the most relevant market indicators, did not show statistically significant variation across the sample.

Table 5 presents how ROS and MV/BV have evolved in companies operating in different sectors of the RE market. Differences between sectors were statistically confirmed in each analyzed period. In each isolated market segment, there is a trend recorded at the level of the entire sample. We observe a decline in the return on sales ratio in 2020 and its recovery in 2021, and this leads to a level higher than in the pre-pandemic years. However, the scale of the fluctuations varied. The smallest changes can be observed in ROS affected companies that derive most of their revenues from the housing market. The largest decreases in profitability in 2020 affected businesses operating in the commercial space market. Companies whose business is defined as being in diversified markets experienced equally large fluctuations in ROS. Statistically significant changes in ROS were observed among businesses operating in both commercial space and diversified markets. With range tests, the observed increase in ROS in 2021 relative to the pre-pandemic period was not statistically significant. Changes in ROS for businesses operating in the apartments and flats market were not confirmed to be statistically significant.

Fluctuations in the measure of market valuations were evident in all market segments, with tests showing that these changes were not statistically significant. Relatively the smallest changes in MV/BV were recorded by companies operating in the apartments and flats market and an upward trend in market valuations was observable for them in 2021 compared to the pre-pandemic period. Businesses operating in the commercial space market, on the other hand, saw the largest declines in value in 2020 and, despite the reversal of this trend, were not recovering to the pre-pandemic MV/BV ratios observed. Changes in this market were the strongest and most strongly confirmed in the tests performed, although confidence levels remain low. Companies operating in diversified markets were predicted to have the most stable MV/BV ratios. There was even an increase in the median MV/BV in 2020 in this segment.

Table 5

Changes in ROS and MV/BV during the pandemic by RE markets *(Source*: own study)

Panel A *ROS by Markets*						
ROS	Residential		Commercial		Diversified	
	Mean	Median	Mean	Median	Mean	Median
A: 2016-2019	9.29	11.88	8.47	10.16	18.16	18.95
B: 2020YE	0.10	5.71	-31.14	-38.71	-10.65	-9.78
C: 2021/9M	10.37	13.20	15.94	12.50	20.75	24.34
F	20.12	***	14.150	**	18.121	***
K-W test	3.336		6.9128	*	7.383	**
Panel B *MV/VA by Markets*						
MV/BV	Residential		Commercial		Diversified	
	Mean	Median	Mean	Median	Mean	Median
A: 2016-2019	55.97	55.36	51.35	58.39	61.43	61.18
B: 2020YE	50.58	52.84	37.25	37.97	57.35	69.06
C: 2021/9M	59.59	76.39	44.65	47.49	59.18	63.05
F	0.717		1.677	*	0.128	
K-W test	0.683		2.541	*	0.168	

Source: own study.

Table 6

Changes in ROS and MV/BV during the pandemic by RE sectors

Panel A *ROS by Sectors*

ROS		Rent		Sales	
		Mean	Median	Mean	Median
	A: 2016-2019	12.27	12.06	6.22	8.72
	B: 2020YE	-20.10	-28.12	-2.95	4.35
	C: 2021/9M	13.95	13.45	11.10	14.22
	F	16.96	***	16.86	***
	K-W test	12.000	***	7.441	**

Panel B *MV/VA by Sectors*

MV/BV		Rent		Sales	
		Mean	Median	Mean	Median
	A: 2016-2019	53.53	55.20	58.59	61.30
	B: 2020YE	38.60	35.59	52.32	54.94
	C: 2021/9M	43.23	43.70	62.29	73.81
	F	*1.420*		*0.137*	
	K-W test	2.948		3.799	*

Source: own study.

Table 6 presents the evolution of ROS and MV/BV during the pandemic in the rental and sales sub-sectors. The observed trends were in line with those noted earlier. In general, a decrease in ROS and its recovery to pre-pandemic levels in 2021 was noted. When the sample is divided into two classes, the obtained class sizes allow for confirmation of strong statistical significance of the observed results at $p<0.01$. The rental sector recorded significantly higher operating losses in 2020. These conclusions were in line with those presented earlier, taking into account that most companies operating in the renal sector conducted their business in the commercial real estate market. The results seemed obvious given the impact of the pandemic on demand for office and retail space. The sales sector, despite exhibiting a similar trend of change, was characterized by a much shallower ROS change. Furthermore, it is worth noting that the median ROS in 2020 in the sales sector remained positive, indicating a group of companies in the sector that have maintained positive financial results. Despite confirming statistical significance in the achieved ROS values, range tests have not confirmed that the values recorded in 2021 were statistically significantly higher than in the pre-pandemic years.

