

The Impact of ESG Factors on Company Share Prices in the European Energy Sector

Aneta Drab*

ESG factors are increasingly becoming an inseparable part in company reports. Despite many difficulties connected with reporting of non-financial activities, there are more and more companies which undertake this difficult task each year. This kind of information is especially important for contemporary investors, who do not only look at the profit on a given investment, but pay more and more attention to the company's image, methods of operation, approach to employees and the closer and farther environment. The hypothesis was as follows: the ESG factors have an increasing influence on stock prices. A panel study was used for the analysis. The study covered European energy companies which closed their financial year at the end of the calendar years 2010–2021. However, the results of the study did not reliably reflect the impact of ESG on the achieved rates of return because only in the last few years have they begun to gain significance. Previously, their impact was too weak to be shown in studies on larger samples.

Keywords: ESG, share prices, investing, energy sector, panel study.

Submitted: 23.05.2022 | Accepted: 14.10.2022

Wpływ czynników ESG na kursy akcji spółek z sektora energetycznego w Europie

Czynniki ESG coraz częściej stają się nieodłącznym elementem w raportach firm. Pomimo wielu trudności związanych z raportowaniem działalności pozafinansowej z roku na rok przybiera ona formę, która podejmuje się tego niełatwego zadania. Tego typu informacje są szczególnie ważne dla współczesnych inwestorów, którzy nie patrzą jedynie na zysk z danej inwestycji, ale zwracają coraz większą uwagę na wizerunek firmy, metody działania, podejście do pracowników oraz otoczenia zarówno bliższego, jak i dalszego. W niniejszej pracy postawiona została hipoteza głosząca, że czynniki ESG mają coraz większy wpływ na kursy akcji. Badaniu poddano spółki energetyczne z Europy, które w latach 2010–2021 zamykały swój rok obrotowy wraz z końcem roku kalendarzowego. Wyniki badania nie odwzorowały jednak miarodajnie wpływu ESG na osiągnięte stopy zwrotu, ponieważ dopiero w czasie kilku ostatnich lat zaczęły one nabierać istotnego znaczenia. Wcześniej ich oddziaływanie było zbyt słabe, aby dało się to wykazać podczas badań na większych próbach.

Słowa kluczowe: ESG, kursy akcji, inwestowanie, sektor energetyczny, model panelowy.

JEL: G32

* **Aneta Drab** – PhD Student, Faculty of Management, University of Warsaw, Poland. <https://orcid.org/0000-0001-5307-2399>.
Adres do korespondencji: Faculty of Management, University of Warsaw, 1/3 Szturmowa St., 02-678 Warsaw, Poland; e-mail: ADrab@wz.uw.edu.pl.

1. Introduction

The world is still changing, it entails the diverse needs and requirements of society as a whole. Several dozen years ago, almost nobody thought about caring about the environment or reducing pollution. Far fewer entrepreneurs looked at the welfare and health of employees and their families. Upper staff put the company's interests as their main priority. Nowadays, a lot aspects have changed and the situation is quite different. Environmental, social and governance factors have become very important. Entrepreneurs should pay attention not only to the profit they can achieve but also to how they achieve it and how it affects the environment. They should not only try to harm the environment as little as possible, but also look for various and innovative solutions that will work in its favor. Moreover, companies should engage in social life and take care of employees, their families and enable them to develop. This is a very important task and at the same time a challenge for the upper staff to ensure the necessary balance, create internal standards and control all processes.

ESG (Environmental, Social and Governance) is an important issue in the field of non-financial reporting, relating mainly to three areas: environment, society and governance. The ESG area covers many issues which are increasingly important in the financial world. They are relatively difficult to present using financial measures, which means that many entities still have significant problems in this respect. Nevertheless, in the face of the changing world and environment, investors pay more and more attention to them and appreciate the presentation of this type of data. An important purpose of reporting is to provide investors with information on a broader scope than just financial results achieved. Companies that try to take care of ESG areas, implement them at a strategic level, stand out from the competition with social responsibility and present their activities in a transparent manner, are more trustworthy, which can contribute to their success.

