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ESG Disclosure and Portfolio Performance

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Abstract: This paper illustrates the impact of Environmental Social and Governance (ESG) disclosure on European corporate equity performance. In this study, we use an extensive data set of European ESG ratings provided by Bloomberg to demonstrate that ESG disclosure is associated with improved return growth, with the Governance pillar exhibiting the strongest effect on corporate performance. The impact of ESG disclosure on volatility is changing over time, suggesting that the existence of opaque ratings limits the transmission of information disclosure into corporate performance.

Keywords: ESG investing; governance; sustainability; volatility; excess returns

1. Introduction

It is now clear across market participants that investors demand high sustainability disclosure standards when making their investment decisions. The need for a broader shareholder accountability follows the introduction of the 2005 UN defined Principles of Responsible Investment (UNPRI thereafter). Under this initiative the UN defines ratings for corporate Environmental, Social and Governance (ESG) characteristics. The protocol has now been signed by more than 1400 companies, spread over more than 50 countries, with more than $80 trillion of assets under management.[1]

The question of whether firms should maximize stakeholder value regained attention in the aftermath of the Global Financial Crisis in 2008 and was enhanced by the signature of the Paris agreement in 2015 and the more recent COVID-19 pandemic. More recently the COVID-19 pandemic has raised attention and demand for CSR and ESG investing policies (see Bae et al. 2021). The post-pandemic recovery has accelerated the green transition towards the net-zero objectives by delivering a recovery package not seen before in European history. Moreover, the European Commission has proposed the first European Climate Law aiming to write into law the goal set out in the European Green Deal for Europe's economy to become climate-neutral by 2050.

Europe has led the global move into ESG investments, and its fund managers are advanced in quantifying the impacts of their strategies (See Alastair 2021) on climate change and social equality. As a result, the extent to which corporates contribute to the transition to a green and socially inclusive economy becomes highly important.

In this paper, we address the following question: Does the disclosure of ESG-related information affect corporate performance? Using a panel data approach, we analyze the existence of positive ESG effects on corporate stock return and volatility over our sample period. The intensity of the revelation of ESG characteristics is analyzed for this purpose.

This paper applies ESG disclosure-related variables provided by Bloomberg and a series of financial ratios for a wide array of 6211 European companies over the 2005–2019 period. The ESG disclosure effect on company performance is measured by quantifying the impact of ESG global and individual pillars on portfolio volatility and returns. In doing this we filter portfolios using ESG disclosure information as well as benchmark profitability, value and momentum measures. A set of panel data estimations based on

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standardized metrics confirms the benefits of higher disclosure for ESG for European portfolios. Moreover, the impact of disclosure is highest for the Governance pillar. Our results document that the effect of the different ESG metrics on volatility is changing over time which reveals the difficulty of measuring environmental and social attributes, as outlined in the work of Berg et al. (2019). The relationship between measurement discrepancies and economic uncertainty has been addressed in the forecasting literature. For instance, Baker et al. (2020) analyze various forward-looking measures regarding economic uncertainty in the search for monitoring devices in the aftermath of the COVID-19 crisis.

Our work contributes to the existing literature by focusing on the European market as the leader of the global move into ESG investing (See Alastair 2021). While most studies addressing ESG factors have focused on US data, we exploit a large set of European corporate and ESG data provided by FactSet and Bloomberg, respectively. Our results shed light on a literature that has not found a consensus regarding the link between ESG considerations and corporate performance.

Many empirical studies based on US equity markets examined the potential relationship between ESG scores and stock performance. Bae et al. (2021) analyze the link between corporate social responsibility (CSR) and stock market returns in a sample that includes the COVID-19 pandemic market crash and the aftermath recovery. They fail to find a robust link between CSR and corporate performance.

Earlier studies using US equity data include Borgers et al. (2015) and Derwall et al. (2005). The main conclusion of these studies is that the consideration of ESG criteria in the investment process produces significant positive portfolio performance differences (see also Van Duuren et al. 2016). In a related analysis, Nofsinger and Varma (2014) show that mutual funds that include ESG criteria outperform their non-ESG counterparts under abnormal market conditions. Tamimi and Sebastianelli (2017) use data from S&P500 quoted companies to perform a granular analysis of ESG scores and find that ESG disclosure affects firm value.

