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ESG Score Uncertainty and Excess Stock Returns: European Stock Market Case*

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Abstract

The study explores a relationship between divergence in ESG scores (measurements of a company's performance in environmental, social and governance issues) and excess stock returns on the European equity market. The sample consists of 851 European stocks in the period from January 2015 to May 2022. It is concluded that, despite previous findings on the US stock market, a similar effect is not observed for equities in Europe. Even though the stock portfolios with the most and the least divergent ESG scores bear excess returns, the effect disappears when it is adjusted for Fama-French factors. The effect is not relevant for any specific industry, nor does it depend on the level of ESG awareness of the issuer's country. Deeper exploration of the nature of ESG score divergence, specifically by decomposition of the individual elements of ESG scores, could further contribute to the understanding of the relationship between the quality of non-financial disclosures and stock performance.

Keywords: ESG score divergence, excess returns, Fama-French analysis, sustainable finance, ESG investing

JEL Codes: G11, G12, G24, M14, Q01, Q56

Introduction

Over the last two decades, sustainable investing, i.e., an investing approach which considers environmental, social and governance (ESG) factors in the asset selection process, has experienced an exponential growth. For example, the cumulative volume of issued green bonds has increased

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from USD 65.9 billion in 2015 to USD 1.6 trillion in 2021 with an almost fivefold increase in yearly issuance volumes. The yearly issuance of GSS+ bonds, i.e., green, social, sustainability and sustainability-linked bonds and transition loans has surpassed USD 1 trillion in 2021, with a universe of almost 17,000 instruments worth USD 2.8 trillion in total (CBI, 2016; 2022).

Nevertheless, the growing attention to sustainable investing has also been recognized on an international policy level. Since the launch of the UN Principles for Responsible Investment (UN PRI) in 2006, the number of signatories increased rapidly from 890 in 2011 to 1384 in 2015 and 3826 in 2021. Total assets under management reached USD 24 trillion in 2011 and USD 121 trillion in 2021 (UN PRI, 2022).

The flourishing interest in socially responsible investing (SRI) is further demonstrated by the ever-increasing share of sustainable investments in investors' portfolios (Camilleri, 2020). Moreover, the shift of investors' preferences towards the SRI is recognized not only in the retail segment but also in the segment of professional investors, which is driven by a significant group of proponents, including non-profit organizations, high net worth individuals, family offices, investment banks and international financial institutions for development, which mobilize capital for investments intended to create a meaningful societal impact besides standard returns (Epstein, 2018).

In the face of the increased attention of investors to socially responsible investing, there is also a boosted academic interest in the topic, which is documented in several systematic reviews of ESG literature (e.g., Daugaard, 2020; Li et al., 2021; Widyawati, 2021). While the most influential research articles were published between 2000 and 2011, according to bibliometric analysis, the number of research articles had already been growing exponentially since the 1970s (Daugaard, 2020).

As the interest in research into sustainable investment grows, so do the numbers of ESG rating providers and their assessment methodologies (Huber and Comstock, 2017). There are at least 13 rating providers, each covering more than 2,000 companies with different methodologies (Douglas et al., 2017). As a consequence, ESG investors often face a substantial amount of uncertainty about the true ESG profile of a firm, which hinders their decision-making (Matos et al., 2020). Given that, the obvious research question is to be raised – does such uncertainty play a significant role in the asset pricing mechanism of the securities with ESG characteristics? And if so, is the relationship significant only for several industries or countries?

Theoretical models distinguish several alternative hypotheses on the alpha returns of ESG or sustainable/responsible stocks. Hamilton et al. (1993) and Revelli and Viviani (2014) hypothesized that companies with stricter ESG policies earn higher returns through the channel

of higher corporate financial performance. This is caused either by improved governance or through more aligned expression of consumer values. On the contrary, the impact of ESG policies could also be negative, if internalization of externalities or acts of philanthropy lead to lower financial performance (Benabou and Tirole, 2010). With a dynamic approach, Girerd-Potin et al. (2011) constructed a model of higher financial performance of higher ESG-rated firms through lowering costs of capital at first, while achieving inferior performance in later stages by further engagement in social responsibility actions. It could, however, be argued that these hypotheses explain the relationship of sustainability actions on stock returns mainly through increased profitability, which is the factor traditionally controlled for (Fama and French, 2017).

Performance gaps between ESG and conventional stocks could, however, also be explained by differences in systematic risk exposures and different investor taste. In this case, theoretical models (Heinkel et al., 2001, Benabou and Tirole, 2010; Pástor et al., 2021) presume a negative relationship between stock returns and ESG score. This is because investors receive non-pecuniary benefits in holding green assets, thus accepting lower risk premium relative to an ESG-indifferent agent. In this theoretical framework, stocks of ESG firms achieve lower CAPM alphas, especially in episodes of low risk aversion and strong ESG preference. Green assets also provide a hedge to climate risks, which are considered to be an important category of investment risks. Furthermore, firms with higher carbon emissions are more exposed to the tail and variance risk, which is also supported empirically (Ilhan et al., 2020).

When, however, uncertainty about ESG ratings is added into the model, this relationship is no longer binding (Avramov, 2021). When ESG rating divergence rises, the demand for such stock evaporates due to the uncertainty of the amount of non-pecuniary benefits and ability to hedge against climate risks. A brown-averse agent could thus substantially reduce his stock investing, even when the market is green on average. Consequently, this should lead to higher risk premiums and a rise in stock returns. This has been empirically validated, e.g., by Brandon et al. (2019) who showed that higher dispersion in ESG ratings from six providers about social and governance factors leads to overvaluation of S&P 500 shares.

One could therefore reasonably argue that with higher ESG rating uncertainty of a stock comes a higher risk premium and thus higher returns. Furthermore, industries experiencing a higher degree of ESG rating divergence would be likely to exhibit higher risk premiums due to elevated environmental risk uncertainty. A similar effect could finally be assumed for securities from countries with higher ESG awareness. It could be assumed that investors in these countries consider climate risks to be a major risk driver compared to stocks from other countries. As will be shown, there is only a small amount of academic research evaluating this

relationship, especially for the European stock market. The objective of this article is therefore to enlarge the discussion on this topic, specifically in terms of observing the relationship in various sectors and time horizons.

The rest of the paper is structured as follows: Section 1 presents a literature review on general research into ESG and sustainable finance characteristics, Section 2 provides the data and methodology background for the paper, Section 3 offers results of the Fama-French and portfolio performance analyses, while final section discusses aims for future analyses and concludes.