Issues related to ESG have appeared relatively recently, various legal and regulatory bases are being constantly improved. There are new standards of non-financial reporting; therefore, more and more entities are trying to make serious attempts

to create reports. It is a very important component for investors who want to get as much knowledge about the company, its methods of operation and broadly understood plans for the future as possible before making a decision to invest their capital. The perception and many financing possibilities of a company are an important part of building its long-term value, which affects the market valuation of the company's shares. If the rates of return on investment in a company are high, an increasing number of investors start to take an interest in it, which results in additional capital for development.

The aim of this study was to investigate the impact of ESG factors on share prices and shaping the value of companies in the energy sector. The research covered the results of 287 companies from 35 different European countries. It was based on data from 2010–2021 on an annual basis. The data was downloaded from the Eikon Refinitiv database.

2. Literature Review

The subject literature on ESG issues is not developed well enough yet. It is quite simple to find scientific articles relating to sustainable development of enterprises, corporate social responsibility (CSR), broadly understood non-financial reporting; however, when it comes to ESG and its impact on the financial condition of enterprises, there are much fewer publications. Despite the fact that the essence of these issues began to be mentioned more and more in the 1990s, they began to become an inseparable element in decision-making and reporting only a few years ago. For many entities that have already undertaken it, this is not a simple task and it still raises many doubts.

Among the latest research, you can find an article on the impact of ESG on credit ratings awarded to non-financial institutions by the largest rating agencies, by Patrycja Chodnicka-Jaworska. The first of the hypotheses claimed that there was a strong negative impact of changes in ESG risk on the ratings granted. The second one assumed that the intensity of the impact would vary depending on the sector. They were examined using panel models. The results confirmed the significant impact of ESG factors on the ratings of Moody's and

Fitch agencies. The agencies have clearly adapted their rating methods to the current requirements and the emergence of more information based on ESG. The Fitch agency notes were more sensitive to the data published by the companies. The agencies paid the greatest attention to environmental factors. Social factors were definitely less significant for them. Moreover, the findings obtained by the author confirmed the impact of ESG results on the method of estimating the risk of default by the company. Furthermore, dependencies among sectors were found. The following sectors turned out to be the most sensitive: energetic, industrial, public utility and material. This is related to the regulations on saving water, energy, as well as the requirements to reduce CO₂ emissions. The results of the research conducted nowadays are radically different from the research conducted at the beginning of the 21st century. Those results showed that the ESG factors were not as important as now. This shows how much is changing: the environment, people's way of thinking and the requirements of the whole society. There is still a great need to develop this research area. The conducted research shows the increasing importance of ESG indicators, but a tiny amount of available information does not allow for a full, complete and comprehensive assessment of the situation and drawing general conclusions. The longer the ESG data is presented and the larger the group that presents this kind of data, the more conclusions can be drawn, more dependencies can be found and the processes will be systematized (Chodnicka-Jaworska, 2021). The granted credit ratings have an impact on the cost of capital obtained, e.g. in loans; therefore, a responsible corporate policy may lower this cost (Cooper & Uzun, 2015). There was also a study which showed that factors E and S have a statistically significant impact on the granting of loans (Hoepner et al., 2016). Little research has been done to verify the relationship between the probability of default and ESG measures. However, it is known that they have an impact on the cost of capital (Ge & Lui, 2015). It has also been found that measures of ESG factors can play a role in risk management and assessment (Miralles-Quirós & Miralles-Quirós, 2017). It has been suggested that ESG measures may be included

in the credit policy of banks (Zeidan et al., 2015).

In an article from 2017 "The role of ESG factors in building enterprise value", Beata Domańska-Szaruga decided to present the impact of corporate governance and sustainable development management on building the company's value in the face of changing market expectations. The publication presents a list of 22 companies from the Warsaw Stock Exchange which were included in the RESPECT Index on November 16, 2011, along with some information on their reporting. The following information can be presented from the analysis carried out by the author:

- 9 companies did not publish special reports – they presented information on their involvement in social and environmental activities on their websites,
- 7 companies published a CSR report on an annual basis,
- 2 companies published a social report,
- 1 company published an environmental report,
- 1 company published an annual CSR review,
- 1 company published a report for the Global Compact,
- 1 company published an annual integrated report.

The companies predominately adopted GRI or their own systems as the reporting standard. Reports of only 2 out of 22 companies were verified by auditing companies. The above data indicate that the ESG subject was quite new on the Polish capital market at the time. The author concluded that it is worth paying attention to social and ecological activities. According to her, you should create the identity of the company and its brand on an ESG basis and build your image on this, because investors appreciate such actions. In many cases, they are focused not only on profit, but on the long-term prospects of enterprises, their development potential and long-term value (Domańska-Szaruga, 2011).

