

RATES OF RETURN ON SHARES OF REAL ESTATE DEVELOPMENT COMPANIES IN POLAND IN THE YEARS 2001-2015. A COMPARATIVE ANALYSIS

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Abstract

The paper presents an analysis of the diversity of real estate development companies listed on the Warsaw Stock Exchange based on the rates of return on their shares which were attained in 2001-2015. The study included 10 real estate development companies. The analysis was conducted for different investment horizons (from 1 year to 10 years), and based on the quartiles of the empirical distributions of the rates of return on the shares of individual companies. The empirical distributions were obtained using a rolling window of observation based on daily share quotation. The diversity of the funds was examined by formulating six hypotheses concerning: the diversity of the quartiles of the distributions of returns on individual funds, the differences between the values of the quartiles of returns for the best and worst companies during each investment horizon, changes in the value of individual quartiles of returns for individual companies along with a lengthening of the investment horizon, differences in the positions of the companies in the rankings of companies based on different investment horizons and having different quartiles being accepted as the criterion for the rankings. The results obtained did not indicate grounds for the rejection of the formulated hypotheses.

Key words: real estate development companies, shares, returns, comparative analysis, Poland.

JEL Classification: G11, R30.

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1. Introduction

Direct and indirect investments in real estate are an important part of the capital market. Real estate development companies' and construction companies' shares and bonds, closed real estate fund investment certificates and units of open-ended equity funds in the real estate sector allow investors to invest indirectly on the Polish real estate market.

The real estate market in Poland has already undergone a phase of stagnation in the era of the market economy, followed by a sharp increase in prices, then declines, and finally stability. These phases can be observed both in terms of the prices of real estate (e.g. the price of 1m² of residential property) as well as in terms of changes in the prices of stocks of real estate development and construction companies listed on the Warsaw Stock Exchange.

The issue of cost-effectiveness and the risks of investing in the real estate market are always relevant. The Polish real estate market is often perceived by investors through the prism of the high profits and high losses achieved in the past on investments in: shares of real estate developers, shares of construction companies, and real estate funds as well as direct investment.

2. Literature review

In research conducted on the development industry in recent years, the following issues have been raised: the condition of development companies, the methods of valuation of real estate developers, the circumstances surrounding the issuance of securities by developers and the costs and risks of investing in real estate.

The condition of real estate companies was the subject of studies of various researchers. Research conducted by Gierałtowska and Putek-Szeląg (GIERAŁTOWSKA, PUTEK-SZELĄG 2015) made it possible to draw up a ranking of 24 Polish real estate companies listed on the WSE on the basis of an analysis of their economic and financial situation. To examine the conditions of the companies, a TMAI measure was used. Selected financial indicators (current liquidity, debt rate, ROE and EPS) were taken into account for the period 2011-2013. Tarczyńska-Łuniewska and Foryś (TARCZYŃSKA-ŁUNIEWSKA, FORYŚ 2015) examined the condition of real estate companies listed on the Warsaw Stock Exchange in the period of recession (2007-2013). The authors concluded that, firstly, the economic and financial standing of the real estate companies surveyed was rather weak; secondly, the companies were characterized by a large diversification of financial results. Chrzanowska and Zielinska-Sitkiewicz performed a division of 17 real estate companies listed on the Warsaw Stock Exchange into groups exhibiting similar economic conditions (CHRZANOWSKA, ZIELIŃSKA-SITKIEWICZ 2013). The analysis was conducted on data from 2010-2012. The condition of the companies was examined on the basis of 9 financial indicators. In order to group the companies, the authors applied Ward's method and the method of k-means clustering. Zielinska-Sitkiewicz performed a ratio analysis on 17 real estate companies listed on the Warsaw Stock Exchange (ZIELIŃSKA-SITKIEWICZ 2013). The research was based on the financial data of the companies in the years 2005 - 2011. The author stated, among others, problems associated with the use of financial indicators in the study of the condition of real estate development companies. Siemińska raised the problem of the condition of real estate developers in Poland in (post)critical economic circumstances (SIEMIŃSKA 2010).