1. Literature Review

In recent years, there has been an enormous number of papers regarding the impact of a company's CSR and ESG activities on its financial performance and its stock performance. A positive impact on a company's financial performance (CFP) has been noted in meta-analyses conducted by Derwall et al. (2005), Margolis et al. (2009), Friede et al. (2015), and recently Velte (2021). The direct CSR-CFP relationship has been explained by pointing to various corporate channels, such as lower costs of capital (El Ghoul et al., 2011; Dhaliwal et al., 2014), decreased interest costs (Goss, 2011), higher employee satisfaction, productivity and lower turnover rate (Edwards, 2013a; 2013b; Gubler et al., 2018) and to some extent by increased sales (Waheed and Yang, 2018; Yannan et al., 2022; Nyame-Asiamah and Ghulam, 2020). Higher company financial performance was also documented in times of crisis (Lins et al., 2017).

A similar positive relationship has been documented between the level of a company's CSR and its stock returns. Higher stock returns are generated by companies with a lower ecological footprint (Matsumura et al., 2014; Flammer, 2013), higher employee satisfaction (Edmans, 2011), higher overall ESG score (Berg et al., 2022; Barth, 2022), and social issues (Bajic and Yurtoglu, 2018). Researchers have also pointed out that the outperformance could be associated with several "irrational" psychologic factors (Elliot et al., 2014) and that they are characteristic of short-term growth-driven investors (Guenster et al., 2011). Regarding ESG investing performance, however, the effect of ESG preferences on the efficient frontier and expected returns has been observed as ambiguous (Pástor et al., 2021; Pedersen et al., 2021). In the long run, higher ESG-rated stocks are seen both as underperforming (Di Giuli and Kostovetsky, 2014; Bolton and Kacperczyk, 2020) and outperforming (Dimson et al., 2015; Lins et al., 2017; Barko et al., 2018) conventional stocks, depending on the time horizon, scope, and methodology of the research.

The observable relationship between CSR/ESG and CFP is, however, deeply tied to the quality of the accounting reports. This relationship becomes even more critical as relevant actors on the financial markets object to the heterogeneous character of sustainability and ESG reports. In general, accounting quality is supposed to have a positive effect on company financial performance mainly by reducing information asymmetry between the company and creditors (Biddle and Hilary, 2006; Biddle et al., 2009). The relationship has furthermore been assessed in quantitative models, which have documented both direct and indirect effects on financial performance related to managerial decision-making based on report quality (Bentley et al., 2021) and by quantitative analysis using linguistic readability metrics (Li, 2008). The effect is attributed to some extent to the establishment of voluntary non-financial reporting, which seems to have a certain effect on lowering costs of capital (Dhaliwal et al., 2011).

As previously stated, the quality and coherence of sustainability reports have an important effect on the CSR-CFP relationship, which was documented in a systematic literature review by Crous et al. (2021). In the case of ESG scores and ratings, the effect is particularly visible as there happens to be a systematic difference in relevant ESG scoring metrics (Berg et al., 2022) and higher sensitivity to audit differences in sustainability actions than in financial cases (Moroney and Trotman, 2016). ESG scores tend to be weakly correlated as quite diverse methodologies are applied when constructing scores. Furthermore, the so-called "rater effect", i.e., a rater's overall bias influencing the measurement of specific categories, has been identified (Berg et al., 2022).

The divergence of ESG scores and ratings has also been supported by various analytical methods, including Pearson and Spearman correlations (Chatterji et al., 2016; Berg et al., 2022), incorporation of ESG risk components (Dorfleitner et al., 2015), univariate and multivariate tests (Semenova and Hassel, 2015), and exploratory data analysis (Gyönyörová et al., 2021).

For instance, Berg et al. (2022) documented that the average correlation between six major rating providers is 0.54, with scope and measurement divergence being the main drivers of disagreement. The main drivers of the divergence between ratings seem to be the level of transparency, measuring difficulties and company complexity, mainly in the financial and telecommunications sector (Christensen et al., 2019; Brandon et al., 2020; Kotsantonis and Serafeim, 2019). On top of that, Serafeim and Yoon (2022) found that the consensus rating predicts future news, but its predictive ability diminishes for firms with large disagreement between raters. The level of transparency, measurement difficulties, company complexity and industry specifics have been identified as the main causes of divergence between ratings. Comparability, consistency, and transparency across the sector are now dominant priorities for investors (Wong et al., 2019).

Brandon et al. (2021) found that stock returns for a sample of firms in the S&P 500 Index between 2010 and 2017 are positively related to ESG rating disagreement, suggesting there is a risk premium for firms with higher ESG rating disagreement. Avramov et al. (2022) presented that ESG rating uncertainty reduces investor demand for US stocks, especially for ESG-sensitive investors (i.e., norm-constrained institutions) in their ESG investment (i.e., green stocks). Starting with the market portfolio as the single risky asset, they show that rating uncertainty leads to higher perceived market risk, higher market premium and lower investor demand. Secondly, brown stocks may outperform green stocks only when rating uncertainty is low and the negative return predictability of ESG ratings does not hold for the remaining firms. However, Cornell (2021) pointed towards lower expected returns for investments in highly ESG-rated companies. Although ESG investing may have social benefits, higher expected returns for investors are not among them. Similarly, Bae (2021) found no evidence that CSR affected stock returns during the crash period, e.g., during the economic slowdown caused by the COVID-19 pandemic.

Even though several important topics regarding the relevance of ESG score and its divergence of corporate performance and company stock returns have been recently explored – as was shown in the previous paragraph – several critical questions remain unanswered. As far as I am concerned, it is still unclear (i) how strong the relationship between ESG rating divergence and stock returns is, (ii) how ESG divergence is incorporated into the investment analyses of stock investors in Europe, (iii) how the predictability of returns varies across different countries and sectors, and (iv) how consistent the so-called ESG divergence beta is across different time horizons.

2. Methodology

2.1 Data

Major data sources used are the Bloomberg and Refinitiv databases. I obtained data for European publicly traded stocks from January 2015[1] to May 2022. From this universe, stocks with positive prices with at least two ESG ratings were selected. After the adjustment, the total stock universe comprised 851 stocks from 17 countries operating in 9 sectors. As will be described below in more detail, stocks are grouped into three regions, based on countries' awareness of sustainability issues.

From both databases, I extracted a total of five ESG ratings for each stock where possible. For the evaluation of the overall ESG sentiment, the RobecoSAM total sustainability rank, Refinitiv ESG score, ESG risk score by Sustainalytics, ESG score by MSCI and ESG news

1 The first month in which at least two types of ESG score are gathered by market data providers.

sentiment score by Amenity Analytics were used. Given the different assessment and rating methodologies with various scales, several data-cleaning processes had to be performed. For example, the RobecoSAM total sustainability rank ranges from 0 to 100, ranking the most-aligned companies with the highest percentile, while e.g., the ESG risk score from Sustainalytics grants a higher rating to companies with higher exposure to ESG risks, thus to the "worst" ESG performers. To standardize the metrics, the results of the ESG risk score were inverted for the alignment to other indicators. Similarly, the MSCI score ranges from 0 to 10, with the best performer attributed with highest ranking. For the analysis purposes, the range of the MSCI score was multiplied by the factor of 10. Adjusted in this way, each ESG metric of the stock is scaled on a range from 0 to 100, granting the highest ranking to the best performer. The next paragraphs will briefly summarize the scope, methodology and rating scale of the metrics used.

