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INVESTING IN DIVIDEND VS. NON-DIVIDEND STOCKS – EFFICIENCY ASSESSMENT USING FRACTAL MEASURES

Rafał BUŁA[1*], Bartłomiej JABŁOŃSKI[2]

[1] University of Economics in Katowice, Faculty of Finance, Department of Investment;
rafal.bula@ue.katowice.pl, ORCID: 0000-0002-9890-7078
[2] University of Economics in Katowice, Faculty of Finance, Department of Investment;
bartlomiej.jablonski@ue.katowice.pl, ORCID: 0000-0002-9398-017X
* Correspondence author

Purpose: The purpose of the paper is to reveal potential differences in risk and profitability of investment in dividend and non-dividend stocks.
Design/methodology/approach: The scientific aim of the paper is achieved by conducting a scrupulous literature analysis. Moreover, the authors use methods of comparative analysis to investigate the characteristics of dividend and non-dividend stocks and reveal similarities and differences. Study of fractal features of chosen stocks and comparisons between abovementioned groups of shares are conducted using the ANOVA methods.
Findings: The results of the empirical analyses conducted in this paper prove that dividends paid by US dividend companies grow at significantly lower rate than dividends distributed by Polish dividend stocks. Additionally, rates of return on Polish dividend stocks are more heavily influenced by dividend pay-outs than rates of return on US ones. Taking into account riskiness of investments there are no differences in risk level between dividend and non-dividend stocks in USA and Poland, independently whether the risk measure exploited is stock volatility or its fractal dimension.
Research limitations/implications: The research was based on limited number of companies analyzed. As a result, there could be present a bias introduced by the deterministic method of choosing a sample of stocks. It is recommended to enlarge the analyzed set in future research.
Practical implications: Knowledge about similarities and differences among dividend and non-dividend companies is highly relevant to investors as well as corporate managements. As a consequence, better financial decisions could be taken leading to increased final wealth.
Social implications: Among the social implications of the paper the possible change in investors' attitude towards dividend and non-dividend companies seems most important. This could influence companies' boards to adjust their payout policies to satisfy the investors. Finally, the improvement in investor's needs fulfillment can be achieved.
Originality/value: The novelty of the paper is the comparison of dividend and non-dividend stocks taking into account classical and modern risk measures. Moreover, it compares the efficiency of investing in dividend and non-dividend stocks during period 2015-2021, i.e. partially catching the effect of SARS-CoV-2 pandemic filling a gap in our knowledge.

Keywords: payout policy, dividend, financial investment, fractal dimension.

Category of the paper: Research paper.

1. Introduction

Since the publication of the groundbreaking paper by F. Modigliani and M. Miller (Miller, Modigliani, 1961) proving that dividend policy has no impact on stock prices, the issue of dividend payments has become the subject of many scientific studies (Al-Malkawi, Rafferty, Pillai, 2010). Apart from the basic question of whether dividend policy has an effect on asset prices, and if so, what effect, the question of whether dividend-paying companies are different from other companies naturally arose. In particular, it was considered a key issue to determine whether investing in dividend companies makes it possible to achieve above-average income, also if adjusted for the level of risk (McQueen, Shields, Thorley, 1997). However, the construction of an optimal investment portfolio requires knowledge of the properties of the assets to be included in it, in particular the characteristics of the dividend policy pursued.

Changes in stock prices of dividend companies and the issues of investing in stock of dividend-paying companies are widely discussed in the literature (i.a. P. Asquith & D.W. Mullins Jr, B. Graham, M. Lichtenfeld, H. Rubin & C. Spaht II, M. Skousen). The results of research indicate specific common features of dividend companies' stock listings both in terms of stock price volatility, rates of return, as well as capital drawdown when the market is in a downturn. Investors expecting a stable cash flow from dividend payments take special scrutiny of the history of management board activities with regard to dividend payments, variations in the amount of dividends paid, and any periodic interruptions in dividend payments. Particularly during a downturn, it becomes important to regularly receive dividends, as they can be used to increase the share of undervalued dividend stocks in the portfolio. In the view of J. Pioch (Pioch, 2015), a dividend is a manifestation of property rights in their purest form – as an owner's income from their capital invested in the stocks or shares of a particular company. Long-term, fundamental investors prefer shares of companies whose management indicates the dividend policy adopted and, based on it, pays stable or increasing dividends on a regular basis (this is known as the so-called clientele effect). The characteristics of a dividend company are often determined by guidelines from capital market institutions. In the US stock market, according to Standard & Poor's, a company can be characterized as a dividend aristocrat, if it belongs to the S&P 500 index and at the same time has increased its dividend payments every year for the past 25 years, its capitalization is at least $3 billion on the index update date, and for the 6 months preceding the index update, the company's stock turnover averaged $5 million per day. On the Warsaw Stock Exchange, in turn, a company can be classified in the WIGDIV index for dividend companies if it has the highest dividend yield at the end of November each year and has paid dividends at least three times in the last 5 years of trading.