MV/BV showed the same trend of decline and recovery. Again, these were not confirmed as statistically significant. Fluctuations were stronger in the rental sector and it was additionally noteworthy that the sector did not rebuild MV/BV in 2021 to pre-pandemic levels. The real estate sales sector, on the other hand, recorded a more than 20% increase in MV/BV in 2021 relative to the valuations observed before the pandemic. Pairwise comparisons indicate the significance of this relationship at a weak level of just over $p=0.1$.

The last analyzed groups of RE market participants indicate stability and even strengthening of the position of home building companies. Profitability decreased in 2020 in this group, although they were relatively the shallowest. It was worth noting that, on average, home building enterprises did not show negative profitability in 2020 and improved their profitability in 2021 in comparison with the profitability before the pandemic. An interesting observation was that, for construction companies, the time of the pandemic is a time of increasing MV/BV. These observations were not confirmed in regards to their significance in the tests conducted, but attention should be drawn to the insufficient size of the selected class, which undoubtedly affected the results of the tests.

On the other hand, changes in the profitability of the two remaining separate groups of conducting activity on the RE market were confirmed statistically in terms of significance. The service segment recorded the largest profitability declines in sales in 2020 and has not returned to its pre-pandemic valuation levels. These results were in line with those observed earlier, given that the service business in a significant share of cases meant the leasing of commercial space.

Development companies were strengthening their market positions with a 13% increase in median MV/BV compared to the pre-pandemic period.

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Table 7

Changes in ROS and MV/BV during the pandemic by RE activities (*Source*: own study)

Panel A ROS by Activities

ROS	Services		Owners & Dev.		Home building	
	Mean	Median	Mean	Median	Mean	Median
A: 2016-2019	6.45	9.57	10.53	13.65	8.21	7.49
B: 2020YE	-17.42	-25.07	-7.31	0.23	2.18	2.07
C: 2021/9M	8.70	11.87	16.73	19.36	8.77	9.80
F	4.152	*	4.851	**	1.023	
K-W test	5.179	**	7.667	***	1.454	

Panel B MV/VA by Activities

MV/BV	Services		Owners & Dev.		Home building	
	Mean	Median	Mean	Median	Mean	Median
A: 2016-2019	55.22	58.54	61.35	64.44	42.97	40.25
B: 2020YE	41.98	37.97	51.58	56.11	46.85	41.19
C: 2021/9M	43.43	42.70	63.78	72.82	54.59	54.59
F	1.061		1.331		0.266	
K-W test	1.711		2.626		0.162	

Source: own study.

4.3. The pandemic impacts on value migration processes in the real estate market

Table 8 shows the evolution of the synthetic index value migration (SIVM) in the RE sector during the pandemic period. SIVM analyses changes of three market parameters MVA, dMVA, MVA/IC among all the participants of a given market and positions the companies participating in it through linear positioning on a scale from 0 - 1. Within value migration processes, we distinguish entities that fall into one of three phases: (i) value stabilization phase (S), (ii) value building phase (B) and (iii) value destruction or outflow phase (D).

The results showed a clear increase in SIMV throughout the pandemic period. The results were confirmed as to their statistical significance at an arbitrarily low significance level of $p < 0.001$, observed in pairwise comparisons of all observed periods. This means that, taking into account the changes in values in other economic sectors, we observed a process of value migration to the RE sector during the pandemic period. The median SIVM doubled in 2021 relative to that observed before the pandemic.

Table 9 shows the assignment of RE companies to migration phases in the periods before and during the pandemic. The table presents the results of the analyses conducted using multivariate tables. The observed expected counts and their comparisons are presented. The results showed the excesses of observed counts over expected counts for companies in the value stabilization phase for both pandemic years, i.e. 2020 and 2021. No significant increase in the number of entities moving to the value destruction phase was observed. The table presents an interaction plot which graphically presents the discussed relationships. Statistical measures confirmed a statistically significant correlation between the periods before and during the pandemic.

Table 8

SIMV during the pandemic by RE activities

Panel A RE Sector performance

SIVM	Mean	Median
A: 2016-2019	36.97	30.35
B: 2020YE	55.67	55.76
C: 2021/9M	62.53	62.22
F	*219.81*	***
K-W test	88.086	***

Panel B: Range tests

|		YES NO/sign.
A>B		No ***

			No	***
A>C				
C>B			Yes	**

Source: own study.