Hanna Sikacz and Przemysław Wołczek summarized a number of their research on the ESG analysis of companies included in the RESPECT Index in the article "ESG analysis of companies from the RESPECT index – research summary". The aim of the article was to analyze the results of companies from the index, after previous comparison of information obtained from the

Thomson Reuters Eikon and ASSET4 ESG databases. The first discovered dependence was the fact that the results of the companies from the ASSET4 ESG database were more favorable. Nevertheless, the survey showed that companies with relatively poor results qualified for the 10th edition of the index, which may raise concerns about the process of selecting companies. The analysis showed that companies with results as low as 20–30% were qualified to the index, which is not a satisfying information. They should not be included in such an important index. According to the results obtained by DB Climate Change Advisors 2021, entities with high CSR ratings have an ex-ante lower cost of capital. Therefore, it can be concluded that the market perceives this kind of companies as more reliable, less risky and rewards them accordingly. However, there is no doubt that the importance of non-financial results will increase in the light of the investments made and strategic decisions (Sikacz & Wołczek, 2017).

Izabela Emerling also wrote about the growing importance of the role of disclosures and non-financial reports in recent years in the publication about the importance of non-financial disclosures for investors and business image. Issues related to the publication of this kind of data are becoming more and more popular in Poland and around the world; therefore, they are becoming an inseparable element in building a strategy and development of enterprises. The hypothesis assumed that the entities that present non-financial data are better perceived by stakeholders. The research methods used in that article are a study of the literature, a review of legal acts, comparisons and conclusions. Non-financial reports provide a lot of important data that allows investors and other stakeholders to make more and more effective decisions. This effect encourages entrepreneurs to pay even more attention to ESG-related issues. The larger the group of companies that presents non-financial data and the more regulations are created, the clearer and more reliable the reports become. The presented data is assessed more and more often and more thoroughly, and then compared between the entities. Such data is also necessary for qualifying for various indices of socially responsible companies. These companies are somewhat elite in their environment, which encour-

ages them to raise their standards and pay even more attention to environmental, social, employee and corporate governance aspects. In addition, these entities are often more popular among potential employees, which allows them to hire the best people. The image also affects the trust of customers, which can be observed in particular on the example of banks, which are quite specific economic entities. The study was conducted on a sample of approximately 2,000 clients of the largest banks in Poland. It proved that clients' trust in banks is correlated with their financial and non-financial results. The analyses and considerations carried out in the study emphasize that reporting practices are still at an early stage of development, often cause many problems, and it is difficult to meet the requirements of the standards. Despite this, more and more entities try to submit such reports on non-financial activities. Non-financial reporting provides benefits to both entities publishing data and entities using this information (Emerling, 2018). ESG initiatives can impact the value of a company in two ways. First, good reputation can positively affect sales, which increases the level of cash flow. On the other hand, shareholders maximize utility by having a stake in a sustainable structure (Gillan et al., 2020).

The above-presented approach and conclusions from the analysis are confirmed in the publication by Grażyna Michalczuk and Urszula Konarzewska, describing the importance of non-financial reporting in socially responsible investing. The authors analyzed the literature on the subject, reports and databases revealing trends in socially responsible investing. The study also showed an increasing popularity trend of publishing non-financial data. It confirms the growing interest in such documents by investors who look at potential investments not only in terms of financial results. The dynamically changing environment presents companies with new challenges which they must face in order to stay on top. Reporting on ESG or CSR becomes an element of long-term development and plans for further activity. Unfortunately, the comparability of data is still low (Michalczuk & Konarzewska, 2019). ESG is a kind of response to the need to combine sustainable development with the interaction of the company and its stakeholders (Diez-Canamero et al., 2020).

The more transparent the data on ESG is presented, the more rational and accurate the investment decisions are.

Justyna Kłobukowska undertook a study in which she identified the features of integrated reporting for the process of building investor value in capital markets. The study was directed at the analysis of problems related to the area of CSR and the opinion of entities regarding the functioning of socially responsible investing in Poland. The conclusion that can be drawn from the analysis is that the more transparent the ESG data, the more rational and accurate the investment decisions are. The standardization of these measures and an increase in the degree of comparability of published information are still a major challenge for enterprises. It can be expected that the trend in the importance of non-financial reporting as a significant tool in value building will be upward (Kłobukowska, 2020).