Research by H. Rubin and C. Spaht II (Rubin, Spaht, 2011) confirms that regular and increasing dividends received by investors are an important hedge against portfolio declines regardless of capital market sentiment (Lichtenfeld, 2015; Skousen, 2011). Also P. Asquith and

D.W. Mullins Jr. (Asquith, Mullins, 1983) indicate that when investing in dividend companies, it is important for investors to consistently receive increasing dividends. Furthermore, studies conducted by A. Williams and M. Miller (Williams, Miller, 2013) and K.P. Fuller and M.A. Goldstein (Fuller, Goldstein, 2011) confirm that such investments are reasonable. Regardless of changes in stock prices in the capital market, dividends provide a hedge against depreciation in the value of a securities portfolio. The authors claim that dividends paid become particularly important during a downturn, since the stocks of dividend-paying companies have lower declines then. It is also worth noting that the worst reputation from the point of view of the stability of dividends paid can be attributed to companies characterized by high volatility of earnings, which translates into unpredictability of future dividends.

The literature points out that the investor's income in the form of expected dividends is more important than the expected gain on the sale of stock – the dividend is certain, while any gain on an increase in the stock price is not (this is known as the so-called "bird-in-hand" theory) (Cwynar, Cwynar, 2007; Kowerski, 2011). It is worth mentioning that dividend payment certainty applies to dividend companies with a clear record of regular dividend payments. The company's management board which recommends paying dividends on a continuous basis is winning the votes of those shareholders who hope that dividends will be further paid. According to B. Graham (Graham, 1999, 2009), in the past the dividend policy used to be a frequent subject of dispute between minority shareholders and the management board. If it is assumed that profits "belong" to shareholders and they are entitled to receive them, and that for many shareholders the cash flow from dividends is a form of maintaining their standard of living, while cash retained in the company may not have such tangible value, then regular dividend payments are an important factor in the selection of stock for investment portfolios. M. Skousen (Skousen, 2011) points out in turn that the regular payment of dividends is a form of pressure on the company's management board. According to this view, it will focus on highly profitable projects, because the worst possible scenario for a dividend company is that, as a result of unsuccessful investment decisions by the board, the level of dividend payments will fall or they will be suspended altogether. The author also claims that there is growing evidence that companies paying regular dividends show better long-term results and lower risk than non-dividend-paying companies focused on rapid growth. D.J. Skinner and E.F. Soltes (Skinner, Soltes, 2011) have identified a number of financial characteristics of dividend companies. First of all, there is a low probability of loss for a dividend-paying company and the financial results generated by these companies are more stable than those of companies that do not pay dividends, and this trend continues over the long term.

In view of significant turbulence in financial markets related to the SARS-CoV-2 pandemic, the authors found it advisable to examine potential differences occurring between dividend and other companies listed on the US and Polish markets in the period covering the aforementioned turbulence. The literature search conducted reveals that there are no such studies for the period indicated. Also, there are no studies devoted to analyzing the differentiation of investment risk

between dividend-paying and non-dividend-paying companies, particularly for the Polish stock market. By filling the indicated research gaps, the authors aimed to detect the identified potential differences.

The paper is organized as follows. In the next section a literature review and hypothesis development are provided. Section 3 describes sample selection and methodological issues. In the next section the results obtained are presented. The final section concludes.

2. Literature review and research hypotheses development

Analyzing the efficiency of investing in dividend vs. non-dividend stocks, it is worth referring to the research conducted on the historical performance of investments in dividend stocks. According to M. Lichtenfeld (Lichtenfeld, 2015), the average annual return of the S&P Dividend Aristocrats index for the period 2001–2011 was 7.1%. For the same period, the S&P 500 index generated the average annual return of 2.9%. A. Williams and M. Miller (Williams, Miller, 2013, pp. 58-69) found that during the US financial market crisis (2001 and 2008), the returns of companies ranked among dividend aristocrats were higher than those of the S&P 500 index. M. Lichtenfeld (Lichtenfeld, 2015) also points out that the standard deviation of the dividend aristocrats' return amounted to 18.4% and was lower than the same parameter calculated for the S&P 500 index at 21.3%. M. Skousen (Skousen, 2011), based on his research, concludes that dividend-paying stocks deliver better financial results than stocks that do not pay dividends.

Investors who include dividend stocks in their portfolios base their investment decisions on a number of indicators relating to the regularity and growth rate of dividends. Particularly relevant dividend market indicators include dividend yield (DY), cumulative dividend yield (DY_C), and dividend growth rate (g). Key information about the attractiveness of an investment in particular stocks can be obtained by an investor by analyzing the dividend yield ratio (DY). The DY level from the perspective of the price changes every session, while from the perspective of the DPS parameter – when the dividend is paid. The higher the value of the ratio, the higher the dividend paid per share market price. Therefore, it reflects the attractiveness of the investment from the perspective of dividends paid at a given price to be paid for shares (for companies that have not paid dividends the ratio is not calculated). An alternative use of the ratio is to compare it to DY for the entire market or a selected group of companies, such as dividend companies. However, this makes sense if the issuer is a dividend company and consistently pays dividends. For long-term investments, the traditional dividend yield measure is modified to the cumulative dividend yield (DY_C). It is calculated taking into account the purchase price of shares (rather than the current quotations) and the sum of dividends received since the date the shares were purchased.