The profitability and risk of investing in the real estate market has been extensively studied in recent years. Gierałtowska and Putek-Szeląg indicated the available instruments on the Polish market allowing for indirect investment in the real estate market in the country (GIERAŁTOWSKA, PUTEK-SZELĄG 2015). The authors also conducted an analysis of the profitability of closed investment funds on the real estate market and an analysis of the rates of return on shares of real estate developers in 2011-2014. Gostkowska-Drzewicka assessed the attractiveness of investment in shares of real estate companies listed on the Warsaw Stock Exchange in the period 2007-2014 (GOSTKOWSKA-DRZEWICKA 2015). Attractiveness was examined on the basis of the P/E and P/BV ratios. The author found a large variation of these two indicators in the period considered. Wolski studied the use of measures of downside risk under conditions of downturn in the real estate market (WOLSKI 2013). Henzel, Śmietana and Maszyk assessed the availability of financial instruments on the real estate market in Poland, as well as their attractiveness with regards to their potential to protect the value of invested capital from the perspective of an individual investor aiming to diversify his investment portfolio (HENZEL et al. 2013). The analysis included: equity and debt instruments on the real estate market issued by collective investment institutions, closed public asset real estate investment funds and listed real estate development companies. Załączna and Wolski evaluated the variety of instruments enabling investments on the Polish property market and their competitiveness in relation to classical forms of investment (ZAŁĘCZNA, WOLSKI 2012). The authors pointed out the obstacles which make these investments difficult in Poland. Kowalke compared the rates of return on investments in investment certificates of closed real estate funds with the returns on the bond and equity market in the years 2004-2011 (KOWALKE 2012). The author determined the low profitability of investing in certificates of funds operating on the real estate market, especially when compared with investing in treasury bonds. Śmietana analyzed investment portfolio diversification principles (ŚMIETANA 2014). Haran et al. examined the extent and nature of the inter-relationships between three emerging real estate markets: that of the Czech Republic, Hungary and Poland (HARAN et al. 2016). Researchers have also determined the rationale for including emerging real estate markets within a Pan-European investment portfolio. Adair et al. sought to assess issues of data and the extent to which property markets are becoming more transparent in Central and Eastern Europe, discussing the stages in the transformation and evolution of markets with reference to sources of real estate information (ADAIR et al. 2006).

The researchers also addressed the topic of financing real estate development activities. Pauka and Śmieja analyzed the circumstances surrounding the issuance of securities by Polish developers (PAUKA, ŚMIEJA 2013). Researchers have analyzed which variables determine the number of covenants proposed by bonds issuers from the real estate development industry in Poland and how those variables affect the final number of covenants placed in emission. Hutchison et al. considered the merits of using project bonds to finance infrastructure investment projects and also considered the pricing of such bonds and the level of risk premium demanded by the market (HUTCHISON et al. 2016). Shen and Yin explored the impact of credit expansion in 2009 and 2010 in China on the capital structure of listed real estate companies (SHEN, YIN 2016).

The methods of valuation of real estate developers have been studied by Żelazowski (ŻELAZOWSKI 2015). He presented the potential of the application of multiple-based methods in the valuation of Polish real estate development companies.

3. Research objectives and hypotheses

The subject of the research in this paper were the historical rates of return on investments in shares of real estate development companies listed on the Warsaw Stock Exchange. The first objective of the study was to conduct a comparative analysis of real estate development companies in Poland based on the quartiles of distributions of the rates of return on shares in 2001-2015. The second objective was to examine the significance of the investment horizon for the profitability of investments in shares of real estate development companies.

The study was conducted on the basis of the empirical distributions of the simple rates of return, calculated for different investment horizons (i.e. for different lengths of the investment period). In the study conducted on the differentiation of the rates of return from shares of real estate developers, quartiles of distribution were used (Q_1 , Q_2 , Q_3). Each quartile can be used to assess the level of investment risk. The first quartile (Q_1) can be interpreted by the investor as follows: the chances of obtaining a rate of return lower than the value of the quartile is 25%, and the likelihood of achieving a higher rate of return - 75%. The second quartile (Q_2) indicates to the investor that the chances of obtaining a rate of return both lower and higher than the median are the same (i.e. equal to 50%). The third quartile (Q_3) is the value of the rate of return at which the chances of exceeding the value of the quartile are at 25%, and the chances of failing to achieve the value of the quartile - 75%. For this reason, companies characterized by higher values of the quartiles of distributions of returns from shares are considered better than companies characterized by lower values of the quartiles of distributions of the rates of return on shares.

To the author's best knowledge, a comparison of the profitability and risk of investing in shares using the methodology used in this paper has not yet been carried out.

The following hypotheses were formulated:

H1: The companies differed significantly¹ (from the investor's point of view) based on the values of the first quartiles Q_1 of the distributions of returns on shares.

H2: The companies differed significantly (from the investor's point of view) based on the values of the second quartiles Q_2 of the distributions of returns on shares.

H3: The companies differed significantly (from the investor's point of view) based on the values of the third quartiles Q_3 of the distributions of returns on shares.

H4: The differences between the values of individual quartiles of returns for the best and worst companies were very large.

H5: Along with the lengthening of the investment horizon, large variations in the values of individual quartiles of returns on the shares of a given company occurred.

H6: The positions of the companies in the rankings differed significantly for different investment horizons and when different quartiles of returns were accepted as the criterion for drawing up the ranking.

4. Data and methodology

Currently, 36 real estate development companies are listed on the Warsaw Stock Exchange (as of January 4, 2016). The selection of companies forming the focus group was made following two criteria.

¹ It was assumed that a standard deviation of at least 10p.p. would be evidence of differentiation significant from investor's point of view.