A study was conducted to examine the impact of ESG measures on energy sector indices in the face of the COVID-19 pandemic. The author, Patrycja Chodnicka-Jaworska put forward a hypothesis that ESG measures have a significant impact on power sector returns, especially during the COVID-19 pandemic. The study found that ESG was given more attention before the outbreak of the COVID-19 pandemic than at the time of the pandemic. This may have been influenced by decisions based on behavioral finance. Sector type specificity is also not insignificant. Investing in ESG was seen as a big risk of losing money. New regulations have significantly raised costs in the energy industry. These results are different from previous studies. Subsectors such as oil and gas are particularly sensitive to social and environmental factors. Returns for companies where one of the top five stakeholders is the government are not responsive to ESG performance. Companies whose five largest investors collectively own more than 50% of shares are much more sensitive. Then the most important are factors from groups E and S. Moreover, there is no connection between ESG assessment and CO₂ emission. Therefore, there is a need to prepare a new, more valuable measure of this risk. The study shows that there are significant differences in the impact of ESG on valuation between different sectors and subsec-

tors. Also the behavior of different types of investors is highlighted. The smaller the entity, the greater the sensitivity of stock prices to changes in ESG ratings. Large units do not react significantly to such informations. However, these are conclusions drawn from still too little data. This creates a need to repeat the study in the future (Chodnicka-Jaworska, 2022a).

Another article of this author on the energy sector presents the relationship between ESG and default risk. The author hypothesized that ESG factors had an impact on the ratings of companies in the energy sector during the COVID-19 pandemic. The study was based on quarterly financial data of companies from all over the world in the years 2000–2021. They were divided based on the types of sectors and the date of the COVID-19 pandemic. In addition, credit ratings were taken into account. The hypothesis stated that ESG factors significantly affected the credit ratings of companies in the energy sector during the COVID-19 pandemic was confirmed in the study. A trend of increasing role of ESG on ratings was observed. They are so important during the first estimation, later the importance of these variables diminishes. It should be mentioned that the study was conducted on still a small amount of available information. Environmental factors are the most important. Many countries have not yet introduced climate risk regulations. Companies in the energy sector are large very often and the government is an important investor. The ratings of such companies are quite stable and do not experience large fluctuations (Chodnicka-Jaworska, 2022b).

There are also publications by authors who suggest that there is no influence of ESG factors on investors' decisions (Revelli, 2017). In a study conducted almost 20 years ago, the results did not show any influence of ESG factors on the value of entities. They also showed no other additional benefits (Orlitzky et al., 2003). Changes in the direction of contemporary research show that this is a relatively new field, which is only gaining importance in the financial markets. The results of the research conducted today are radically different from the research conducted at the beginning of the 21st century. The results at that time showed that the ESG factors are not so important. It shows how much

the environment, people's way of thinking and the requirements of the whole society are changing. There is still a great need to develop this research area.

The hypothesis put forward in this paper is that ESG factors have an increasing influence on the prices of stocks of companies. To verify this hypothesis, a panel study was used.

3. Data Description & Methodology

The basis for the study was built on the data from the energy sector companies from all over Europe. The data was downloaded from the Refinitiv Eikon database. Annual data from the beginning of 2010 to the end of the third quarter of 2021 was used (the system downloaded the data with the date 31.12.2021 – this date was also used in further steps of the study). An additional criterion was the end date of the financial year – the companies selected for the study had to end their financial year at the end of the calendar year. In the long line, this database was created consisting of 287 companies listed on the stock exchanges of 35 European countries:

The logarithmic, annual rate of return on the prices of companies' shares was adopted as the explained variable. The explanatory variables are selected, uncorrelated indicators from different groups:

- X_1 – Income Aft Tax Margin, %,
- X_2 – ROE, Percent,
- X_3 – Long Term Debt to Capital, Percent,
- X_4 – Quick Ratio,
- X_5 – ESG Score,
- X_6 – Total Assets, Reported (LN).