Modification of the DY ratio allows tracking the growth scale of the dividends paid in relation to the level of investment in shares. Exceeding 100% means that the sum of dividends received exceeded the investment (such a reading is not possible with a traditional DY ratio, since the stock price would have to be adjusted to 0 after the dividend right is cut off). In other words, exceeding 100% means that the company has paid in dividends to the investor the entire amount that had been invested in its shares. The level of DY_C also changes when an investor decides to buy more shares in a company. Then the purchase price changes and becomes the average purchase price of shares (this is known as the so-called cost-averaging strategy). The last discussed parameter supporting investor decisions – the dividend growth rate (g) – shows the annual rate at which dividend payments per share change.

A high dividend growth rate is possible to be maintained by an issuer over the long term only if financial results grow at least at this rate. Therefore, maintaining a high rate of growth in dividend payments without confirming it in the issuer's earnings could mean the risk of reducing future dividends or even discontinuation of dividend payments in the future. For this reason, dividend companies, particularly those included in the S&P 500 Dividend Aristocrats index, pay dividends at a stable growth rate that exceeds inflation by several percentage points, even though the dividend they pay could show a higher rate of change. Therefore, investors prefer companies that pay dividends with a satisfactory cumulative dividend yield and a stable dividend growth rate that exceeds inflation by several percentage points.

The main focus of the above discussions was on issues related to the profitability of dividend companies, with less attention paid to their riskiness. However, the issue of the riskiness of the indicated instruments must also be included in the analyses if they are to present the full spectrum of financial consequences for the investor. As past research indicates (Fama, French, 2001; Gwilym, Seaton, Thomas, 2005), companies that pay regular dividends are generally of significantly larger size (Fama and French indicate that in the sample they analyzed, the difference in the size of companies paying and not paying dividends is 10 times) (Fama, French, 2001; Karpavičius, Yu, 2018) and have a stabilized financial position (including higher profitability). In contrast, companies that have never paid dividends are generally companies with expected high growth rates (companies with strong growth potential), high capital expenditures and high P/BV ratios, but lower profitability than dividend-paying companies. The least favorable situation, in turn, is found in the once dividend-paying companies, which now most often have low earnings, low capital expenditures, and liquidity problems. The indicated characteristics of the entities that make up the analyzed classes (i.e., dividend-paying and non-dividend-paying companies) allow us to make the assumption that it is riskier to invest in companies that do not pay dividends (although these are factors different from the previously indicated faster realization of benefits by investors in case of dividend-paying companies). At the same time, it is pointed (Allen, L. et al., 2012) to the impact of significant debt as a factor limiting the ability to pay dividends (i.a. as a result of monitoring and prudential measures taken by providers of debt, particularly credit institutions). On the other hand,

(Gwilym, Seaton, Thomas, 2005) indicate that dividend companies are no longer dominant when returns earned are adjusted for the level of risk – adjustments made as suggested in (McQueen, Shields, Thorley, 1997). The considerations presented clearly indicate the need to expand the ongoing research also to include relevant measures of investment risk.

There is a fairly widespread belief among researchers that companies paying (above-average) dividends generally produce above-average returns (Clemens, 2012), yet neither the motives behind managers' decisions to pay dividends nor the mechanism for generating excess returns have been conclusively explained – as Black (Black, 1976) has already pointed out. Some researchers justify the higher returns on portfolios of dividend companies by the increased risk (Fama, French, 1993; McQueen, Shields, Thorley, 1997) associated with *value investing*, which includes investing in dividend companies, but this view is sometimes challenged (Clemens, 2012).(Andrikopoulos, Daynes, 2004) state that "(…) companies with value potential are less risky than companies with growth potential given standard measures like beta or standard deviation (…)". Existing studies based on classical risk measures do not provide definitive guidance. A pioneering study focusing primarily on the level of riskiness of investments is the work by (Baskin, 1989). The methodology developed by the author became common in further studies of the indicated phenomenon, based on the study of the impact of the dividend yield and the dividend payout ratio on stock price volatility while using control variables that included company size, operating profit volatility or debt level. In the analyzed sample of 2,344 US companies listed between 1967 and 1986, the author clearly confirmed the negative impact of the dividend payout ratio or the dividend yield (as well as company size) on return volatility, combined with a positive (as expected) impact of earnings or debt volatility.

Similar studies have been conducted in later periods for other markets as well. Among developed markets, the US, UK, and Australian markets were analyzed. (Profilet, 2013) for US companies represented in the Value Line Investment Survey found a significant negative effect of the dividend yield on the volatility of stock returns with a non-significant positive relationship for the dividend payout ratio. Analogous research conducted by (Hussainey et al., 2011) for the UK market led to conclusions similar to those of (Baskin, 1989), however, the research sample in this case was much smaller (comprising 123 entities). Similar results for the Australian market were achieved by (Allen, D. E., Rachim, 1996), but in this case the negative correlation for the dividend yield proved to be statistically insignificant. In case of European stock exchanges (except for the London stock exchange), research on the discussed phenomenon is rather limited. However, mention should be made of the results obtained for the Frankfurt Stock Exchange (Karlsson, von Renteln, 2021). Having analyzed 30 companies in the DAX index from 2000 to 2020, the authors were able to confirm Baskin's results (Baskin, 1989) for both dividend yield and dividend payout ratio. The indicated negative correlation thus appears to be a fairly common rule for developed markets.