Table 9

RE companies by value migration phases during the pandemic period

Panel A: Contingency table				Panel C: Interaction graph

		migration chase		
		S	B	D
2019-2017	observed items (A)	71.0	23.0	32,0
	expected items (B)	76.8	21.7	27,5
	A-B	-5.8	1.3	4,5
2020	observed items (A)	24.0	6.0	8,0
	expected items (B)	23.1	6.6	8,3
	A-B	0.9	-0.6	-0,3
2021	observed items (A)	25.0	5.0	3,0
	expected items (B)	20.1	5.7	7,2
	A-B	4.9	-0.7	-4,2
Panel B: Statistics				
	Chi^2 Pearsona	5.059		
	Chi^2 NW	5.648		
	Fi Yula	.1602		
	C Pearson	.1582		
	R Spearmana	.1472 **		
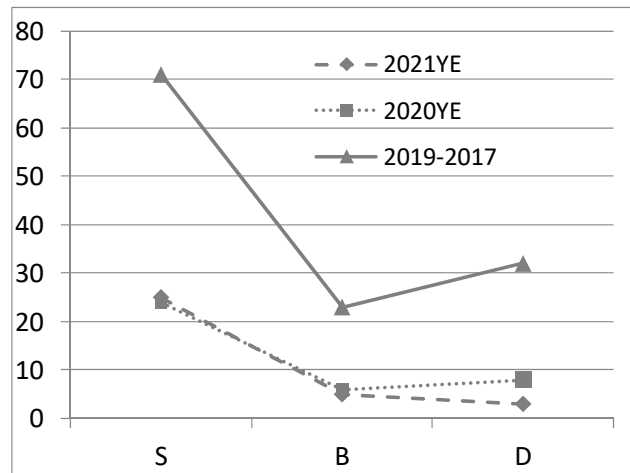
Note: The value migration phase column concerns Siudak's model, with destroy (D), stability (S) and build (B) migration phases.

Source: own study.

5. Discussion and Conclusions

In times of turbulence in socio-economic systems, people are looking for safe solutions to secure their assets, thus improving their individual sense of security. In this research, attention was drawn to the question of whether the property market is perceived in this way by investors. Due to the relatively short period of time since the outbreak of the COVID-19 pandemic, it is not currently possible to draw long-term conclusions about the impact of this factor on the property market. It is, however, possible to determine the current reactions of financial markets to the situation.

The conducted research allowed to positively verify hypothesis 1 H1: the pandemic caused turbulent changes in the key value drivers of real estate companies. Analysis of the financial data of the largest real estate companies shows that COVID-19 pandemic-related constraints are affecting the companies' performance. Most value drivers deteriorate significantly or even collapse in the first year of the pandemic. Sales decline, with return on sales ratios approaching virtually zero across the entire analyzed sample. Our research reflects, by means of financial indicators, the conclusions

formulated by Żabówka and Maciuk, who point to a significant drop in the number of transactions on the real estate market. In Poland a significant drop was observed. In the case of single-family houses, this drop was around 1/3 and in case of other residential premises around 1/2 the number of transactions (Żabówka & Maciuk, 2022). It can be seen that this drop equally affected the primary market, represented mainly by the sample of companies we analyzed.

At the same time, it is worth noting that no significant changes were noted in the liquidity ratios of the companies in the sector or the related increases in debt. CCC and D/E ratios deteriorated very slightly in the first year of the pandemic and the statistical significance of these changes is rarely confirmed. In our view, this indicates that the relatively strong financial pillars of the large listed RE companies were not affected by the relatively short-term declines in sales. Despite clear operational problems in the first year of the pandemic, there is no collapse of the financial situation, spectacular bankruptcies or financial distress.

The second analyzed year of the pandemic reveals the impact of an increase in the money supply in the market on the financial situation of the industry's enterprises. Across the sample, we observe significant

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improvements in accounting ratios in the three analyzed quarters of 2021. The sector takes advantage of the situation, sales increase and the abundance of capital allows the industry to achieve profitability above that observed in the pre-pandemic period. The margins observed in 2021 indicate that investors have accepted rising property prices and we have not seen a negative sentiment indicating an imminent price decline during our period of analysis. Similarly, Bełej relating this to the models used to determine potential future property values, does not forecast that property prices will fall after 2021 (Bełej, 2021). This may confirm an increased level of investor confidence in the market, thus stabilizing local property markets (Forys & Tarczynska-Luniewska, 2018; Heldak, 2017). It should be highlighted that this situation will also depend on the potential actions of public authorities affecting the investment attractiveness of real estate (Krajewska & Pawłowski, 2019; Palicki & Rącka, 2016; Stacherzak et al., 2019).

It is worth noting, however, that despite the recovery in sales in 2021, its dynamics across the sample remain negative. The research also does not confirm that the pandemic has led to significant changes in the return on assets or equity of RE companies. This may, of course, be related to the inertia of investment processes in the industry and the fact that the problems of 2020 reduced supply in the RE sector in the following year. However, it may also indicate that the sector is taking advantage of the resulting market situation and points to the possibility of speculation. In this context, we are cautious about forecasting further increases in property prices.