Figure 1 presents a heat map showing the level of correlation of selected explanatory variables with each other and with the dependent variable. Negative values mean that as the value of one variable increases, the value of the other decreases, and vice versa. No variables are strongly correlated with each other, only one value fluctuates around 0.3 and 0.2, while the correlation of most other variables is close to 0.

The method of panel study was used to conduct this research. In order to perform it, tools such as Excel spreadsheets and the GRET program were used. The aim of the study was to verify the impact of indicators from various groups (including the general ESG – ESG Score) on the rates

Table 1. The Number of Companies Participating in the Survey by Country

	Country	Number of companies		Country	Number of companies
1.	Austria	4	19.	Luxembourg	3
2.	Belgium	4	20.	Macedonia	2
3.	Bermuda	10	21.	Malta	1
4.	Bosnia and Herzegovina	8	22.	Monaco	2
5.	Bulgaria	3	23.	Netherlands	8
6.	Croatia	3	24.	Poland	12
7.	Cyprus	2	25.	Portugal	2
8.	Czech Republic	1	26.	Republic of Montenegro	2
9.	Denmark	5	27.	Republic of Serbia	2
10.	Finland	1	28.	Romania	14
11.	France	14	29.	Russia	31
12.	Germany	14	30.	Slovenia	1
13.	Greece	8	31.	Spain	5
14.	Hungary	2	32.	Sweden	20
15.	Iceland	2	33.	Switzerland	2
16.	Ireland; Republic of	2	34.	Ukraine	3
17.	Italy	10	35.	United Kingdom	83
18.	Lithuania	1			

Source: Own elaboration.

Figure 1. Correlation Matrix of the Dependent Variable and Explanatory Variables



Source: Own elaboration in the GRETL program.

of return achieved by stock companies in Europe in 2010–2021.

Panel data is datasets that contain cross-sectional information in at least two dimensions, for example space-time data, i.e. data with the same units over several time periods. This kind of collections have advantages over single cross-sectional datasets as well as over multiple cross-sectional datasets for single entities. Their main advantage is the possibility of verifying and easing the assumptions that are made by default in the case of cross-sectional analysis (Maddala, 2013).

The first step during building a panel model is the estimation of OLS (Ordinary Least Squares). The estimated model will take the form:

$$y_{it} = x_{it}\beta + v_{it}$$

where:

- y_{it} – explained variable,
- x_{it} – explanatory variable,
- β – vector with the N dimension of the structural parameters of the model,
- v_{it} – total random error,

i – subsequent objects, for $i = 1, 2, \dots, N$,
 t – time, for $t = 1, 2, \dots, T$.

The OLS method can be used to estimate the model provided that there is no individual effect, there is no correlation between the explanatory variables and the panel is treated as a set of cross-sectional data. It should be checked whether the tested panel model can be estimated with the use of OLS by verifying the hypothesis that the variance of the individual effects component is equal to zero. For this purpose, the Breusch-Pagan test is used, assuming the following hypotheses (Kufel, 2013):

$$H_0 : \sigma_u^2 = 0$$

$$H_1 : \sigma_u^2 \neq 0$$

If the random component has a normal distribution, and the sample has a large number of observations, then the statistic of the Breusch-Pagan test has a distribution of χ^2 with one degree of freedom and is equal to:

$$\lambda = \frac{NT}{2(T-1)} \left(\frac{S_1}{S_2} - 1 \right)^2$$

where:

$$S_1 = \sum_{i=1}^N \left(\sum_{t=1}^T \hat{u}_{it} \right)^2,$$

$$S_2 = \sum_{i=1}^N \sum_{t=1}^T \hat{u}_{it}^2,$$

\hat{u}_{it} – the remainder from the estimated OLS model (Maddala, 2013).

The confirmation of the null hypothesis implies negligible variance changes as a result of introducing individual effects, so adding them is unnecessary in the modeling. The rejection of the null hypothesis indicates the legitimacy of introducing individual effects to the model. An alternative solution might be to add zero-one variables. Then you can take into account the effect of group averages for individual panels (effect of individual differentiation of the averages). In that case, the LSDV (least squares dummy variable) is used.

In the next step of creating a panel model, individual effects should be considered. They are divided into two types:

- Fixed effects,
- Random effects (Kufel, 2013).

As concerns the first group – fixed effects, the model should be considered in the form of:

$$y_{it} = x_{it}\beta + u_i + \varepsilon_{it}$$

where:

u_i – individual effect,

ε_{it} – pure random error.