RobecoSAM total sustainability rank is largely based on the so-called annual corporate sustainability assessment, which serves as the framework for measuring corporate sustainability performance. Approximately 6000 companies are evaluated, based on a range of financially relevant sustainability criteria covering the economic, environmental and social dimensions. Since its introduction in 2016, companies have received a so-called total sustainability score from 0 to 100 and are ranked against other companies in their industry.

Refinitiv ESG score captures more than 630 company-level ESG measures across 10 main themes, such as emissions, product innovation, human rights, etc. The score adopts percentile rank scoring methodology attributing the score of 100 to the best performer. As of 2022, Refinitiv has calculated its ESG score for more than 11800 companies worldwide, of which approximately 2100 are based in Europe.

ESG risk score by Sustainalytics, started in 2021, consists of a quantitative score and a risk group. The quantitative score reflects units of unmanaged ESG risk with lower unmanaged risk ratings. Companies are sorted into five different risk groups, which are based on their quantitative evaluation (from negligible to severe). The rating is based on two dimensions – exposure of a business to industry-specific risks and assessment of risk management strategies. The scale of scores ranges from 0 to 100, with the most severe being 100. These categories of risk are absolute, meaning a "high risk" assessment reflects a comparable degree of unmanaged ESG risk across all covered subindustries.

MSCI ESG score ranks on a scale of 0–10 from the issuer's lowest to highest stocks based on their ESG performance. The score indicates how well an issuer manages its most material ESG risks relative to its sector peers. The score is calculated as a weighted average score for all three key pillars (environmental, social and governance).

Amenity Analytics has created an ESG dataset that provides company and sector-level analysis of hundreds of news sources for monitoring and tracking ESG issues in depth. The entities covered in this dataset are the majority of public companies worldwide (12000 companies). The underlying source of the data is the top 200 English news sources obtained from LexisNexis database. Amenity applies natural language processing and sentiment analysis to news to derive a numerical score (signal). The score is the result of the net sentiment divided by negative and positive extractions of the previous three calendar days per any ESG topic. The news are then weighed by the total counts of appearance in media. The values in the study dataset are represented as ESG news sentiment score with scores between −1 and +1. A score of −1 is the most negative while +1 is the most positive.

Table 1: Descriptive statistics of ESG score ratings by year

year	RobecoSAM Score			Refinitiv Score			Sustainalytics score			MSCI Score			Amenity score		
	n	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd
2015	0	NA	NA	694	63.1	18.7	0	NA	NA	34	3.7	0.8	115	0	0.9
2016	189	72	24.4	669	65	18.7	0	NA	NA	164	3.9	1	87	0	0.8
2017	637	68	25.9	725	65.9	17.5	0	NA	NA	181	4.2	1	61	0.1	0.9
2018	702	64.3	26.6	757	67.1	16.9	0	NA	NA	207	4.3	1	112	0	0.8
2019	739	63.1	26.5	798	68.4	16.9	0	NA	NA	209	4.4	1	130	0	0.7
2020	77.3	63.9	26	819	70	15.9	0	NA	NA	211	4.6	1	218	−0.1	0.6
2021	828	71	21.7	827	73.1	14.3	606	20.3	6.7	213	4.7	1	360	−0.1	0.5
2022	842	77.4	18.3	837	75.1	13.3	817	19.7	6.5	213	4.7	1	445	−0.1	0.6

Notes: This table presents the main descriptive statistics of each ESG score variable in the dataset. Values represent arithmetic means for the corresponding year. The variable *n* stands for average number of stocks with assigned ESG score each year. *Mean* is an average of monthly arithmetic means of the relevant ESG score, while *sd* is an average standard deviation of the monthly standard deviations of ESG score.

Source: author's processing

Table 1 presents the average number of observations and average values of mean and standard deviation for each ESG score in any given year from the dataset. As can be observed, ESG scores have been assigned since 2015 with an average of 631 rated stocks with Refinitiv score, 33 rated stocks with MSCI score and 115 stocks with ESG news sentiment score. The ratings gradually increase for each score, most notably for the RobecoSAM sustainability rank, with an average of 842 observations each month. The table also demonstrates slight improvement

of each ESG score in time, except the news sentiment score, which oscillated around zero during the data period, and even indicated slightly negative ESG sentiment of the stock market in 2022. The ESG sustainability risk score started only in 2021, but has quickly expanded, reaching an average of 817 rated stocks at the end of the data period. The RobecoSAM and Refinitiv scores reached 842 and 837 rated stocks on average in 2022, accomplishing almost 98.9% and 98.4% coverage in the sample respectively.

Table 2 shows the correlation matrix of ESG score variables. Unsurprisingly, the Refinitiv and RobecoSAM ESG scores, which are very similar in scope, are highly, though not perfectly, correlated. Rather unexpected is the divergence of correlation coefficients between the Sustainalytics risk score and the RobecoSAM score (mild negative correlation), and between the Sustainalytics risk score and the Refinitiv ESG score (uncorrelated). Equally notable is a very weak correlation between the Amenity ESG news sentiment score and the other ESG metrics.

Table 2: Correlation matrix of ESG score variables

	RobecoSAM score	Refinitiv score	Sustainalytics score	MSCI score	Amenity score
RobecoSAM score	1.000	0.594	−0.223	0.333	0.025
Refinitiv score	0.594	1.000	−0.007	0.488	0.011
Sustainalytics score	−0.223	−0.007	1.000	0.140	0.024
MSCI score	0.333	0.488	0.140	1.000	−0.025
Amenity score	0.025	0.011	0.024	−0.025	1.000

Notes: This table presents correlation coefficients from pair-wise correlation analysis for each ESG score variable across all stock characteristics. Missing observations were omitted from the analysis and were treated as NAs.

Source: author's processing

Tables 3 and 4 present correlation coefficients of ESG ratings by industry and by year. It can be concluded that ESG scores diverge mostly in the basic materials and utilities sectors. Contrary to Berg et al. (2022), European financials enjoy a relatively high convergence of ESG ratings, similar to industrial and the energy sector. Worth noting is a relatively high discrepancy between the correlation coefficients of the sustainability risk score and the MSCI score, particularly a mild positive correlation in the sectors Basic Materials, Energy and Utilities, while a mild negative correlation is observed in the sectors Consumer Non-cyclicals, Financials and Industrials. Bearing in mind a relatively strong correlation between the Refinitiv and MSCI scores, a negative correlation between these two variables in the sector Consumer Cyclicals seems anomalous.