First - the maximization of the number of companies covered by the study, second - maximizing the longest investment horizon² adopted in the study³ (the longest acceptable investment horizon was determined based on the date of entry of the company onto the Stock Exchange). A period of 10 years was accepted as the longest investment horizon. The study was conducted for 10 companies whose shares had been listed on the Warsaw Stock Exchange for at least the last 10 years. These were: Alta S.A. (AAT)⁴, BBI Development S.A. (BBD), Echo Investment S.A. (ECH), Immofinanz AG (IIA), KCI S.A. (KCI), Octava S.A. (O8N), Orco Property Group S.A. (OPG), Polnord S.A. (PND), Triton Development S.A. (TRI) and Wikana S.A. (WIK).

Calculations were made using the daily trading price of the shares of the companies (the opening price from the service stooq.pl) from the period: 19.12.2000-30.12.2015.

The course of the study, which was conducted to verify the research hypotheses, was as follows. For each of the 10 companies, the gross annual simple rate of return⁵ was calculated repeatedly using a rolling observation window, the length of which was equal to the adopted investment horizon. The window of observation was shifted each time by one day. The gross annual simple rate of return was calculated by dividing the gross rate of return during the investment period by the duration of the investment in years (i.e. the investment horizon). In this way, for each company, the empirical distributions of the rates of return on shares for a given investment horizon were obtained. Next, the length of the rolling observation window (i.e. the investment horizon) was changed, and the procedure was repeated. Due to the fact that the survey was conducted for 10 different investment horizons (from 1 year to 10 years), for each company, 10 empirical distributions of the rates of return were obtained; jointly, for all 10 companies, this resulted in 100 empirical distributions of the rates of return.

5. Results

The empirical distributions of the rates of return for different investment horizons were determined based on the following number of observations (that is, annual gross rates of return). In the case of a 1-year investment horizon, there were 3509 observations, for a horizon of 2 years - 3260, a horizon of 3 years - 3009, a 4-year horizon- 2760, a horizon of 5 years - 2508, a 6-year horizon- 2255, a 7-year horizon - 2004, an 8-year horizon - 1754, a 9-year horizon - 1504, and for a 10-year horizon - 1253.

Table 1

The values of the first quartile (Q_1) of the rates of return on shares of individual companies, the standard deviation of the quartiles (S) and the value of the range for different investment horizons

Company	Investment horizon in years									
	1	2	3	4	5	6	7	8	9	10
AAT	-41%	-22%	-17%	-16%	-14%	-11%	-11%	-7%	-3%	0%
BBD	-35%	-21%	-14%	-13%	-10%	-10%	-10%	-4%	4%	6%
ECH	-6%	-5%	-1%	0%	2%	-1%	1%	1%	14%	21%
IIA	-11%	-12%	-13%	-16%	-13%	-11%	-9%	-8%	-7%	-6%
KCI	-36%	-30%	-24%	-20%	-17%	-15%	-12%	-8%	-7%	-7%
O8N	-20%	-17%	-20%	-15%	-10%	-9%	-9%	-7%	-3%	-2%
OPG	-47%	-40%	-30%	-23%	-19%	-16%	-14%	-12%	-11%	-10%
PND	-35%	-28%	-22%	-19%	-15%	-12%	-11%	-7%	5%	5%
TRI	-57%	-37%	-27%	-21%	-17%	-14%	-12%	-10%	-8%	-7%
WIK	-37%	-27%	-19%	-16%	-14%	-11%	-11%	2%	11%	7%
<i>S (in p.p.)</i>	15	10	8	6	5	4	4	4	8	9
<i>Range (in p.p.)</i>	51	35	29	23	21	15	15	13	25	31

Source: own calculations.

Hypotheses $H1$, $H2$ and $H3$ concerned the differentiation of the companies based on the quartiles of distributions of returns on the shares. In order to verify these, the quartiles of the rates of return on the shares of individual companies, for different investment horizons, and the standard deviation of

² The study was conducted for different investment horizons.

³ The need to study the effectiveness of assuming different investment horizons at the same time has been pointed out by, among others, Zamojska (ZAMOJSKA 2015).

⁴ The abbreviations of the companies, used in tables and graphs in the rest of this article, are given in parentheses.

⁵ The gross rate of return is understood as not taking into account any fees or capital gains tax.

the quartiles of the rates of return on the shares of the companies surveyed, for different investment horizons, were calculated on the basis of pre-determined empirical distributions (Tab. 1 - 3). Charts were also prepared (Fig. 1 - 3).

The companies differed significantly (from the investor's point of view) according to the values of the first quartiles Q_1 of the distributions of returns on shares. For some investment horizons $h = 1, 2$, the standard deviation of the values of the first quartile was respectively 15% and 10%. This diversification can be regarded as significant for the investor. It should be noted, however, that without the company Echo Investment S.A., the diversification would be significantly lower for some investment horizons. The value of the range (from 13 p.p. to 51 p.p.) should also be noted. The highest values (at least 25 p.p.) were found at $h = 1, 2, 3, 9$ and 10. The highest values for the first quartile distributions of the rates of return on shares were recorded for Echo Investment S.A., while the lowest (except for the 1-year investment horizon) - Orco Property Group S.A.