Fixed individual effects should be eliminated by averaging the model over time (t). The above equation takes then the following form:

$$\frac{1}{T} \sum_{t=1}^T y_{it} = \frac{1}{T} \sum_{t=1}^T x_{it}\beta + \frac{1}{T} \sum_{t=1}^T u_i + \frac{1}{T} \sum_{t=1}^T \varepsilon_{it}$$

which might be written equivalently as:

$$\bar{y}_{it} = \bar{x}_i\beta + \bar{u}_i + \bar{\varepsilon}_i.$$

Subtracting the above equations with the sides:

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)\beta_i + (\varepsilon_{it} - \bar{\varepsilon}_i)$$

fixed individual effect (u_i) has been eliminated. The resulting model is:

$$\tilde{y}_{it} = \tilde{x}_{it}\beta + \tilde{\varepsilon}_{it}.$$

After estimating the above model using the Ordinary Least Squares, an estimator of the structural parameters is created:

$$\hat{\beta}_{FE} = (\tilde{X}^T \tilde{X})^{-1} \tilde{X}^T \tilde{y}$$

where:

\tilde{X} – matrix of transformed explanatory variables (x),

$\tilde{x}_{it}, \tilde{y}$ – vectors of transformed explained variables.

It should be kept in mind that situations of strict exogeneity are overlooked here, as is the occurrence of variables for which the values in the panel are constant over time for each unit.

Considering the second group of cases – random effects, it is assumed that individual effects are random variables and are not correlated with the so-called pure random error, $Cov(u_i, \varepsilon_{it}) = 0$. The cumulative random error consists of the individual (random) effect and the pure random error (v_{it}). It is characterized by simultaneous correlation within one object and a lack of correlation among many different objects in panel data. This type of data model requires the use of GLS – Generalized Least Squares. The GLS estimator takes the following form:

$$\hat{\beta}_{RE} = (X^T \Omega^{-1} X)^{-1} X^T \Omega^{-1} y$$

X – matrix of explanatory variables,

y – vector of dependent variables,

Ω – invertible variance and covariance matrix of the total random error:

$$\Omega = Var(v) = \begin{bmatrix} Var(v_1) & & 0 \\ & \ddots & \\ 0 & & Var(v_n) \end{bmatrix} = \begin{bmatrix} \varpi & & 0 \\ & \ddots & \\ 0 & & \varpi \end{bmatrix}.$$

This estimator can be written equivalently (Greene, 2003):

$$\hat{\beta}_{RE} = \left(\sum_{i=1}^N X_i^T \Omega^{-1} X_i \right)^{-1} \left(\sum_{i=1}^N X_i^T \Omega^{-1} y_i \right).$$

The correct choice between the use of fixed and variable effects is a very important element while creating a model. In order to do it, the Hausman test should be used, which examines the degree of correlation between random effects and explanatory variables. It allows for verifying whether the estimators converge to the same vector.

$$H_0 : Cov(u_i, x_{it}) = 0$$

$$H_1 : Cov(u_i, x_{it}) \neq 0$$

The null hypothesis assumes consistency and efficiency of the GLS estimator. The statistic that is used to verify the Hausman test is described by the formula:

$$q = \hat{\beta}_{FE} - \hat{\beta}_{RE}$$

The above statistic is convergent with the χ^2 distribution with the number of degrees of freedom equal to k – the number of explanatory variables. The confirmation of the null hypothesis proves the compatibility of the estimator for fixed effects and the estimator of random effects, which is generally more effective (Kufel, 2013).

The panel study belongs to the group of dynamic studies. It allows for examining a large number of cases in a certain period, which gives great opportunities for analysis and drawing conclusions for a relatively large group on the market. The basic features of such a study include: regularity, continuity and repeatability. Among the negative sides of the panel study, it is necessary to mention the often encountered difficulties in the appropriate selection of the research group and obtaining a sufficient amount of necessary data.

4. Results

The study conducted presented surprising results. The tests performed indicated the use of a model with fixed effects. After performing the test, it turned out that only some of the listed variables were significant for the model, which was evaluated using Student's t-test parameters. ROE and total assets showed the significance of influence in the model on the achieved rates of return (Y). The higher the profitability of a company, the higher rates of return can be achieved by investing in its

shares. It also positively influences the total value of the company. As a rule of thumb, the greater the total assets, the higher the value of the company is. The study found that a high value of total assets helps generate higher rates of return. Large companies often tend to be more attractive to investors, they are considered safer. Large investors choose to invest in large, secure companies with an established market position. Similar conclusions were drawn when studying various relationships affecting the financial health and value of listed companies (Szewc-Rogalska, 2017).