A more recent line of literature analyzes the quality of different ESG scoring providers. Several studies covering US corporates (e.g., Halbritter and Dorfleitner 2015; Berg et al. 2019; Bae et al. 2021) address the measurement discrepancy between raters (See Papuc 2021) by analyzing the effect of corporate responsible investment using alternative databases on ESG scoring, such as MSCI stats, Refinitiv, Robeco, and company surveys. This literature establishes that the observed large disagreement between raters may explain the absence of a robust relationship between ESG rating and corporate performance. Our results shed light on this literature by showing that the effect of ESG disclosure on volatility changes over time, suggesting that raters' scores may be imprecise and subjective. Marquis et al. (2016) analyze the problem of selective disclosure which is pursued by firms that aim to mask their true underlying (non-financial) performance.

The literature has responded to the existence of discrepancies in ESG ratings by considering direct measures. Edmans (2011) uses a survey reporting the degree of employee satisfaction to generate abnormal positive performance. Przychodzen et al. (2016) used a survey of fund managers from different geographical areas, to conclude that ESG criteria are usually used to reduce risk and not to generate value. Gimeno and González (2021) introduce a Green Factor (i.e., GMP, Green companies Minus Polluters) which is shown to be relevant in explaining cross-section variation on US and European equity portfolios.

In this paper, we measure the ESG disclosure effect on volatility and returns. We argue that if the quality of the ESG data is low, standard errors of estimated factor sensitivities incorporated in the panel estimations will be large while delivering low significance in our panel estimations. Our results identify governance disclosure as the strongest factor in determining performance, contributing to the recent literature that fails to establish a robust link between CSR or ESG considerations and portfolio returns. We contribute to the sustainability performance debate by showing that an increase in corporate governance disclosure will increase return growth, while the improvement in disclosure of social and

environmental attributes does not exhibit a robust effect on the volatility of abnormal returns.

Our results suggest that a uniform strategy for measuring ESG standards is required. This is of great relevance in a context where the European Commission demands tighter measures to better reflect the climate change impact on risk management practices of the financial system.

The paper is organized as follows. In Section 2 we discuss data used and methodology. Section 3 presents estimation results and we conclude in Section 4.

2. Data and Methodology

This study uses data on end of year balance-sheet and monthly total returns for across all European companies, provided by FactSet, along with ESG-related information from Bloomberg, over the 2005–2019 period. This encompasses an extensive proprietary database on ESG and company specific magnitudes. To make the data comparable across firms operating in different countries, our dataset is measured in US dollars.

Data on balance-sheet information, along with ESG disclosure information, is obtained on an end of year basis and comprises market capitalization (size), value and profitability variables along with ESG disclosure related variables. Regressors within the value category include Book to Market, PER, Enterprise Value over EBIT and Enterprise Value over EBITDA. The profitability related variables are GPA, ROC, and a detailed version of ROC (ROCD), which includes intangible assets in the denominator. Stock momentum is computed as the previous year June to actual year May accumulated return. Table 1 presents descriptive statistics of the balance-sheet financial variables considered in the analysis which reports industry and country categorization in the second and third row. Results presented in rows 4–7 show that there is a large variation in the values of the financial metrics considered over our sample period.

Table 1. Descriptive statistics.

	Mean	Std. Dev.	Min	Max
Companies by Year	6211.67	294.22	5472.00	6528.00
Companies by Sector	326.93	178.44	29.13	725.00
Companies by Country	144.15	228.30	0.06	1157.13
MktValUSD	1608.82	9514.79	0.00	351,423.20
EBIT	292.97	4689.67	−28,793.21	467,977.00
Ebitda	498.19	8273.28	−28,436.67	763,449.00
TotalAssets	4105.44	57,117.64	0.00	5,132,287.00

This table presents descriptive statistics for relevant company variables.