Some different conclusions from the results obtained for developed markets were obtained for developing economies. (Rashid, Rahman, 2008) noted a positive effect of the dividend yield on price volatility of stocks listed on the Dhaka Stock Exchange between 1999 and 2006, but the relationship was not statistically significant. Their results were confirmed for the years 2008-2017 in the studies by (Hossin, Ahmed, 2020). Similar results for the Jordanian market in the period 2001-2013 were obtained by (Al-Shawawreh, 2014), as well as for the Karachi Stock Exchange in the period 2005-2009 (Lashgari, Ahmadi, 2014). In turn, research by (Jahfer, Mulafara, 2016; Nazir et al., 2010; Nguyen et al., 2020) finds a statistically significant indicated positive relationship for the stock exchanges of Sri Lanka, Pakistan, and Vietnam.

Conclusions similar to the results obtained for developed markets have been made i.a. for Malaysia, Vietnam, Iran, Pakistan, and Nigeria. Research by (Hooi, Albaity, Ibrahimy, 2015) conducted on a sample of 319 Malaysian companies clearly shows the volatility-reducing impact of the increased dividend yield as well as the dividend payout ratio. Analogous results were also obtained by (Zainudin, Mahdzan, Yet, 2018), while for Pakistan by (Nazir, 2012; Shah, Noreen, 2016) and the Tehran Stock Exchange by (Lashgari, Ahmadi, 2014), although for much smaller samples (166, 75, 50 and 51 entities, respectively). Analyses presented by (Dang, Tran, Tran, 2019) for 248 Vietnamese companies suggest a significantly negative effect of an increase in the dividend payout ratio on the volatility of returns, with no significance attributed to the dividend yield. The opposite results were found by (Hashemijoo, Ardekani, Younesi, 2012) for a group of 84 Malaysian companies engaged in the manufacture of consumer goods and by (Okafor, Mgbame, Chijoke-Mgbame, 2011). However, it seems that the limitations imposed on the set of entities analyzed in the studies by (Hashemijoo, Ardekani, Younesi, 2012) may distort the actual relationships present in the Kuala Lumpur Stock Exchange, and due to the larger sample and wider time range, the results obtained by (Hooi, Albaity, Ibrahimy, 2015; Zainudin, Mahdzan, Yet, 2018) should be considered more reliable.

The results of the research presented so far clearly indicate the existence of an effect of dividend policy on the volatility of stock returns as measured by the standard deviation, most often estimated using a procedure based on the use of extreme values. However, it should be noted that the spectrum of risk measures is much wider, and the use of a single (though undoubtedly common and methodologically sound) risk measure limits the universality of the conclusions drawn. One of the purposes of this paper, therefore, is to examine whether the indicated relationship is also true for companies listed on the Warsaw and New York Stock Exchanges, and whether it remains valid if risk measures other than the standard deviation of returns are used in the analyses. However, it is still challenging to select the right measures so that they do not duplicate the information already contained in the classical measures. Empirical studies to date (Bhatt, Dedania, Shah, 2015; Buła, 2017, 2018; Buła, Pera, 2015) indicate the possibility of using the fractal dimension as a non-classical measure of the riskiness of financial investments, as advocated by the creator of the concept of a fractal (Mandelbrot, Hudson, 2010). Therefore, this study also uses the fractal dimension as a measure of investment riskiness.

The fractal dimension was proposed as a characterization of objects of a new type, previously unknown and perceived by 19th-century mathematicians as "monstrous" or "pathological", due to their extremely complex structure, which was difficult to describe mathematically. This belief was all the stronger because it was assumed that all objects could be treated as exhibiting regularity. However, the indicated alleged disadvantage turned out to be an advantage when, with the development of science, the existing apparatus proved inadequate to describe reality correctly.

The concept of a fractal (Latin: *fractus* – broken) was introduced by Mandelbrot (Mandelbrot, 1983). It has become widely used in both natural and social sciences. The formal definition of a fractal object: "A fractal is by definition a set for which the Hausdorff-Besicovitch dimension strictly exceeds the topological dimension" (Mandelbrot, 1983, p. 15) has proved to be of little use in empirical studies, so it has been replaced by a series of conditions, the most important of which is the condition of the self-similarity (or self-affinity) of the analyzed object. According to the mentioned condition, an object is called a fractal if it is self-similar or self-affine, also in the statistical sense (in other words, it is required that the probability distribution of the analyzed quantity belongs to the same family of distributions with the accuracy of the parameter values). For stochastic processes, a process $X(t)$ is considered to be self-similar if it meets the following condition:

$$X(t) \overset{d}{=} r^{-H} X(rt), \quad t \geq 0 \tag{1}$$

for any $r > 0$ (*H-ss* process),
where:
t – time,
H – self-similarity coefficient,
r – constant,
$\overset{d}{=}$ – denotes equality in the sense of probability distribution.