The ESG Score was still not a sufficiently significant variable. This is due to several facts. First, very few companies report their ESG-related activities. The lack of a formal obligation to report this type of non-financial activity so far has contributed to this. The companies which made attempts to create reports were faced with many problems and difficulties. Often comparing reports of different companies was almost impossible, because they were created on the basis of different guidelines and legal bases. All this contributes to a small number of available ESG observations and ratings. Another problem was the lack of disaggregation of data into subgroups and subsectors. Different subsectors from the energy sector could respond to ESG-related information in different ways. In addition, previous studies have shown that elements E, S, and G do not have the same impact. Most often, G proved to be the least influential, in contrast to E. Such findings were also confirmed in the previously reviewed studies (Chodnicka-Jaworska, 2021; Chodnicka-Jaworska, 2022a). It is likely that the generalization of the study influenced its outcome – low significance of ESG Score.

From the final model built, it was clear that the variables were correctly selected for the model and were significant for the model. After the first regression, the model was explained by 33.2%, while after the second regression, it was only 9.3%. This indicates that the achieved returns were also influenced by many other factors not included in this study. The biggest influence on the explained variable was the change in Income After Tax Margin, Long Term Debt to Capital and Total Assets by one unit. The following table presents the most important measures obtained in the study.

Table 2. The Obtained Test Results

	Variable	Coefficients	p-Value
Fixed effects model	X_1	-0.000001909	0.8765
	X_2	0.00398	7.21e-07
	X_3	0.00002364	0.7200
	X_4	0.0037	0.6807
	X_5	-0.0014	0.5094
	X_6	0.27355	0.0153
Wald test			8.78e
Breusch-Pagan test statistics			0.000000
Hausman test statistics			5.21177e-007
LSDV R-square			33.20%
Within R-square			9.3%
the F-test			2.05e-13

Legend: X_1 – Income Aft Tax Margin, %; X_2 – ROE, Percent; X_3 – Long Term Debt to Capital, Percent; X_4 – Quick Ratio; X_5 – ESG Score; X_6 – Total Assets, Reported (LN).

Source: Own elaboration.

Conclusion

This paper presents the topic of ESG. The aim of the study was to explore the impact of ESG factors on the share prices of energy sector companies in Europe. The hypothesis claimed that these factors had an impact on stock prices. The study covered 287 companies from 35 countries operating in the energy sector. It covered the timeframe from 2010 to the end of the third quarter of 2021. The data is presented on an annual basis. The results confirmed the impact of indicators, including the ESG Score, on share prices and investors' returns. However, the impact of ESG turned out to be relatively low. This is due to the fact that at the beginning of the second decade of the 21st century, just a few companies submitted optional and non-financial reports on ESG areas. It was very difficult to use this as a determinant of making investments at that time. Over time, more and more entities paid attention to these issues, and also made attempts to demonstrate their commitment in reports. Nowadays, it is easier to hear much more about pro-ecological and pro-social activities, or an individual approach to employees, caring for their professional development and not only. Investors appreciate initiatives like that. They decide to invest

their capital in this type of enterprises more willingly and more confidently than among companies that do not have long-term plans for the future and focus only on profit maximization, not the way in which they will achieve it. In addition, financial institutions such as banks or rating agencies recognize entities that positively report ESG issues as safer, more reliable, with a lower risk of insolvency. This is another factor that inspires a great deal of attention to this area. The increasing importance of ESG in shaping the company's value and rates of return on the stock exchange can definitely be noticed. This area is still in the early stage of development; therefore, despite its importance, it is difficult to notice it in the results of the research due to the fact that the period is too short. We can expect a dynamic increase in the importance of ESG factors for share prices in the coming years.

The presented study has some limitations. The period of time when companies reported this data is too short. Hence, there are problems with obtaining reliable results. It should be checked whether this data is more comprehensive in specific sectors and will allow for more precise conclusions. This kind of panel study should be repeated in a few years on the latest, future data.