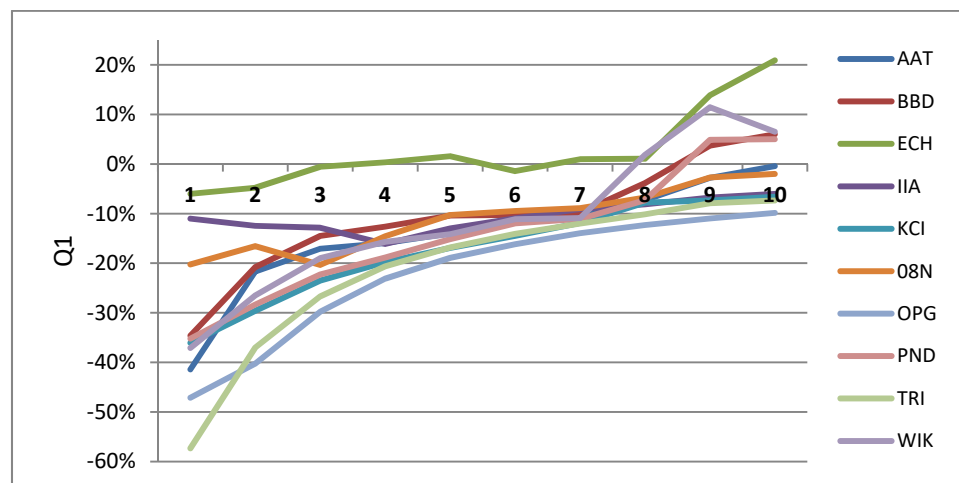


Fig. 1. Values of the first quartile (Q_1) of the rates of return on shares of the companies tested, for different investment horizons. *Source:* own elaboration.

Table 2

The values of the second quartile (Q_2) of the rates of return on shares of individual companies, the standard deviation of the quartiles (S) and the value of the range for different investment horizons

Company	Investment horizon in years									
	1	2	3	4	5	6	7	8	9	10
AAT	8%	1%	-8%	-4%	-2%	7%	2%	3%	29%	52%
BBD	0%	-8%	-6%	0%	10%	10%	13%	14%	11%	9%
ECH	13%	20%	18%	13%	13%	21%	15%	15%	25%	29%
IIA	8%	5%	5%	-2%	-5%	-9%	-8%	-7%	-6%	-5%
KCI	-13%	-14%	-11%	4%	6%	-2%	-6%	-5%	-3%	-2%
O8N	7%	3%	-4%	-1%	8%	15%	11%	10%	1%	1%
OPG	-1%	-21%	-21%	-20%	-17%	-14%	-13%	-11%	-10%	-9%
PND	-8%	-13%	-10%	-8%	18%	55%	25%	14%	9%	9%
TRI	-26%	-21%	-19%	-13%	-10%	-5%	-8%	-6%	-6%	-7%
WIK	-13%	-8%	-9%	-10%	18%	61%	38%	23%	23%	17%
<i>S (in p.p.)</i>	12	12	11	9	11	24	16	11	14	18
<i>Range (in p.p.)</i>	39	41	39	33	35	69	51	34	39	61

Source: own calculations.

The hypothesis H_2 stated that the companies differed significantly (from investor's point of view) due to the values of the second quartiles Q_2 of the distributions of returns on shares. The differentiation of the median values can be regarded as significant for the investor. The average deviation from the mean ranged from 9 p.p. to 24 p.p. The values of the ranges calculated for the second quartile were significantly higher than the values calculated for the differences in the first quartile. They ranged from 33 p.p. to 69 p.p. As with the first quartile, the worst company (except for the 1-year investment horizon) was Orco Property Group S.A. The best companies were, depending on the investment hori-

zon: Echo Investment S.A. (for $h = 1,2,3,4$); Wikana S.A. (for $h = 5$ (along with Polnord S.A.), 6,7,8); Alta S.A. (for $h = 9, 10$).

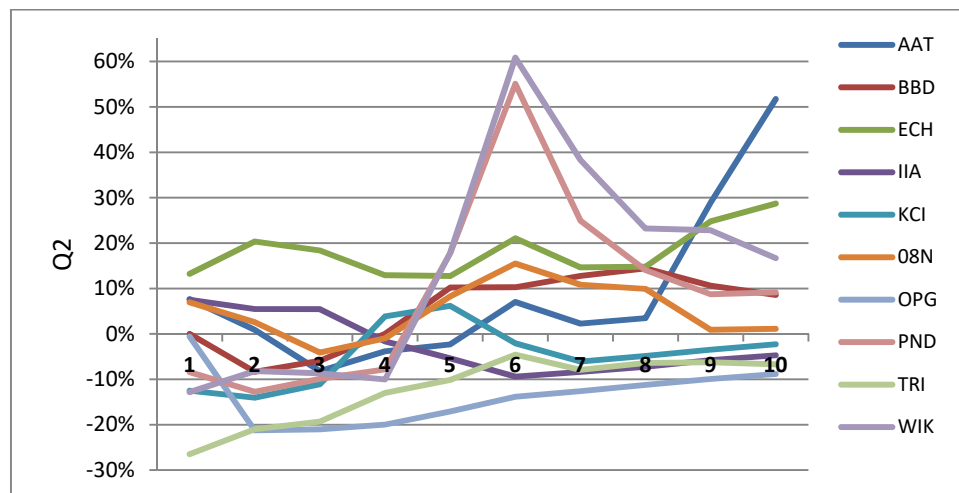


Fig. 2. Values of the second quartile (Q_2) of the rates of return on shares of the companies tested, for different investment horizons. *Source:* own elaboration.