Table 3: Correlation coefficients of ESG score variables by industry

Industry	rob/ref	rob/sus	rob/msc	rob/ame	ref/sus	ref/msc	ref/ame	sus/msc	sus/ame	msc/ame
BMA	0.50	−0.25	0.22	−0.01	−0.17	0.46	0.03	0.21	0.01	−0.02
COM	0.41	−0.59	NA	0.00	−0.35	NA	−0.02	NA	−0.06	NA
CON-C	0.59	−0.36	0.43	0.00	−0.08	−0.20	0.07	NA	0.04	NA
CON-NC	0.67	−0.29	0.44	0.04	−0.25	0.46	0.01	−0.21	0.01	0.01
ENE	0.41	−0.45	0.41	0.05	−0.02	0.64	−0.07	0.35	−0.10	−0.07
FIN	0.70	−0.12	0.56	−0.01	0.11	0.56	0.01	−0.22	0.05	0.00
IND	0.56	0.05	0.80	0.06	0.00	0.72	0.00	−0.22	−0.06	−0.12
TEC	0.67	−0.45	NA	−0.06	−0.28	NA	−0.02	NA	0.09	NA
UTI	0.59	0.05	0.19	0.06	−0.08	0.34	−0.01	0.21	0.08	−0.03
All	0.59	−0.22	0.33	0.02	−0.07	0.48	0.01	0.14	0.02	−0.02

Notes: For each pair of variables, the correlation coefficient is estimated. The pairs are sorted from the left to the right by the size of the sample being assigned by the first ESG score from the pair in descending order. The symbols "*rob*", "*ref*", "*sus*", "*msc*" and "*ame*" represent RobecoSAM total sustainability rank, Refinitiv ESG score, Sustainability ESG risk score, MSCI ESG score and Amenity ESG news sentiment score, respectively. Missing observations were omitted from the analysis and were treated as NAs.

Source: author's processing

Table 4: Correlation coefficients of ESG score variables by year

year	rob/ref	rob/sus	rob/msc	rob/ame	ref/sus	ref/msc	ref/ame	sus/msc	sus/ame	msc/ame
2015	NA	NA	NA	NA	NA	0.46	0.04	NA	NA	−0.30
2016	0.61	NA	0.21	0.02	NA	0.48	−0.02	NA	NA	−0.01
2017	0.65	NA	0.32	0.07	NA	0.46	−0.05	NA	NA	−0.04
2018	0.64	NA	0.37	−0.04	NA	0.49	−0.03	NA	NA	0.00
2019	0.60	NA	0.39	−0.01	NA	0.49	−0.01	NA	NA	−0.04
2020	0.57	NA	0.39	0.03	NA	0.52	0.04	NA	NA	−0.11
2021	0.52	−0.22	0.30	0.02	0.00	0.45	0.03	0.14	0.00	−0.01
2022	0.54	−0.23	0.23	0.09	−0.01	0.42	0.05	0.14	0.06	0.07
All	0.59	−0.22	0.33	0.02	−0.07	0.48	0.01	0.14	0.02	−0.02

Notes: For each pair of variables, the correlation coefficient is estimated. The pairs are sorted from the left to the right by the size of the sample being assigned by the first ESG score from the pair in descending order. The symbols "*rob*", "*ref*", "*sus*", "*msc*" and "*ame*" represent RobecoSAM total sustainability rank, Refinitiv ESG score, Sustainability ESG risk score, MSCI ESG score and Amenity ESG news sentiment score, respectively. The category of Industries consists of Basic Materials (BMA), Communications (COM), Consumer-Cyclicals (CON-C), Consumer Non-cyclicals (CON-NC), Energy (ENE), Financials (FIN), Industrials (IND), Technology (TEC) and Utilities (UTI). Missing observations were omitted from the analysis and were treated as NAs.

Source: author's processing

From the correlation analysis categorized by year, the RobecoSAM and Refinitiv scores do not converge in time. Rather, they diverge as the correlation coefficient has slipped by seven percentage points in the last seven years. The maximum value of the coefficient of these two variables, the absolute maximum of any pair from the analysis, reached 0.67 in 2017. The correlation of the MSCI score with both the RobecoSAM and Refinitiv scores seems to have stagnated somewhat after the rapid increase in 2018–2020. The correlation coefficients, which include the sustainability risk score and the Amenity ESG news sentiment score, do not express any clear pattern, mainly due to low coverage.

2.2 Methodology

All the ESG scores were adjusted by sorting stocks into ranks from 0 to 100, granting the highest possible ranking to the "best" performer in the category. For the assessment of ESG score divergence, I created two separate variables for each period: the weighted average of ESG scores per each stock (*ESG composite*) and the standard deviation of adjusted ESG scores of the stock (*ESG divergence decile*). The variables are calculated monthly from all available ESG scores per each stock regardless of stock characteristics. For the purpose of the factor analysis, values of both variables were sorted in deciles, with the highest ranking attributed to the "best" performers, to obtain an appropriate distribution of values. The relevant risk factors (market capitalization, price/book multiple, operating profitability on equity, asset growth, momentum) per each stock in any given month were also obtained from Eikon and Bloomberg databases and sorted into deciles using the same process. STOXX600 adjusted for the risk-free rate was chosen as a main market risk benchmark, as it is the index most aligned with the characteristics of our sample. The risk-free rate is the 12-month EURIBOR rate. Net returns of MSCI Europe and STOXX50 were later incorporated into factor models for performing robustness checks. The monthly returns of securities were adjusted for the EURIBOR rate and subsequently estimated on a monthly basis, using several variations of the CAPM model:

$$R_{nj} = \alpha_{n,j} + \sum Z_{x,n,j} + ESG_{composite\ score,n,j} + ESG_{divergence,n,j} + \varepsilon_n \quad (1)$$

where $R_{n,j}$ is the monthly return for the stock n at the time j, Z_x is the relevant beta for the purpose of the factor analysis (including market risk premium, value, size, performance, investing and momentum betas). In coherence with previous studies, three relevant hypotheses are constructed:

Hypothesis 1 (ESG divergence beta): The security's historical returns are positively correlated with its ESG rating divergence and negatively correlated with an aggregate ESG score. Similar findings have been theoretically assumed by Pástor (2021) and empirically discovered by Avramov (2022) on US securities listed on NYSE and NASDAQ.

Hypothesis 2 (*ESG divergence in financials beta*): Consistently with Crespi and Migliavacca (2019), I assume that the financial sector is specifically complicated in ESG score evaluation due to the divergence of metrics selected in the process. Thus, the ESG divergence score should be positively correlated with the returns of financials.

Hypothesis 3 (*ESG divergence in emerging countries beta*): Given the extended focus of ESG rating agencies on highly developed countries, it can be assumed that ESG ratings will be more divergent in emerging European countries, which thus experience higher market-adjusted returns.