Our data on ESG disclosure scores are provided by Bloomberg. Score values range between 0.1 (minimum) and 100 (maximum) and quantify the degree of the firm's transparency in reporting environmental, social and governance data. The corporate decision to be evaluated under the Bloomberg scoring system is completely discretionary. Therefore, companies revealing ESG information may decide not to be graded, while those not disclosing ESG information will not be evaluated. Scores are sector and ESG weighting specific and are published on an annual basis. In Appendix A, we provide a brief description of each of the scores considered in the analysis.

ESG disclosure data is only available from 2005. The quality of ESG data in terms of the information provided under each category is limited between 2005 and 2010 and almost fully available from 2011. From that period, 90% of our sample of corporates disclose some ESG information as you can see in Table 2. The importance of ESG disclosure in the investment decision process has been enhanced by the 2015 COP 21 event, when 195 signatories committed to limit global warming below 2 degrees Celsius above preindustrial levels. The Paris Agreement introduces a new paradigm in international climate policy by declaring the primacy of domestic politics in climate change. It is therefore expected

to have an impact on the way ESG disclosure affects corporate performance as higher incentives are introduced to enhance ESG transparency and disclosure.

Table 2. The number of companies in the sample.

	Companies	% ESG Info
2005	5472	26.90%
2006	5724	29.30%
2007	6063	48.70%
2008	6373	53.80%
2009	6358	54.40%
2010	6528	71.90%
2011	6524	88.70%
2012	6494	92.10%
2013	6361	93.10%
2014	6367	93.00%
2015	6316	94.00%
2016	6205	94.10%
2017	6149	93.80%
2018	6154	93.90%
2019	6087	94.70%

This table presents the yearly evolution in the number of companies included in our sample (column 1) as well as the percentage of those that disclose ESG data (column 2).

In what follows we analyze the effects of ESG disclosure on stock performance. In line with the factor investing literature (i.e., Fama and French 1993, 2015; Novy-Marx 2013), we build four different portfolios yearly according to size, value, momentum, and profitability measures.

Portfolios are created according to 25th, 50th 75th and 100th percentiles. The value criteria use value-based metrics and are applied as a first filter in descending order so that higher variable values correspond to lower percentiles. Profitability and momentum related measures are applied as second and third filters respectively and are allocated so that smaller values are sorted in the low percentiles.

In a second stage, every generated portfolio is split into two sub-portfolios using the median threshold according to each of the four ESG disclosure scores.[2] This delivers 288 ($9 \times 4 \times 4 \times 2$) portfolios for every single year within our sample. We calculate simple average annualized portfolio returns as the mean of individual stock returns. Note that the method applied in this paper creates benchmark market portfolio returns calculated as the simple mean of returns of all the stocks within the portfolio. Finally, excess returns and 12-month volatilities are estimated for every portfolio. The market risk premium is obtained by subtracting from monthly returns 1Y EUR LIBOR rates from benchmark portfolio returns.

Our approach standardizes every metric to control for (a) the heterogeneity in the scale of the different measures, (b) the increasing number of firms disclosing ESG data and (c) the time changing volatility observed during our sample period.[3] To assess the impact on the relative performance of each factor individually, every metric or factor exposure, i, corresponding to the company j is standardized each year, t, to retrieve its corresponding z-score:

$$Z_{i,j,t} = \frac{V_{j,i,t} - \overline{V}_{i,t}}{\sigma_{i,t}}$$

where $V_{j,i,t} - \overline{V}_{i,t}$ is the distance from its mean of each specific metric, and $\sigma_{i,t}$ denotes the yearly dispersion (standard deviation) of the values of the corresponding measure. This standardization provides a set of uniform neutral scores where each factor z-score exhibits zero mean and unit standard deviation across the universe of securities. It also allows scale alignment across the different factors and makes company ratio comparisons congruent (see Altman 1968). This is important in a context where we observe high variation in

the reported financial data (see Table 1). The standardization approach has recently been applied in the factor investing literature (see Clarke et al. 2014) who perform multivariate regressions and scaling of stock characteristics to unit standard deviations (i.e., z-scores).