Table 3

The values of the third quartile (Q_3) of the rates of return on shares of individual companies, the standard deviation of the quartiles (S) and the value of the range for different investment horizons

Company	Investment horizon in years									
	1	2	3	4	5	6	7	8	9	10
AAT	74%	110%	230%	228%	332%	265%	250%	182%	144%	102%
BBD	30%	17%	14%	52%	52%	43%	24%	20%	21%	12%
ECH	59%	59%	51%	55%	52%	33%	32%	41%	38%	38%
IIA	22%	17%	14%	14%	10%	3%	-8%	-6%	-5%	-4%
KCI	26%	35%	33%	30%	27%	51%	32%	19%	8%	0%
O8N	37%	23%	34%	32%	36%	33%	22%	19%	19%	21%
OPG	36%	34%	32%	37%	21%	-10%	-9%	-8%	-7%	-8%
PND	27%	25%	35%	107%	116%	98%	66%	43%	30%	13%
TRI	31%	20%	19%	20%	28%	20%	10%	0%	-3%	-5%
WIK	31%	11%	24%	135%	136%	105%	70%	55%	40%	23%
<i>S (in p.p.)</i>	16	28	61	64	92	75	72	52	42	31
<i>Range (in p.p.)</i>	52	99	216	214	322	275	259	190	151	110

Source: own calculations.

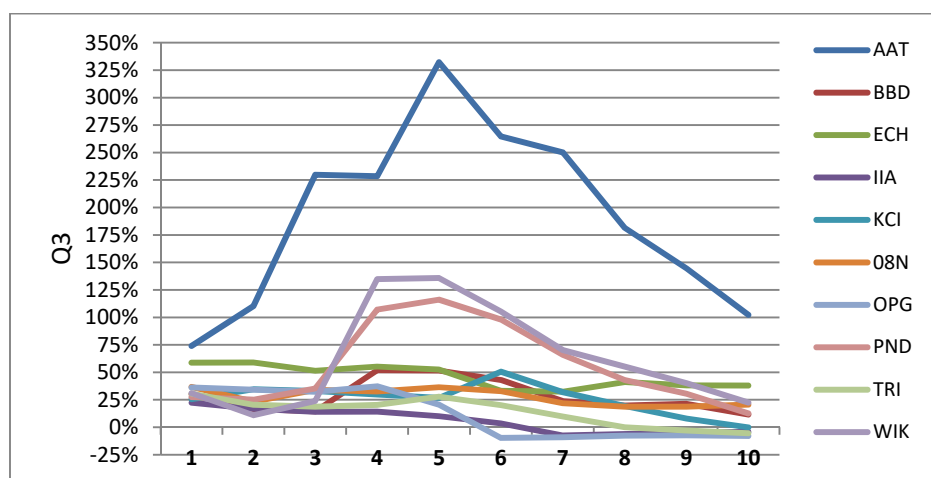


Fig. 3. Values of the third quartile (Q_3) of the rates of return on shares of the companies tested, for different investment horizons. *Source:* own elaboration.

The hypothesis *H3* stated that the companies differed significantly (from the investor's point of view) due to the values of the third quartiles Q_3 of the distributions of returns on shares. Differentiation of the third quartile can be regarded as significant for the investor. The average deviation from the mean ranged from 16 p.p. to 92 p.p. For seven horizons, it exceeded 40 p.p. – which was a very high result. The values of ranges calculated for the third quartiles were high and very high, much higher than the values calculated for the differences in the second quartile. They ranged from 52 p.p. to 322 p.p. The best company, with exceptionally high values for the third quartile, was Alta S.A. There were very large differences between the values of the third quartile for this company and the third quartile values for other companies. The worst companies were, depending on the investment horizon: Immofinanz AG (for $h = 1,3,4,5$), Wikana S.A. (for $h = 2$), Orco Property Group S.A. (for $h = 6,7,8$ and 9).

Hypothesis *H4* stated that the differences between the values of specific quartiles of returns between the best and the worst companies were very large. Partial verification of this hypothesis took place during the verification of hypotheses 1–3, because, among others, the extent of the differences calculated between specific quartiles for each investment horizon was indicated. The range in the values for the first quartile exceeded 30 p.p. only in the case of four time horizons, and exceeded 50 p.p. only in the case of a single horizon. The differences in the values for the second quartile exceeded 30 p.p. for each investment horizon; in the case of three horizons, it exceeded 50 p.p. The differences in the values of the third quartile were over 50 p.p. for each investment horizon; in the case of eight horizons they exceeded 100 p.p. It can, therefore, be concluded that the differences between the values of the quartiles of returns for the best and worst companies were, in most cases, either large or very large.