3. ESG Divergence Beta

3.1 Factor analysis

As stated in the previous section, I estimated the Fama-French regression with factors of ESG composite score and ESG divergence score included. The multiple linear regression was performed with each of the three control factors at first and with a 1-month, 3-month and 1-year momentum and other two factors (profitability and asset growth) included for a robustness check. The results are shown in Table 5.

It can be summarized from the performed analyses that the ESG score divergence significantly contributes to the expected individual stock returns when controlling for variables in the 3-factor Fama-French and 4-factor Carhart models with a 12-month momentum. The resulting positive value of the coefficient indicates the expected investors' reward for the uncertainty of the ratings. The effect, however, dissolves when control variables include operating profitability and asset growth from the 5-factor Fama-French model or shorter momentum periods. It is also worth noting the negative effect of the ESG composite score on the stock returns, meaning that ESG performers access cheaper equity financing, possibly explained by lower sustainability risks. This is in line with the theoretical framework of Pástor (2021). Given the highest explanatory power, the 5-factor model will be the first choice for model construction in the subsequent analyses.

Table 5: Summary of Fama-French factor models

	3-factor	5-factor	4-factor (12M)	4-factor (3M)	4-factor (1M)
Market premium	108.8*** (0.777)	108.5*** (0.753)	108.8*** (0.762)	108.8*** (0.771)	108.7*** (0.776)
Value effect	0.182*** (0.011)	0.113*** (0.014)	0.146*** (0.011)	0.142*** (0.011)	0.142*** (0.012)
Size effect	0.089*** (0.012)	0.084*** (0.011)	0.074*** (0.012)	0.076*** (0.012)	0.079*** (0.012)
ESG composite	−0.082*** (0.013)	−0.044*** (0.012)	−0.067*** (0.013)	−0.065*** (0.013)	−0.071*** (0.013)
ESG divergence	0.027* (0.011)	0.017 (0.011)	0.026* (0.011)	0.026 (0.011)	0.026 (0.011)
Growth effect		0.650*** (0.011)			
Profitability		−0.083*** (0.014)			
12MOM			0.512*** (0.011)		
3MOM				0.325*** (0.011)	
1MOM					0.142*** (0.012)
Obs.	52448	52303	52448	52443	52351
R2	0.273	0.318	0.301	0.284	0.275

Notes: The response variable is gross stock return on a monthly basis, expressed in percentage points. The explanatory variables consist of standard Fama-French factors, constructed divergence of ESG scores (ESG divergence), constructed ESG composite score (ESG composite), 1-year momentum (12MOM), 3-months momentum (3MOM) and 1-month momentum (1MOM). The first value in the cell corresponds to the value of the beta coefficient for a given variable, the value in brackets below represents the standard error of the coefficient. The symbols *, ** and *** highlight statistical significance at the 5%, 1% and 0.1% level.

Source: author's processing

Table 6: Performance characteristics of portfolios consisting of stocks in *n*-th decile of ESG score divergence

Portfolio group	Gross return	Sharpe ratio	St dev	Expected shortfall	VaR	Max drawdown
1st decile	**0.0268**	**0.2148**	0.1766	−0.1249	−0.0741	0.3580
2nd decile	**0.0326**	**0.2868**	0.1658	−0.1119	−0.0609	0.3098
3rd decile	0.0235	0.2532	0.1675	−0.1143	−0.0687	0.2920
4th decile	−0.0012	0.0858	0.1563	−0.1133	−0.0760	0.2568
5th decile	**0.0435**	**0.3120**	0.1669	−0.1165	−0.0700	0.2850
6th decile	**0.0332**	**0.3420**	0.1694	−0.1086	−0.0757	0.3673
7th decile	**0.0367**	**0.4188**	0.1478	−0.1029	−0.0803	0.3023
8th decile	0.0165	0.2472	0.1565	−0.1092	−0.0767	0.2637
9th decile	0.0135	0.2076	0.1729	−0.1235	−0.0823	0.3804
10th decile	**0.0331**	**0.3408**	0.1521	−0.0971	−0.0764	0.2941
HML strategy	0.0016	0.0381	0.0770	−0.0394	−0.0354	0.1765
Risk-free rate	−0.0017	0	0.0006	−0.0004	−0.0004	0.0145
STOXX 600	0.0244	0.3276	0.1439	−0.0926	−0.0584	0.2446
MSCI Europe	0.0508	0.5712	0.1426	−0.0905	−0.0560	0.2394
STOXX 50	0.0106	0.2232	0.1702	−0.1022	−0.0705	0.2979

Notes: Each month, the stocks in the sample are grouped into deciles of ESG scores divergence, defined as a standard deviation of the percentile ranks of all available ESG ratings for each stock in a given month. The risk-free rate is the 12-month EURIBOR. The negative performance of the risk-free rate is caused by the period of the negative EURIBOR rates between March 2016 and March 2022. Portfolios are equal-weighted and rebalanced on a monthly basis. Gross return is a compound annual growth rate (CAGR), calculated from monthly portfolio returns. The Sharpe ratio and standard deviation per each portfolio group are annualized. Expected shortfall and VaR are historical monthly rates based on the 95% confidence level. Max drawdown measures maximum consecutive cumulative loss of a portfolio proportionate to its peak value.

Source: author's processing

Table 6 presents the main portfolio characteristics of investment strategies based on the *n*-th ESG divergence decile. Each month, the investor rebalances its portfolio equally invested in the stocks of the *n*-th decile of the ESG divergence. Furthermore, I construct a portfolio for each period of stocks from the highest decile from the previous period in a long position and stocks from the lowest decile in a short position (HML strategy). Surprisingly, the annualized

returns of a 1st and 10th decile portfolio outperform two benchmarks respectively in absolute terms. The investor alpha against the STOXX600 benchmark amounts to 0.24 percentage points for the lowest divergence portfolio and 0.87 percentage points for the highest divergence portfolio. When adjusted for risk, the outperformance of the 1st decile vanishes as the Sharpe ratio is 2 percentage points below the Sharpe ratio of the STOXX600 index. The outperformance of the highest decile persists (Sharpe ratio of 0.341), but it is beaten by the 7th decile (0.419) and 6th decile (0.342), signalling no clear relationship between ESG rating divergence and stock returns. This is also confirmed by the insignificance of alpha and risk-adjusted returns of the HML strategy. Looking at the risk characteristics, it can be noted that portfolios based on deciles of ESG divergence bear more risk in terms of expected shortfall and for maximum drawdown. This could be attributed to the idiosyncratic market risks of ESG-rated stocks in contrast to the total market indices.