Since ESG score components are in the range of (0, 100), we further standardize in the interval (0, 1), to obtain a uniform scale representation of the *ESG* factor and constituents. In line with the risk management literature[4], we take the absolute values and then assign the corresponding sign *ESG* with the following expression:

$$Z_{ESG} = \frac{ESG_{i,t} - \min(ESG_{i,t})}{\max(ESG_{i,t}) - \min(ESG_{i,t})}$$

where $\min(ESG_{i,t})$ and $\max(ESG_{i,t})$ denote minimum and maximum values of the corresponding *ESG* score across portfolios at a given date. Portfolio returns are regressed against each of the standardized value, profitability, market and momentum and *ESG* variables.

The hypothesis that we test lies on whether higher *ESG* disclosure is associated with higher portfolio returns and lower volatility. The following equations are estimated for this purpose:

$$R_{p,t} = \alpha + \beta R_{M,t} + \sum_g \xi_{1,g} Z_{ESG,p,t} + \sum_i \theta_{1,i} Z_{i,p,t} + e_{1,p,t} \quad (1)$$

$$\sigma_{p,t} = \alpha_2 + \beta_2 R_{M,t} + \sum_g \xi_{2,g} Z_{ESG,p,t} + \sum_i \theta_{2,i} Z_{i,p,t} + e_{2,p,t} \quad (2)$$

where R_{pt} denotes portfolio excess returns, $\sigma_{p,t}$ represents excess return volatility; $R_{M,t}$ stands for benchmark excess returns $Z_{ESG,p,t}$, represents the global ESG score and, $Z_{i,p,t}$, are a set of company specific controls.

The method applied is related to Halbritter and Dorfleitner (2015) who use a factor model approach with Mac-Beth regressions including global and individual ESG scores. As specified in Equations (1) and (2), our analysis applies a wide set of control variables that are introduced as standardized z-score measures.[5] The first and second order processes are considered over the whole sample period as well as across different sub-periods. The Arellano and Bond (1991) estimator is used to correct for potential heteroskedasticity in estimated regression errors.

3. Empirical Analysis

Table 3 presents preliminary evidence supporting the existence of a positive effect of ESG disclosures on portfolio risk-adjusted returns. Average excess returns of long-short strategies are constructed as the difference between the highest and lowest ESG scores under each of the four subcategories considered.

Table 3. Mean premiums, standard deviations, Sharpe ratios and T-stats.

	All	Global Disclosure	Environmental Disclosure	Social Disclosure	Governance Disclosure
Mean Premium	1.116%	0.918%	0.325%	1.051%	2.171%
Standard Deviation	31.94%	31.37%	32.83%	31.65%	31.85%
Sharpe Ratio	3.49%	2.93%	0.99%	3.32%	6.82%
T-Stat	4.517	1.891	0.639	2.146	4.404

This table presents mean premiums, standard deviations, Sharpe ratios (assuming zero return in the risk-free asset) and T-stats for the portfolios obtained by going long on portfolios with high ESG score and short on those with low ESG score, for each 12.5% portfolio created through the use of size, value, profitability or momentum variable.

Column 1 in Table 3 shows that the investor earns an average excess return of 1.116% when the long-short strategy is conducted for all value and profitability metrics (excluding

ESG metrics). Note that this portfolio is labeled as "All". When we further split among the different ESG disclosure variables, the global ESG, the environmental (E) or the social disclosure scores (S) do not deliver higher average returns (see columns 2, 3 and 4 in raw one of Table 3). The only case in which over-performance is delivered concerning the "All" portfolio is when the governance metric is applied. This strategy earns a market premium of 2.171% and risk-adjusted return or Sharpe Ratio of 6.82%.[6]

Divergence in reported Sharpe ratios for the different ESG pillars can be related to the literature. For instance, in their analysis with Bloomberg data, Halbritter and Dorfleitner (2015) show that estimated alphas for different ESG portfolios under a time series regression approach show important differences for estimated coefficients under each of the ESG pillars. They report that the only positive significant relationship between ESG scores and returns is found for the social metric.