The above comparison of the best and worst funds was based on the values of the quartiles of returns (the values of the first, second and third quartiles were compared separately). In light of the box plots⁶ drawn up and the data presented in Tables 1–3 one can, by expanding the research, compare the best funds with the worst ones, taking into account different quartiles of returns at the same time. On this basis, significant differences between the best and the worst funds can be observed. These differences are least apparent in the shortest investment horizon ($h = 1$) and increase with an increase in the horizon. For example, for a 1-year investment horizon:

- a) the value of the second quartile of returns on the shares of Triton Development S.A. is lower than the values of the first quartile of returns on the shares of: Echo Investment S.A., Immofinanz AG, Octava S.A.;
- b) the second quartiles of returns on the shares of KCI S.A. and Wikana S.A. are lower than the first quartiles of returns on the shares of Echo Investment S.A. and Immofinanz AG;
- c) the value of the second quartile of returns on the shares of Polnord S.A. is lower than the first quartile of returns on the shares of Echo Investment S.A.

For a 2-year investment horizon ($h = 2$):

- a) the second quartiles of returns on the shares of Triton Development S.A. and Orco Property Group S.A. are lower than the first quartiles of returns on the shares of Alta S.A., BBI Development S.A., Echo Investment S.A., Immofinanz AG and Octava S.A.;
- b) the second quartiles of the returns on the shares of KCI S.A. and Polnord S.A. are lower than the first quartiles of returns on the shares of Echo Investment S.A. and Immofinanz AG;
- c) the third quartiles of returns on the shares of BBI Development S.A., Immofinanz AG and Wikana S.A. are lower than the second quartile of returns on the shares of Echo Investment S.A.

Hypothesis *H5* stated that, with an increase in the investment horizon, there were large changes in the values of each of the quartiles of returns for a given company. In order to verify this hypothesis, the absolute increases in the value of the first quartile (Tab. 4), second quartile (Tab. 5) and third quartile (Tab. 6) were calculated.

Based on data from Table 4, it can be concluded that, in several cases, there were significant changes in the values of the first quartiles of returns (≥ 10 p.p.) for individual companies along with an increase in the investment horizon. These appeared most frequently when shifting from a 1-year to a 2-year investment horizon. The largest increases in the value of the first quartile (+20 p.p.) characterized the following companies: the formerly mentioned Alta S.A. and Triton Development S.A. It is worth

⁶ Box plots were not included in the paper.

noting that, in almost every case, the changes were positive, i.e. they consisted of an increase in the value of the first quartile.

Table 4

Absolute increase in the values of the first quartiles of returns (in p.p.)

Company	Investment horizon in years										Average*
	1	2	3	4	5	6	7	8	9	10	
AAT	-	20	5	1	2	3	1	3	4	2	5
BBD	-	14	6	2	2	0	0	6	8	2	5
ECH	-	1	4	1	1	-3	2	0	13	7	4
IIA	-	-1	0	-3	3	2	2	1	1	1	2
KCI	-	6	6	4	3	2	3	4	0	1	3
08N	-	4	-4	6	4	1	1	2	4	1	3
OPG	-	7	10	7	4	3	2	2	1	1	4
PND	-	7	6	3	4	3	1	4	12	0	4
TRI	-	20	10	6	4	3	2	2	2	1	6
WIK	-	11	8	3	2	3	0	13	10	-5	6
Average*	-	9	6	4	3	2	1	4	6	2	

* the averages in Tab. 4-6 were calculated on the basis of growth modules. Values ≥ 10 p.p. are highlighted in bold.

Source: own calculations.

Table 5

Absolute increase in the values of the second quartiles of returns (in p.p.)

Company	Investment horizon in years										Average
	1	2	3	4	5	6	7	8	9	10	
AAT	-	-7	-9	4	2	9	-5	1	25	23	9
BBD	-	-8	2	6	10	0	3	2	-4	-2	4
ECH	-	7	-2	-5	0	8	-6	0	10	4	5
IIA	-	-2	0	-7	-4	-4	1	1	1	1	2
KCI	-	-2	3	15	2	-8	-4	1	1	1	4
08N	-	-4	-7	3	9	7	-5	-1	-9	0	5
OPG	-	-21	0	1	3	3	1	1	1	1	4
PND	-	-4	3	2	26	37	-30	-11	-5	0	13
TRI	-	5	2	6	3	6	-3	1	0	0	3
WIK	-	5	0	-1	28	43	-23	-15	0	-6	14
Average	-	7	3	5	9	13	8	4	6	4	

Source: own calculations.