3.2 Factor analysis by industry

To test the hypothesis of the market-significant divergence of ESG ratings in the financial sector, a factor regression was executed for each industry. The risk-adjusted returns were estimated for each industry consisting of corresponding stocks, using the 5-factor Fama-French model:

$$R_{ind,j} = \alpha_{n,j} + \sum Z_{x,ind,j} + ESG_{composite\ score,ind,j} + ESG_{divergence,ind,j} + \varepsilon_n \quad (2)$$

where *ind* is a particular industry. Table 7 demonstrates that the ESG score divergence effect is not significant in any of the industries, though the overall direction of the effect for selected industries varies. The effect is not significant even in *Financials*, the sector with the most observations, while all the control variables except profitability and ESG rating effect are significant. Moreover, given the lower number of observations, the statistical significance of the ESG composite score on excess returns dissolves, except in the sector *Consumer non-cyclicals*.

In the Appendix, Table A1 demonstrates the yearly stock returns by ESG divergence decile for every industry with a p-value of a t-test score. Similarly to Table 5, it can be noted that there is no direct impact of ESG score divergence on stock returns. However, a few anomalies can be spotted, specifically the excess returns of most divergent stocks in the sectors *Basic materials*, *Energy* and *Technology*. On the other hand, excess returns of least divergent stocks are statistically significant in the sectors *Communications, Consumer Cyclicals*, *Financials* and *Industrial*. On the aggregate level, statistical significance at the 95% level can be attributed to excess returns for the first, second and tenth deciles.

Table 7: Summary of Fama-French 5 factor analysis performed by SDG development level

	BMA	COM	CON–C	CON–NC	ENE	FIN	IND	TEC	UTI
Market risk	109.0*** (2.770)	73.93*** (2.899)	133.1*** (2.205)	75.80*** (1.611)	119.1*** (5.385)	127.1*** (1.510)	120.8*** (1.723)	122.0*** (4.206)	77.30*** (2.540)
Value effect	0.111* (0.054)	0.168** (0.059)	0.001* (0.040)	0.002*** (0.037)	0.004*** (0.116)	0.001** (0.034)	0.001* (0.039)	0.005** (0.133)	0.002*** (0.055)
Size effect	0.103* (0.042)	0.078 (0.047)	0.106** (0.033)	0.113*** (0.026)	0.200* (0.078)	0.089*** (0.023)	0.067* (0.026)	0.080 (0.086)	0.061 (0.049)
Growth effect	0.695*** (0.038)	0.728*** (0.042)	0.702*** (0.032)	0.605*** (0.024)	0.748*** (0.074)	0.583*** (0.023)	0.583*** (0.027)	0.631*** (0.062)	0.495*** (0.037)
Profitability effect	−0.001** (0.053)	0.000 (0.057)	−0.001** (0.039)	−0.001*** (0.033)	−0.002 (0.090)	0.000 (0.031)	−0.001 (0.035)	0.000 (0.088)	−0.001 (0.067)
ESG composite	−0.011 (0.058)	0.005 (0.048)	−0.068 (0.035)	−0.089** (0.028)	−0.030 (0.103)	−0.020 (0.025)	−0.027 (0.028)	−0.061 (0.085)	−0.015 (0.047)
ESG divergence	−0.063 (0.043)	0.081 (0.054)	−0.036 (0.036)	0.023 (0.023)	−0.081 (0.087)	−0.002 (0.022)	0.008 (0.027)	0.058 (0.082)	0.015 (0.042)
Obs.	4501	3418	6811	10109	2114	11641	8343	1920	3384
R2	0.305	0.222	0.399	0.218	0.225	0.398	0.397	0.335	0.234

Notes: For each industry, monthly stock returns and factor variables have been selected as dependent and independent variables respectively. The data period for all industries is from January 2015 to May 2022. The first value of a cell corresponds to the value of the beta coefficient for a given variable, the value in brackets below represents the standard error of the coefficient. The category of Industries consists of Basic Materials (BMA), Communications (COM), Consumer-Cyclicals (CON–C), Consumer Non-cyclicals (CON–NC), Energy (ENE), Financials (FIN), Industrials (IND), Technology (TEC) and Utilities (UTI). The symbols *, ** and *** highlight statistical significance at the 5%, 1% and 0.1% level.

Source: author's processing

3.3 Factor analysis by ESG awareness region

The third hypothesis assumes that the effect of ESG rating divergence is significant, especially for countries with higher awareness of ESG investing and Sustainability Development Goals (SDG). For this purpose, the proxy variable *SDG_development_level* was created from the UN Sustainable Development Goals Index. The SDG Index assesses countries' sustainability rank based on more than 100 indicators, including social and economic prosperity and environmental sustainability (Sachs et al., 2022). The rating scale is from 0 to 100, attributing the highest ranking to the "best" performer.

Based on the SDG Index, countries from the sample were divided into three groups (high/medium/low) of country ESG development (i) *High* – Finland, Sweden, Denmark, Norway, (ii) *Medium* – Austria, Germany, France, Switzerland, Ireland, the United Kingdom and (iii) *Low* – Spain, the Netherlands, Belgium, Portugal, Italy, Greece, Luxembourg. The 5-factor Fama-French regression was then applied to the stock universe data grouped into constructed categories of ESG awareness.

$$R_{awa,j} = \alpha_{,j} + \sum Z_{x,awa,j} + ESG_{composite\ score,awa,j} + ESG_{divergence,awa,j} + \varepsilon_n \tag{3}$$

where *awa* stands for the ESG awareness rank. Table 8 presents a summary of the regressions grouped by the ESG development level in the sample countries. Contrary to expectations, the divergence beta is significant only in the low category. The coefficient sign is positive, indicating a direct relationship between the magnitude of the ESG score divergence and excess returns. Furthermore, the diminishing size, profitability and ESG score effect, specifically in the high and low categories of SDG development models, can be observed from the table. The shrinkage of the significance of these effects, however, can be mostly attributed to the decreasing number of observations in the model.

Table A2 in the Appendix further summarizes excess returns grouped for each category of SDG development with the corresponding p-value of the t-test for the significance of excess returns. From this perspective, the most statistically significant are the excess returns of the highest decile in highly SDG-developed countries, which reach an excess return of 7.9 percentage points above the average return in the category. Worth noting is also the fact that the most ESG-divergent portfolio reaches excess returns in all the categories. The effect is, however, inhibited by the excess return of the least ESG-divergent portfolio, which occurs in the high and low SDG development categories. The effect of ESG divergence on excess stock returns is thus not straightforward even after the decomposition of the stock universe by ESG awareness of the issuer's country.