Table 4 presents pairwise correlations for our ESG indicators. Reported correlations are high and significant across the four ESG metrics considered. These provide evidence suggesting that companies with strong environmental commitments also score high in social disclosure. This is consistent with Berg et al. (2019) who show that firms that receive a high score within a given category are likely to receive a high category in other scores provided by the same rater. Disclosure of environmental actions is also related to higher governance disclosure commitment which in turn reduces the frequency and intensity of shocks to corporate performance. For instance, environmental risks may arise due to a higher likelihood of lawsuits related to natural disasters provoked by corporate activity. The degree of exposure to corporate lawsuits is expected to be linked to the quality of firm governance.

Table 4. Pairwise correlations of ESG disclosure scores.

	Global Disclosure	Environmental Disclosure	Social Disclosure	Governance Disclosure
Global Disclosure	1			
Environmental Disclosure	0.9889 *** (0.000)	1		
Social Disclosure	0.995 *** (0.000)	0.9814 *** (0.000)	1	
Governance Disclosure	0.9517 *** (0.003)	0.8981 *** (0.000)	0.9418 *** (0.000)	1

This table presents pairwise correlations of ESG disclosure scores. Šidák-adjusted significance levels in parenthesis. *** significant at 99.9%

The existence of high and significant correlations as reported in Table 4 suggests that the estimation of model 2 may be exposed to multicollinearity problems. We address this concern by applying the Arellano and Bond (1991) estimator, which also corrects for potential heteroskedasticity in estimated regression errors. Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) demonstrate that the existence of collinear (omitted) regressors results in the inconsistency of OLS estimators. Thus, the traditional fixed and random effect techniques are not valid due to endogeneity concerns. Here we use panels with a large number of individual corporates and a shorter number of years in a two-step GMM Arellano Bond estimator which corrects for the existence of multicollinearity and heteroskedasticity. Note that the second step in this estimation procedure needs orthogonal instruments concerning the set of regressors. We used lags of the independent variables for this purpose. The Arellano and Bond (1991) estimation approach has been applied recently in the factor investing literature to render robust estimates of factor effects (Racicot and Rentz 2017; Mosoeu and Kodongo 2020).

Table 5 presents panel-data estimates on the impact of ESG disclosure over portfolio returns (Panel I) and volatilities (Panel II) for different specifications of Equations (1) and (2) for the full sample period. We follow Halbritter and Dorfleitner (2015) in that we consider the individual as well as global ESG scores. Columns two and three of Panel I illustrate the effect of ESG disclosure on portfolio returns. In this framework, higher global and individual ESG scores are expected to deliver increased portfolio returns directly and through the impact on the remaining ESG metrics considered. Reported results show that when the global ESG score increases by one unit portfolio, return significantly grows by 0.124 percentage points. The estimated coefficients measuring the effect of changes in the governance and environmental disclosure scores on annual excess returns are significant and equal to 0.11 and 0.36, respectively. The effect of the social pillar on portfolio returns is negative and significant. The reported positive impact of disclosure of environmental actions is consistent with the work of Gimeno and González (2021), which documents the existence of a green factor based on CO_2 emissions data.

The positive effect of information disclosure on portfolio returns has also been addressed in the factor investing literature. For instance, Gu and Hackbarth (2013) demonstrate that higher transparency in the disclosure of information leads to higher returns showing that accounting transparency and governance interact as complements.

Our analysis is related to the work of Halbritter and Dorfleitner (2015) who apply a factor model approach with Mac-Beth regressions using a variety of ESG data providers. They find that when the Bloomberg ESG data is used, the social variable increases monthly returns by 0.007% while the remaining pillars do not exhibit significant effects on returns. Note that when the same exercise is performed with Asset 4, they do not find statistically significant coefficients for the environmental and social scores. However, they report a negative influence on the governance score. In their application of KLD data, they find positive and significant coefficients for the governance and social scores. Our findings under multiple subsamples differ from the previous literature (see Halbritter and Dorfleitner 2015) in that they show that there are effects of ESG metrics on return growth and volatility that change over time. We contend that this arises from the difficulty of measuring ESG attributes which translates into unstable coefficients and standard error of estimation.