References

- Chodnicka-Jaworska, P. (2021). ESG as a measure of credit ratings. *Risks*, 9(12), 226. <https://doi.org/10.3390/risks9120226>.
- Chodnicka-Jaworska, P. (2022a). *Energy sector stock prices – Is ESG important?*
- Chodnicka-Jaworska, P. (2022b). Environmental, social, and governance impact on energy sector default risk – Long-term issuer credit ratings perspective. *Frontiers in Energy Research*, 457. <https://doi.org/10.3389/fenrg.2022.817679>.
- Cooper, E.W., & Uzun, H. (2015). Corporate social responsibility and the cost of debt. *Journal of Accounting and Finance*, 15, 11–30.
- Diez-Cañamero, B., Bishara, T., Otegi-Olaso, J.R., Minguez, R., & Fernández, J.M. (2020). Measurement of corporate social responsibility: A review of corporate sustainability indexes, rankings and ratings. *Sustainability*, 12(5), 2153.
- Domańska-Szaruga, B. (2011). Rola czynników ESG w budowaniu wartości przedsiębiorstwa. *Contemporary Management Quarterly/Współczesne Zarządzanie*, 3, 141–151.

- Emerling, I. (2018). Znaczenie ujawnień niefinansowych dla inwestorów i wizerunku jednostki gospodarczej. *Studia Ekonomiczne*, 369, 40–53.
- Ge, W., & Lui, M. (2015). Corporate social responsibility and the cost of corporate bonds. *Journal of Accounting and Public Policy*, 34, 597–624.
- Gillan, S.L., Koch, A., & Starks, L.T. (2020). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance*, 66. <https://doi.org/10.1016/j.jcorpfin.2021.101889>.
- Greene, W. (2003). *Econometrics analysis*. Prentice Hall.
- Hoepner, A., Oikonomou, I., Scholtens, L.J.R., & Schröder, M. (2016). The effects of corporate and country sustainability characteristics on the cost of debt: An international investigation. *Journal of Business Finance & Accounting*, 43, 158–90. <https://doi.org/10.1111/jbfa.12183>.
- Kłobukowska, J. (2020). Raportowanie zintegrowane w procesie budowania wartości dla inwestorów na rynku kapitałowym. *Pieniądze i Więź*, 3(88), 47–55.
- Kufel, T. (2013). *Ekonometria. Rozwiązywanie problemów z wykorzystaniem programu GRETL*. PWN.
- Maddala, G.S. (2013). *Ekonometria*. PWN.
- Michalczuk, G., & Konarzewska, U. (2019). Znaczenie raportowania niefinansowego w inwestowaniu społecznie odpowiedzialnym. *Zeszyty Naukowe SGGW, Polityki Europejskie, Finanse i Marketing*, 21(70), 149–159. <https://doi.org/10.22630/PEFIM.2019.21.70.12>.
- Miralles-Quirós, M. d. M., & Miralles-Quirós, J.L. (2017). Improving diversification opportunities for socially responsible investors. *J. Bus Ethics*, 140, 339–351. <https://doi.org/10.1007/s10551-015-2691-4>.
- Orlitzky, M., Schmidt, F.L., & Rynes, S.L. (2003). Corporate social and financial performance: A meta-analysis. *Organ. Stud.* 24(3), 403–441. <https://doi.org/10.1177/0170840603024003910>.
- Revelli, C. (2017). Socially responsible investing (SRI): From mainstream to margin? *Res. Int. Business Finance*, 39, 711–717. <https://doi.org/10.1016/j.ribaf.2015.11.003>.
- Sikacz, H., & Wolczek, P. (2017). Analiza ESG spółek z indeksu RESPECT – podsumowanie badań. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie. Polityki Europejskie, Finanse i Marketing*, 18(67), 170–180. <https://doi.org/10.22630/PEFIM.2017.18.67.32>.
- Szewe-Rogalska, A. (2017). Zależność między własnością instytucjonalną a kondycją finansową i wartością spółek giełdowych. *Folia Oeconomica*, 1(327), 23–39. <https://doi.org/10.18778/0208-6018.327.02>.
- Zeidan, R., Boechat, C., & Fleury, A. (2015). Developing a sustainability credit score system. *J. Bus Ethics*, 127(2), 283–296. <https://doi.org/10.1007/s10551-013-2034-2>.