Table 8: Summary of 5-factor Fama-French analysis performed by SDG development level

	High	Medium	Low
Market risk	91.34*** (2.051)	110.1*** (0.954)	114.6*** (0.013)
Value effect	0.113** (0.043)	0.098*** (0.018)	0.129*** (0.030)
Size effect	0.069 (0.042)	0.120*** (0.017)	0.049+ (0.028)
Growth effect	0.495*** (0.030)	0.721*** (0.014)	0.563*** (0.023)
Profitability effect	−0.025 (0.038)	−0.093*** (0.018)	−0.086** (0.031)
ESG composite effect	−0.015 (0.042)	−0.033 (0.020)	−0.066* (0.032)
ESG divergence	−0.117 (0.070)	−0.049 (0.032)	0.125* (0.051)
Obs.	7795	32246	12262
R2	0.205	0.325	0.336

Notes: For each level of SDG development, monthly stock returns and factor variables have been selected as dependent and independent variables respectively. The first value corresponds to the value of the beta coefficient for a given variable, the value in brackets below represents the standard error of the coefficient. The symbols *, ** and *** highlight statistical significance at the 5%, 1% and 0.1% level.

Source: author's processing

3.4 Robustness checks

Lastly, the sample was divided into two periods: 2015–2018 and 2019–2022 to conduct a robustness check. Bearing in mind the early results of the testing, a sub-hypothesis of a rising significance of ESG rating divergence in time was anticipated. The rationale behind the idea is that the higher excess returns of the average return of all stocks grouped by decile of divergence against the return of constructed portfolios by deciles indicate that higher returns of most ESG-divergent stocks are associated with the latest data due to subsequent increase in the observations.

Furthermore, based on the results of statistical tests from sections 3.1 and 3.2, the variable of ESG divergence decile was slightly adjusted. The metric scale was adjusted from −5 to 5 and subsequently squared to capture the effect of the variance of the divergence from the average. Thus, the effect of extreme divergence values should be visible, if it is significant.

Table 9: Panel summary of robustness check of factor analyses

	STOXX 600		STOXX 50		MSCI Europe	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 2015–2018						
Market risk	96.97***	96.98***	75.80***	75.80***	96.42***	96.42***
Value effect	0.169***	0.170***	0.169***	0.169***	0.170***	0.170***
Size effect	0.063***	0.061***	0.065***	0.065***	0.062***	0.062***
Growth effect	0.568***	0.568***	0.565***	0.565***	0.568***	0.568***
Profitability	−0.141***	−0.141***	−0.142***	−0.142***	−0.142***	−0.142***
ESG composite	−0.007	−0.005	−0.003	−0.003	−0.004	−0.004
Diverg	−0.000008		0.00007		00007	
Diverg_adj		0.00007		0.00007		0.00007
Obs.	20970	20970	20970	20970	20970	20970
R2	0.236	0.236	0.222	0.222	0.236	0.236
Panel B: 2019–2022						
Market risk	112.6***	112.6***	93.7***	93.7***	114.3***	114.3***
Value effect	0.087***	0.086***	0.086***	0.086***	0.086***	0.086***
Size effect	0.088***	0.087***	0.084***	0.084***	0.086***	0.086***
Growth effect	0.703***	0.703***	0.705***	0.705***	0.703***	0.703***
Profitability	−0.052**	−0.052**	−0.051**	−0.051**	−0.051**	−0.051**
ESG composite	−0.056**	−0.049*	−0.046*	−0.046*	−0.049*	−0.049*
Diverg	0.000		0.000		0.000	
Diverg_adj		0.000		0.000		0.000
Obs.	31333	31333	31333	31333	31333	31333
R2	0.350	0.350	0.341	0.341	0.349	0.349
Panel C: 2015–2022						
Market risk	108.5***	108.5***	89.28***	89.28***	109.6***	109.6***
Value effect	0.110***	0.111***	0.111***	0.111***	0.110***	0.110***
Size effect	0.089***	0.087***	0.082***	0.082***	0.087***	0.087***
Growth effect	0.650***	0.650***	0.650***	0.650***	0.650***	0.650***
Profitability	−0.082***	−0.082***	−0.081***	−0.081***	−0.082***	−0.082***
ESG composite	−0.035*	−0.031*	−0.029	−0.029	−0.031*	−0.031*
Diverg	0.000		0.000		0.000	
Diverg_adj		0.000		0.000		0.000
Obs.	52303	52303	52303	52303	52303	52303
R2	0.318	0.318	0.308	0.308	0.317	0.317

Notes: For each period, monthly stock returns and factor variables have been selected as dependent and independent variables respectively. The general data period was from January 2015 to May 2022, the cut−off date for model estimation was December 2018. The variables *Diverg* and *Diverg_adj* stand for the ESG divergence effect. The value of a cell corresponds to the value of the beta coefficient for a given variable. The symbols *, ** and *** highlight statistical significance at the 5%, 1% and 0.1% level.

Source: author's processing

To reach the maximum level of robustness, the regression was further made by using both MSCI Europe and STOXX50 indices as alternative market risk premiums. To enhance the interpretability of results, only the 5-factor Fama-French model with incorporated ESG composite beta and ESG divergence beta was performed for each data period and each market benchmark used as a market risk premium.

Table 9 summarizes the conducted factor analyses. As expected from previous sections, the divergence effect is not relevant for any period in the sample, even when different benchmarks are used for market risk beta estimation. Analogously, the adjusted parameter of the ESG divergence decile does not bear significance in conducted models, despite excess portfolio returns consisting of stocks with extreme ESG divergence scores. It is somewhat surprising that models from the data period between 2018 and 2022 have the highest explanatory power, with the significance of the ESG score effect not detectable in the first data period. Lastly, in the models from the second panel, the decreasing power of the profitability effect can be observed.

Conclusions

The tests of the ESG score divergence effect performed show that despite excess returns of stocks with the highest and lowest divergence of ESG scores, the effect dissolves when the control variables from Fama-French factor models are incorporated into the models. The effect is not evident even for any particular industry, nor does it depend on the ESG awareness level of the issuer's country. The irrelevance of the effect is further supported by robustness checks made using several different market benchmarks as a market risk beta and several other time windows. The empirical data thus do not support the presupposed general hypothesis of a significant risk premium of stocks attributed to a higher degree of divergence of ESG scores. Furthermore, despite the theoretical assumption of an ESG divergence effect in financials, the performed Fama-French regressions grouped by industry did not back the hypothesis of excess stock returns of financial companies with high ESG score divergence. Similarly, the assumption of a higher risk premium for divergent ESG scores of stocks in regions with more heightened ESG awareness does not hold in the conducted analysis.

The empirical results also display the role of ESG scores in the asset selection process, specifically by the negative beta of the factor in the performed models, suggesting lower financing costs for the "best" ESG performers. The robustness checks also imply the possible increase in the critical role of ESG scores in time. These results are consistent with recent academic literature exploring the relationship between ESG and financial performance. Interestingly, the effect of ESG scores, for both the composite and divergence scores, seems to be the highest

in issuers' countries with the lowest SDG development level. This does not support the hypothesis of the growing importance of ESG scores in the most "ESG-aware" countries.