The fractal dimension can then be considered a characteristic describing the global and at the same time local behavior of the indicated process. As there are many definitions of the fractal dimension, for the purposes of this paper it was decided to use the box-counting dimension (cube-counting, Minkowski-Bouligand, sometimes referred to as the Kolmogorov entropy or the entropic dimension). The box-counting dimension is defined as:

$$\dim_{\mathrm{B}}(X) = \lim_{\varepsilon \to 0} \frac{\ln N_{\varepsilon}(X)}{\ln \frac{1}{\varepsilon}}, \tag{2}$$

where $N_\varepsilon(X)$ is the number of hypercubes of the grid with the side length of ε, having at least one point in common with the analyzed object X. The definition is derived from the relationship:

$$N_{\varepsilon}(X) \sim \varepsilon^{-\dim_{\mathrm{B}}(X)} \tag{3}$$

for $\varepsilon \to 0$. Thus, the box-counting dimension illustrates the fluctuation of the number of squares necessary to cover the analyzed object when the side length of the square grid is reduced in the limit to zero.

The fractal dimension can be considered not only as one of the characteristics of the time series, but also as a measure of risk, as evidenced by the studies, i.a. by (Buła, 2013; Mularczyk, 2005; Zwolankowska, 2001). As it has been demonstrated, "(...) instruments with a higher fractal dimension are assigned a higher level of risk (...) when the length of the investment horizon decreases to zero. (...) for the long term (...) instruments with a lower fractal dimension should be considered riskier" (Buła, 2013, p. 465). As indicated in the literature, when classical assumptions about the nature of time series derived from the financial market are not met, this measure can be of great use (Mandelbrot, Hudson, 2010). Therefore, it was used in this study to measure the risk of investing in shares of dividend and other companies.

Based on the literature review and the identified research gaps, the following research hypotheses were defined:

H_1: Dividend companies listed in the US have a higher average dividend growth rate than dividend companies listed in Poland.

H_2: The returns of US dividend companies are determined to a greater extent by dividend payments than by changes in stock prices.

H_3: Investment risk understood as the volatility of returns is lower for dividend companies.

H_4: Long-term investment risk as measured by the fractal dimension is lower for dividend companies, i.e. their fractal dimension is significantly higher – according to the conclusions made in (Buła, 2019).

The hypotheses are verified later in the paper.

3. Sample selection and methodology

For achieving the purpose of the paper, companies listed on the stock exchange in the US and in Poland were investigated. In each of the two markets, 30 companies included in the S&P 500 and WIG indices with the highest stock market capitalization at the end of 2021 were selected. These are for the S&P 500 index: AAPL.US, MSFT.US, AMZN.US, TSLA.US, GOOG.US, FB.US, NVDA.US, UNH.US, JPM.US, JNJ.US, HD.US, WMT.US, PG.US, BRK-B.US, BAC.US, V.US, MA.US, PFE.US, DIS.US, AVGO.US, ACN.US, ADBE.US, CSCO.US, NFLX.US, LLY.US, XOM.US, TMO.US, KO.US, COST.US and ABT.US, and for the WIG index: SAN, UCG, CEZ, PKO, PGN, SPL, ING, PEO, LPP, PKN, PZU, KGH, MOL, CPS, CDR, MBK, KRK, PGE, BNP, IIA, LTS, OPL, MIL, BHW, ACP, ALR, CAR, KRU, EAT and KTY.

The research was carried out in the following stages:

Stage one – breaking the companies down into those that paid dividends in 2016-2021 for the 2015–2020 period without interruption or with one period of no distribution of the financial result to shareholders – the group was defined as dividend stocks (Dividend US and Dividend PL, respectively). The remaining companies did not pay dividends or paid them intermittently – they were identified as other stocks (Other US and Other PL, respectively).

Stage two – among the selected groups of companies, the total return for the period 2015-2021 and the average annual return (both taking into account changes in share prices and dividends paid), the cumulative dividend yield, the average dividend change rate, as well as the share of the cumulative dividend yield in the return for the entire analyzed period were calculated and analyzed.

Stage three – for the selected companies, volatility of returns and their fractal dimension (for cumulative yields) were estimated. The resulting values were then used to benchmark the entities included in the identified groups. For this purpose, relevant variance analysis methods were used.

4. Benchmark of dividend companies listed in the US and in Poland – research results for the period 2015-2021

In order to select dividend companies listed in the US and in Poland, they were divided taking into account the regularity of dividend payments. On this basis, 22 dividend stocks were selected that are components of the S&P 500 index and 14 dividend stocks from the WIG index. The remaining companies in the group of 30 were classified as companies that did not pay dividends (AMZN.US, TSLA.US, GOOG.US, FB.US, BRK-B.US, ADBE.US, NFLX.US, BNP, MIL, ALR and EAT) or made dividend payments intermittently. These are, in turn, the group of Other US and Other PL (Table 1).

Table 1.
Groups of analyzed companies

Dividend US	Dividend PL	Other US	Other PL
AAPL.US	CEZ	AMZN.US	SAN
MSFT.US	PGN	TSLA.US	UCG
NVDA.US	SPL	GOOG.US	PKO
UNH.US	PEO	FB.US	ING
JPM.US	LPP	BRK-B.US	KGH
JNJ.US	PKN	DIS.US	CPS
HD.US	PZU	ADBE.US	CDR
WMT.US	MOL	NFLX.US	MBK

Cont. table 1.

PG.US	KRK		PGE
BAC.US	BHW		BNP
V.US	ACP		IIA
MA.US	CAR		LTS
PFE.US	KRU		OPL
AVGO.US	KTY		MIL
ACN.US			ALR
CSCO.US			EAT
LLY.US			
XOM.US			
TMO.US			
KO.US			
COST.US			
ABT.US			

Source: own research.