Based on the data found in Table 5, it can be stated that, in several cases, along with an increasing investment horizon, there were large changes in the value (≥ 10 p.p.) of the second quartiles of returns from individual companies; these often exceeded 20 p.p. The biggest and most frequent changes can be observed for the following companies: Polnord S.A. and Wikana S.A. Negative growth (also high values) appeared more often than in the first quartile. Large value increases occurred for various shifts in investment horizons; the most significant changes characterized shifts from a 4- to a 5-year horizon, a 5- to a 6-year horizon, and a 6- to a 7-year horizon.

Based on the data from Table 6, it can be concluded that, in almost half of the cases, there were large changes in the value (≥ 10 p.p.) of the third quartiles of returns from individual companies along with an increase in the investment horizon; these often exceeded 20 p.p. and even reached 119 p.p. Just as in the case of the second quartiles, the biggest and most frequent changes can be observed for the following companies: Polnord S.A., Wikana S.A. and Alta S.A. Most of the growth was negative (also high values).

In order to verify the hypothesis H_6 , rankings of the companies were drawn up based on the empirical distributions which had been calculated earlier (Figs. 4 - 6). It can be argued that two types of funds existed, i.e. ones whose position in the rankings underwent major changes with changes in the investment horizon and ones whose position hardly changed at all. In the case of the ranking according to the first quartile of returns (Fig. 4), funds whose position in the ranking hardly changed included: Echo Investment S.A. (the best fund) and OPG (the worst fund). Small changes in position (a max. of 2 places) characterized the funds: BBI S.A. and Triton Development S.A. Other funds changed their

position in the rankings by a few places.

Table 6

Absolute increase in the values of the third quartiles of returns (in p.p.)

Company	Investment horizon in years										average
	1	2	3	4	5	6	7	8	9	10	
AAT	-	36	119	-1	104	-68	-14	-69	-37	-42	55
BBD	-	-13	-2	37	0	-9	-19	-4	1	-10	11
ECH	-	0	-7	4	-3	-19	-1	9	-3	0	5
IIA	-	-5	-3	0	-4	-7	-11	1	1	1	4
KCI	-	9	-2	-3	-3	24	-19	-13	-12	-8	10
O8N	-	-13	11	-1	4	-4	-11	-3	0	2	5
OPG	-	-2	-2	5	-17	-30	1	1	0	-1	7
PND	-	-2	10	72	9	-18	-32	-23	-13	-18	22
TRI	-	-10	-2	1	8	-8	-10	-10	-3	-2	6
WIK	-	-20	13	111	1	-30	-35	-15	-15	-18	29
average	-	11	17	24	15	22	15	15	9	10	

Source: own calculations.

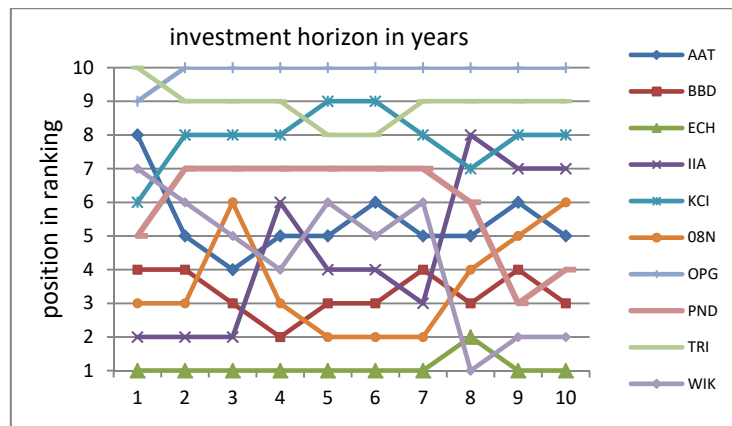


Fig. 4. Ranking of the funds according to the first quartile of returns. Source: own elaboration.

In the case of the ranking drawn up according to the second quartile of returns (Fig. 5), funds whose position underwent slight changes (2 or 3 places) were: Echo Investment S.A., Triton Development S.A., BBI Development S.A. and Octava S.A. Other funds changed their positions in the ranking by several places.

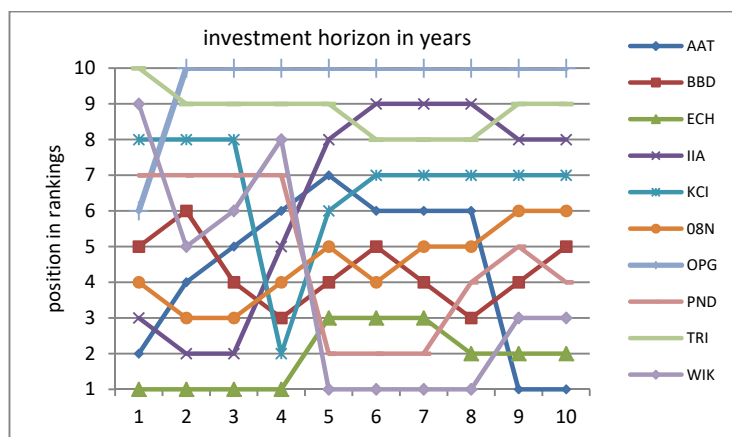


Fig. 5. Ranking of the funds according to the second quartile of returns. Source: own elaboration.