The results of the performed analyses are therefore somewhat mixed. On the one hand, they document the importance of ESG scores in the asset selection process, mainly in terms of the total ESG score. On the other hand, the market does not reward companies with the least divergent ESG scores. This finding slightly disrupts the previous findings based mostly on US data, which suggest a positive relationship between these variables. It is unclear why this is not the case for European stocks, as findings similar to previous literature were expected. The possible reason is the relatively diverse scope and methodology of ESG scores and the smaller sample in contrast with the conclusions of the US study.

Besides the limited sample of the analysis, several other limitations of the work could be noted. In contrast with numerous studies highlighting the importance of separating the individual components of ESG scores, the study aims at the overall discrepancies of ESG scores, regardless of their emphasis on its components. Furthermore, data from only five of the 13 rating providers were used to construct the ESG composite and ESG score divergence variables. The omission of the other rating providers is assumed to be a minor issue since the ratings with the most available data were used; however, it leaves room for further investigation into the effect of the omitted ratings. Finally, the study does not explore the dynamics of the ESG rating divergence after being assessed by a new rating provider in time. These topics, besides exploring differences in times of crisis and market booms, the effect of market-moving news (both natural and legislative) about ESG development in Europe, or investors' sentiment towards sustainable investing, would undeniably contribute to the understanding of the relationship between ESG scores and companies' stock returns.

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Appendix

Table A1: Annualized average returns of stocks belonging to *n*-th decile in a given month by industry

Industry	1	2	3	4	5	6	7	8	9	10	All
BMA	0.1427 (0.204)	0.1792 (0.0324)*	0.0569 (0.5921)	0.0574 (0.6434)	0.0183 (0.8809)	0.0194 (0.9439)	0.0257 (0.8644)	0.1266 (0.1076)	0.0018 (0.9534)	0.2921 (0.000)***	0.0739
COM	0.1061 (0.0116)*	−0.0522 (0.686)	−0.0541 (0.73)	0.039 (0.1457)	−0.006 (0.3001)	−0.1163 (0.8984)	−0.095 (0.9453)	0.0217 (0.1637)	−0.0258 (0.4914)	0.0206 (0.167)	−0.0271
CON–C	0.095 (0.0161)*	−0.0269 (0.7708)	0.0034 (0.576)	0.0289 (0.3533)	0.1333 (0.0017)**	−0.1007 (0.9478)	0.0481 (0.1995)	−0.1015 (0.9952)	−0.0148 (0.7221)	0.0539 (0.1256)	0.0110
CON–NC	0.0845 (0.0645)	0.0924 (0.0262)*	0.0398 (0.4881)	0.0414 (0.4631)	0.009 (0.8679)	−0.0078 (0.9564)	0.0267 (0.6618)	0.0272 (0.6761)	0.0623 (0.1743)	0.0644 (0.2099)	0.0389
ENE	0.0238 (0.5404)	0.081 (0.2248)	0.1301 (0.1842)	−0.0479 (0.8785)	0.0823 (0.3013)	0.0186 (0.609)	−0.1753 (0.8764)	−0.0261 (0.7961)	0.1016 (0.2456)	0.1616 (0.0275)*	0.0364
FIN	0.073 (0.0011)**	0.0085 (0.4392)	−0.022 (0.7975)	−0.0076 (0.6555)	0.0346 (0.1408)	−0.0053 (0.6099)	0.0141 (0.36)	0.0517 (0.0762)	−0.005 (0.602)	−0.032 (0.8454)	0.0036
IND	0.1343 (0.0096)**	0.0896 (0.1894)	0.077 (0.263)	0.0109 (0.9202)	0.0897 (0.1544)	0.015 (0.8692)	0.0311 (0.7505)	0.0653 (0.4151)	0.0472 (0.6085)	0.0955 (0.0933)	0.0579
TEC	0.1289 (0.2833)	0.1462 (0.2944)	0.1714 (0.1036)	0.119 (0.3867)	−0.0567 (0.9571)	−0.0048 (0.8589)	0.0867 (0.5255)	0.0302 (0.8129)	0.1381 (0.2914)	0.3908 (0.0388)*	0.0905
UTI	−0.0324 (0.8696)	0.1175 (0.0995)	−0.0186 (0.9016)	0.1142 (0.125)	0.0925 (0.2012)	0.0611 (0.4405)	0.137 (0.0486)*	−0.062 (0.9957)	0.0641 (0.3797)	0.0394 (0.6757)	0.0544
All	0.0925 (0.000)***	0.0579 (0.167)	0.0275 (0.1256)	0.0251 (0.2099)	0.0478 (0.2075)	−0.0033 (0.8454)	0.0193 (0.0933)	0.0241 (0.3088)	0.0308 (0.6757)	0.0675 (0.0046)**	0.0324

Notes: the universe is grouped by n–th decile of the divergence of the ESG scores and by industry. The first value in each cell corresponds to the annualized return of a given stocks group. The category of Industries consists of Basic Materials (BMA), Communications (COM), Consumer-Cyclicals (CON-C), Consumer Non-Cyclicals (CON-NC), Energy (ENE), Financials (FIN), Industrials (IND), Technology (TEC) and Utilities (UTI). The values in the brackets display the p-value of a one-sided t-test of a selected sample against the mean return of all stocks in a given industry with an assigned ESG divergence score.

Source: author's processing

Table A2: Annualized average returns of stocks belonging to *n*-th decile in a given month by SDG development level

SDG Level	1	2	3	4	5	6	7	8	9	10	All
High	0.0878 (0.3012)	0.1338 (0.0607)	0.0531 (0.6961)	−0.0241 (0.9908)	0.1023 (0.1743)	0.0561 (0.6282)	0.0948 (0.2326)	0.0924 (0.2316)	0.0301 (0.8772)	0.1589	0.0803
Medium	0.0239 (0.6798)	0.0335 (0.5641)	0.0067 (0.8302)	−0.0276 (0.9827)	0.0885 (0.0703)	0.0513 (0.3262)	−0.0125 (0.9513)	0.0867 (0.0341)*	0.0869 (0.0325)*	0.0849 (0.0498)*	0.0439
Low	0.0545 (0.0394)*	0.038 (0.1514)	0.0292 (0.3311)	0.0337 (0.2192)	0.0076 (0.7838)	0.0433 (0.0867)	0.009 (0.7214)	0.0177 (0.5739)	−0.011 (0.9522)	0.044 (0.0951)	0.0270
All	0.0537	0.0491	0.0303	0.0132	0.0372	0.0465	0.0152	0.0489	0.0233	0.0723	0.0389

Notes: the universe is grouped by the *n*-th decile of the divergence of the ESG scores and by SDG development level The first value in each cell corresponds to the annualized return of a given stocks group. The values in the brackets display the p−value of a one-sided t-test of a selected sample against the mean return of all stocks in a given industry with an assigned ESG divergence score.

Source: author's processing