The Dividend US group for the period under review had the highest return (435.86%) and thus the highest average annual return (72.64%). An analogous group of companies from the Polish market generated a much lower total return (141.08%) and annual average return (23.51%). Similar trends are characteristic of Other US and Other PL groups. Companies not classified as dividend stocks in the US market generated for the entire period a return of 368.99% and in the Polish market 106.74% (Figure 1).

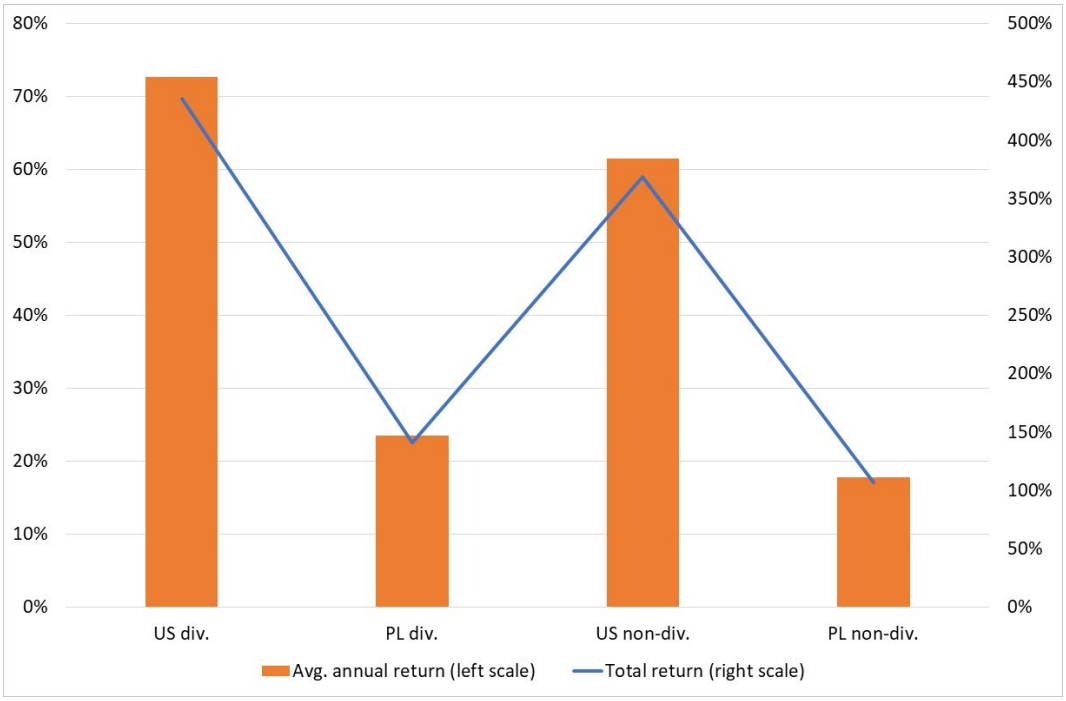

Figure 1. Returns of analyzed company groups. Source: own research.

When analyzing companies that regularly share profits with shareholders, it should be noted that dividend stocks included in the S&P 500 index had a lower cumulative dividend yield (25.75%) than Polish dividend stocks (42.3%). Moreover, companies from the Dividend PL group also had a higher average dividend growth rate (31.58%) compared to the Dividend US (16.33%). Analysis of other groups of companies not classified as dividend stocks from the point of view of parameters based on dividend payments does not make sense due to the small number of payments and thus the significant impact on the averages (for example, IIA paid dividends only in 2018 and 2019 with a dividend change rate of 1,120%). For this reason, both groups of companies (Other US and Other PL) were excluded from this area of analysis (Table 2).

Table 2.
Parameters of the analyzed company groups

Company groups	Rate of return		Cumulative dividend yield	Average dividend change rate	Share of the cumulative dividend yield in the return for the entire period
	for the entire period	annual average			
Dividend US	435.86%	72.64%	25.75%	16.33%	5.91%
Dividend PL	141.08%	23.51%	42.30%	31.58%	29.98%
Other US	368.99%	61.50%	0.83%	5.74%	0.23%
Other PL	106.74%	17.79%	8.01%	182.87%	7.50%

Source: own research.

Conclusions of the analysis of the share of the cumulative dividend yield in the return for the entire period are surprising. It shows that for US companies the share is 5.91%, while for Polish companies it is as high as 29.98%. If we use the stock indices under which the analyzed companies are listed as a benchmark, then for the period 2015–2021 the change in the S&P 500 index was 133.19% and in the WIG index – 49.13%. This means that the total return of dividend companies in the S&P 500 index is mainly determined by changes in stock prices and not by the amount of dividend payments, which cannot be said of Polish dividend companies.

In the next step, the characteristics necessary for risk analysis were estimated, i.e. the volatility of returns (annualized using the average number of trading sessions during the investigated period) and the fractal dimension. The empirical distributions (also taking into account the average return) are shown in the figures below.