In the case of the ranking drawn up according to the third quartile of returns (Fig. 6), one can identify: funds whose position did not undergo any changes (1st place - Alta S.A.), funds whose positions underwent slight changes, i.e. 2-3 places (Echo Investment S.A., BBI Development S.A., Octava S.A.

and Triton Development S.A.), and other funds which changed their positions in the ranking by several places.

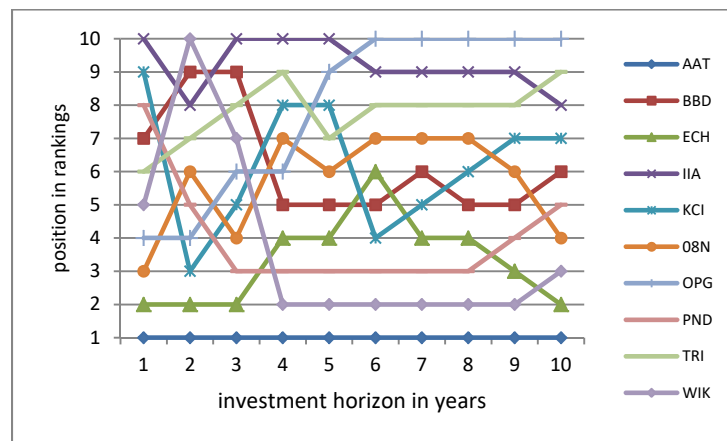


Fig. 6. Ranking of the funds according to the third quartile of returns. Source: own elaboration.

The second part of the hypothesis H_6 stipulated significant differences in the position of the companies in rankings drawn up using different quartiles of rates of return as the criterion for the ranking order. In figures 4-6 significant differences in rankings for different quartiles of returns can be observed for some companies (Alta S.A. and Immofinanz AG). In the case of other companies, there are differences, which, however, seem to have more to do with changes in the investment horizons than with the changes in the quartile of the rates of return adopted as the ranking criterion. It is worth noting that both, in terms of the value of the first quartile of returns and the value of the second quartile of returns, Echo Investment S.A. can be considered the best company, while the worst companies appear to be Orco Property Group S.A. and Triton Development S.A. The ranking drawn up based on the third quartiles of returns indicates the company Alta S.A. as by far the best, with the worst companies being: Orco Property Group S.A., Immofinanz AG and Triton Development S.A.

6. Conclusions

The first aim of the study was to analyze the diversification of real estate development companies in Poland in the years 2001-2015 based on the rate of return on stock. The study conducted allowed for the following conclusions to be made.

Firstly, it was found that, in the studied time period, the companies differed significantly⁷ (from an investor's point of view) in terms of the values of the first quartiles Q_1 of the distributions of returns on shares for some investment horizons ($h = 1, 2$).

Secondly, it was found that, in the studied time period, the companies differed significantly (from an investor's point of view) in terms of the values of the second quartiles Q_2 of the distributions of returns on shares.

Thirdly, it was found that, in the studied time period, the companies differed significantly (from an investor's point of view) in terms of the values of the third quartiles Q_3 of the distributions of returns on shares.

Fourthly, it was found that the differences between the values of the quartiles of rates of returns for the best and worst companies were, in most cases, large or very large.

On the basis of the above conclusions, it should be acknowledged that the distributions of the rates of return on shares of individual companies differ significantly (especially in the values of Q_2 and Q_3). For investors, this means that the rate of return achieved from investments in the shares of real estate development companies varied significantly depending on the company selected.

The second aim of the study was to examine the significance of the investment horizon to the profitability of investments in shares of real estate development companies. It was found that, along with an increase in some of the investment horizons, there were large changes in the values of the second quartile of returns on shares for some of the surveyed companies. With a lengthening of some investment horizons, there were large or very large changes in the values of the third quartile of returns on

⁷ It was assumed that a standard deviation of at least 10 p.p. would be evidence of differentiation significant from the investor's point of view.

shares for all of the companies surveyed. Based on the research results, it can be concluded that the least risky investment horizon was a 10-year and 9-year horizon. It is difficult to identify the optimal horizon (characterized by the highest quartiles of the distributions of the rates of return) – this varied depending on the quartile and the specific company.

In addition to the above, it was found that there were both, funds whose position in the rankings underwent major changes along with changes in the investment horizon, as well as funds whose positions hardly changed. It was also determined that there were differences in the positions of individual companies in the rankings when different quartiles of the rates of return were adopted as the criterion for the order of the ranking. It was recognized that changes in the position of the companies in the rankings had more to do with changes in the investment horizon than with changes in the quartile of the rates of return which had been adopted as the criterion for the ranking.

It should be emphasized that the conducted study concerned the rates of return on shares of real estate development companies in the years 2001 - 2015. The results and conclusions drawn from them relate only to that time period. A survey covering a different period of company share trading activity could produce different results.

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