At the same time, the research confirmed hypothesis 3 formulated in the introduction: the pandemic did not cause significant value migration processes (inflow or outflow) to the real estate sector. The results for the impact of the pandemic on the accounting and market value drivers of RE companies indicate that the real estate sector was resilient to market fluctuations arising during the COVID-19 pandemic period. The changes in market value drivers (MV/BV) that we observe are relatively small compared to fluctuations in accounting measures and the entire sample practically remains unconfirmed as statistically significant. Thus, temporary fluctuations in performance indicators have not translated into investor behaviour. We find no signs of panic or random behaviour among investors in the sector. Investors do not seem to be succumbing to the signals of the operational problems of 2020 as well as

the above-average margins observed in the three quarters of 2021. Our findings in this regard are consistent with those observed by other researchers focusing directly on market measures. He et al. (2020) observed a short-term negative average abnormal return rate during the first pandemic period, similarly to Dang Ngoc at al. (2021). In contrast, Min et al. (2022) found, similar to our observations, the real estate investment trust industry index sector's stock rate of return to be relatively less sensitive to the impacts of COVID-19. At the same time it is worth highlighting that Polish local governments does not have or does not effectively use instruments dedicated to real estate resource management (Gross & Wolny-Kucińska, 2021), therefore, the situation on the market is strongly related to behavior of private investors.

We observed that the impact of COVID-19 was not homogeneous on individual market segments, positively confirming hypothesis 2 of the work: The pandemic affected different groups of real estate market participants in different ways. When analyzing the impact of the pandemic on groups of real estate market participants, the largest decreases in profitability in 2020 have been observed for businesses operating in the commercial and diversified space market. A similar relationship could not be statistically confirmed in the case of enterprises operating in the apartments and flats market. The results of the financial situation of entities operating in the RE sector confirm the general trends observed in the real estate market, where decreases in revenues from commercial real estate are double-digit (Chong & Phillips, 2022) whereas losses recorded in the case of residential property are more than ten times lower (Hu et al., 2021).

Our research indicates that the diversification in the Real Estate sector balanced the risk of COVID-19. This may be a conclusion for the shaping of investment portfolios of the sector's companies. Companies with a diversified investment portfolio recorded relatively small changes in key operating parameters. And, although they recorded greater fluctuations in profitability than companies operating predominantly in the Residential sector, what is particularly worth emphasizing, they were characterized by the lowest volatility of market measures, including BV/MV. This proves that the greatest trust of investors lies in companies with a diversified investment portfolio.

The mature attitude of investors and strong financial pillars of the large RE market players

analyzed mean that the value migration process in the industry is highly stable. The analysis of the distribution of companies in the sector into those in the stabilization, destruction and value building phase in the periods before and during the pandemic show significant correlations. At the same time, the impact of the pandemic on value migration processes in the real estate market is noticeable. Considering value changes in other economic sectors, we observe a value migration process to the RE sector during the pandemic. This means that investors perceive RE as a safe investment market. The SIVM of the sector consistently increases during the analyzed period. In the analyzed sample, the pandemic did not cause significant value transfers. This is in line with studies conducted in Italy confirming that houses (as one of the main parts of the real estate sector) are a stable asset, more useful as pledgeable collateral (Banerjee & Blickle, 2021). It remains an open question whether there will be an outflow of value from RE to other market segments in the post-pandemic period as other companies rebuild their economic foundations. In addition to the impact of COVID-19 on the real estate market itself, it is worth noting that the situation has also affected various real estate professions, such as appraisal (Renigier-Biłozor et al., 2020).

The research we have conducted and the conclusions formulated provide empirical evidence essential for further research on the RE sector, for decision-making and planning purposes. One should, however, be aware of potential limitations. First of all, the research concerned large entities with significant financial potential, listed on the stock exchange. In addition, in the case of some of the classes we distinguished - mainly during the study of different groups of real estate market participants - we obtained small group sizes, which meant that not all conclusions could be confirmed as regards their statistical significance. Taking these and other limitations into account, one should be aware of the fact that the formulated conclusions may not always fully reflect the behavior of the entire real estate market. Moreover, in coming years, the impact of pandemic period should be analyzed from a longer perspective considering that there is a long-term disequilibrium on the Polish real estate market, and there are synergistic systemic processes with time lags manifested in property prices (Brzezicka et al., 2018).

The directions for further research may concern comparisons of our results with those observed in other geographically different markets. An interesting research goal also seems to be to compare the changes we observe in accounting and market measures in the RE sector and other sectors and to look for connections between them. Undoubtedly, it is worth extending our research to a larger sample of RE market entities, including smaller companies not listed on the WSE.

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