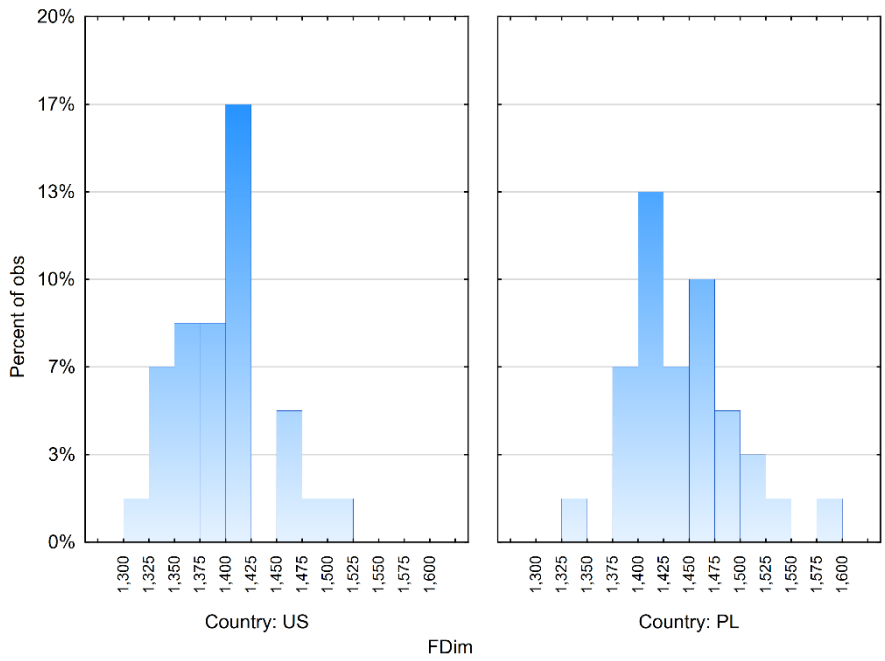

Figure 2. Empirical distribution of the fractal dimension of the investigated Polish and US companies. Source: own research.

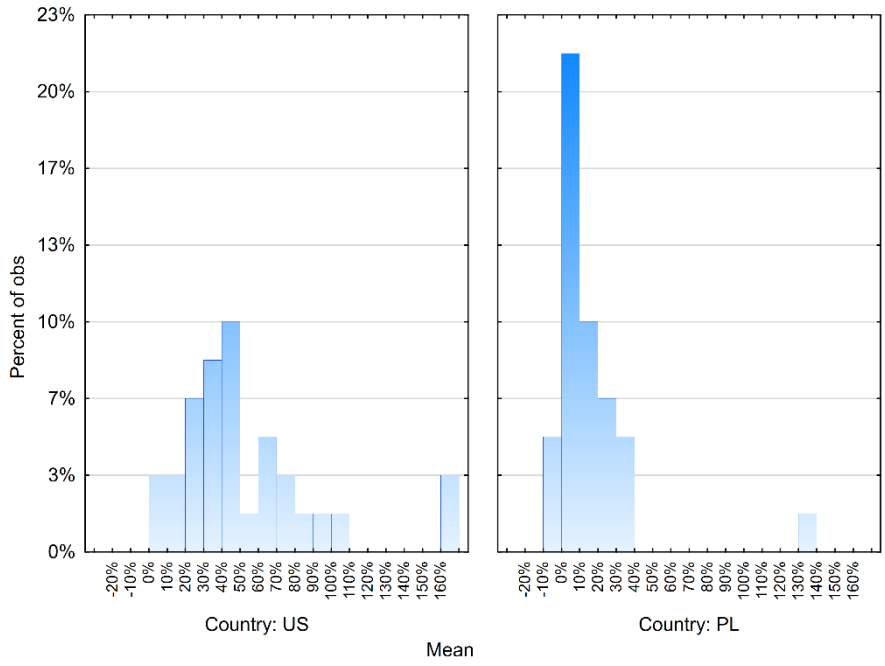

Figure 3. Empirical distribution of the average annual return of the investigated Polish and US companies. Source: own research.

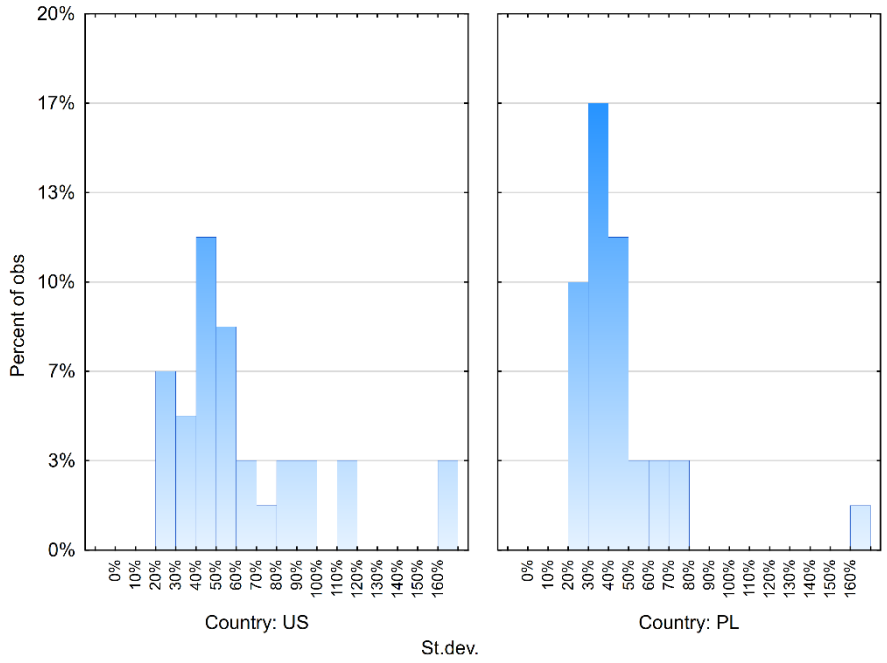

Figure 4. Empirical distribution of the annualized standard deviation of returns of the investigated Polish and US companies. Source: own research.

In the next step, the indicated parameters were compared using variance analysis. First, the normality of the distribution of the quantities considered in the groups was assessed using the Shapiro-Wilk test. The hypothesis of normality of distribution was rejected for the average value of returns and their standard deviation (for a significance level of 0.05). Therefore, when comparing these quantities, the Mann-Whitney test was used. In turn, the non-rejection of the null hypothesis of the equality of variances across groups with respect to the fractal dimension (significance level of 0.05, F-test, Levene test and Brown-Forsythe test) led the authors to use the classical t-test in this case. The results of the statistical tests are summarized in the tables below.

Table 3.
Variance analysis results

Test hypothesis	Div.	Non-div.	p-value	Decision
H_0:$FDim_{US,div}$=$FDim_{US,non-div}$	1.3986	1.3965	0.917	H_0 supported
H_0:$FDim_{PL,div}$=$FDim_{PL,non-div}$	1.4299	1.4530	0.213	H_0 supported
H_0:$\bar{R}_{US,div}$=$\bar{R}_{US,non-div}$	68.35%	85.64%	0.496	H_0 supported
H_0:$\bar{R}_{PL,div}$=$\bar{R}_{PL,non-div}$	16.46%	16.46%	0.271	H_0 supported
H_0:$\sigma_{US,div}$=$\sigma_{US,non-div}$	75.91%	118.08%	0.181	H_0 supported
H_0:$\sigma_{PL,div}$=$\sigma_{PL,non-div}$	41.13%	70.49%	0.062	H_0 supported

Source: own research.

In none of the cases analyzed was it possible to reject the null hypothesis of the equality of the examined parameters (with a significance level of 0.05). For a significance level of 0.10, the hypothesis of equality of standard deviations for Polish dividend and non-dividend stocks can be rejected (with dividend stocks having lower volatility, in line with previous results). The results of the variance analysis presented here do not support the hypothesis that dividend and non-dividend stocks differ in terms of their profitability and risk as measured by both standard deviation and fractal dimension.

5. Discussion and conclusions

Research conducted on the characteristics of dividend stocks listed in Poland and in the US showed significant differences in parameters based on dividends paid. The Dividend US group of companies for the period under review had a higher average annual return (72.64%) than Dividend PL companies (23.51%), with the difference determined, in case of US dividend companies, by changes in stock prices rather than the amount of dividend payments (and thus the dividend yield).

Relating the above results to the research conducted by the others, it must be emphasized that different conclusions have been drawn. Contrary to the claims of (Lichtenfeld, 2015) and (Williams, Miller, 2013, pp. 58-69) dividend stocks do not perform better in terms of the expected rate of return. Results of this study also do not support the remarks formulated by (Skousen, 2011) claiming, that dividend-paying stocks deliver better financial results than stocks that do not pay dividends. On the other hand, taking into account risk level it must be underlined that dividend stocks seem to be less risky than non-dividend stocks, although the difference is not statistically significant. Summarizing, the authors did not find any significant statistical difference between the abovementioned groups of stocks, what stands in opposition to the results obtained by other authors.

The share of the cumulative dividend yield in the return for the entire analyzed period for US companies was 5.91%, while for Polish companies it was as high as 29.98%. The companies from the Dividend PL group also had a higher average dividend growth rate (31.58%) compared to the Dividend US (16.33%).

The considerations presented and the statistical tests performed also made it possible to conclude that dividend stocks and other stocks do not differ significantly in either average profitability or level of risk, whether measured by volatility or level of fractal dimension. For this reason, an investor should definitely attach more importance to the choice of the market, rather than to whether or not an entity pays a dividend.

Based on the conducted research, the adopted research hypotheses were verified, and on this basis, it was concluded that:

H_1: Dividend companies listed in the US have not higher, but lower average dividend growth rate than dividend companies listed in Poland. This hypothesis was verified negatively.

H_2: The returns of US dividend companies are determined not to a greater extent, but to a lower extent by dividend payments than by changes in stock prices. This hypothesis was verified negatively.

H_3: There are no statistically significant differences between dividend and non-dividend companies with regard to the level of their volatility as measured by the standard deviation of returns.

H_4: Long-term investment risk as measured by the fractal dimension is the same for dividend and other companies.

A certain shortcoming of the study conducted is the limitation of the time scope of the analysis, as well as the set of companies analyzed. It is possible that an analysis of a broader set of entities for a longer period would lead to different conclusions. The authors' intention is to conduct analogous analyses for a more extensive dataset. Nonetheless, given the importance of the entities studied in terms of their capitalization, the conclusions drawn provide important guidance for both researchers and investors.

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