A comparison of intercept estimates reported in columns 1, 2 and 3 of Table 5 shows that there is a reduction in the estimated coefficient size when ESG global and individual scores are considered in the regressions. This implies that the introduction of ESG scores increases the explanatory power of the empirical model as underlined in Equations (1) and (2).

Columns 4 to 6 in Table 5 illustrate the effects of ESG disclosure on return volatilities. Global disclosure hurts return risk so that a one unit increase in global ESG disclosure will reduce excess return volatility. This is in line with the results of Przychodzen et al. (2016), in which ESG criteria are used by managers as risk-reducing variables in the decision-making process.

When the ESG disclosure effect is split among their components, we find increasing environmental disclosure by one point reduces volatility by 0.13 percentage points. The reported coefficient corresponding to the social disclosure variable is positive and significant suggesting volatility grows by 0.09 percentage points for every unit increase in the social score. The same increase in the Governance disclosure variable leads to a reduction in the volatility of -0.02 percentage points. Note that this is of lower magnitude than the change reported for the other two components.

Table 5. Portfolio's annualized excess returns and volatilities.

	Dependent Variable: Excess Return			**Dependent Variable: Excess Return Volatility**		
$R_{b,t}$	1.498	1.218	1.218	0.612	0.686	0.685
	(51.35)	(34.99)	(34.98)	(24.44)	(24.54)	(24.63)
MKTval	−1.259	−0.0385	−0.0664	−0.821	−0.894	−0.899
	(−5.73)	(−0.53)	(−0.91)	(−4.84)	(−3.03)	(−3.02)
BTM	0.558	0.192	0.139	0.264	0.666	0.833
	(4.85)	(3.01)	(2.14)	(1.84)	(4.08)	(4.95)
PER	−0.178	0.249	0.193	−0.00394	0.247	0.144
	(−1.48)	(3.04)	(2.35)	(−0.03)	(1.77)	(0.94)
EVEBIT	−0.0532	−0.00604	−0.00597	−0.0118	−0.0104	−0.0106
	(−2.94)	(−0.57)	(−0.56)	(−0.53)	(−0.53)	(−0.55)
EVEBITDA	0.0810	0.0105	0.0106	0.128	0.107	0.106
	(3.05)	(0.58)	(0.58)	(5.38)	(8.32)	(8.30)
GPA	0.391	0.0527	0.0136	0.610	0.728	0.624
	(4.07)	(0.93)	(0.24)	(4.44)	(4.72)	(4.21)
ROC	−0.0944	−0.0322	−0.0320	−0.163	−0.161	−0.169
	(−4.20)	(−1.95)	(−1.96)	(−6.97)	(−4.98)	(−5.35)
ROCD	0.0639	0.00197	0.000731	0.0648	0.0634	0.0736
	(1.84)	(0.08)	(0.03)	(1.58)	(1.13)	(1.35)
MOM	−0.108	−0.337	−0.319	−0.426	−0.777	−0.717
	(−1.62)	(−6.33)	(−6.01)	(−5.08)	(−7.07)	(−6.44)
Global Disclosure		0.1247			−0.10774	
		(14.82)			(−7.65)	
Environmental Disclosure			0.3614			−0.1281
			(3.45)			(−5.22)
Social Disclosure			−0.2633			0.09398
			(−3.13)			(5.61)
Governance Disclosure			0.1152			−0.01826
			(4.62)			(−4.80)
Constant	0.00989	−0.525	−0.427	−0.131	−0.642	−0.293
	(0.11)	(−0.1277)	(−0.0878)	(−2.35)	(−5.40)	(−2.08)

This table depicts the impact of ESG disclosure scores on the portfolio's annualized excess returns and volatilities. Coefficients are estimated using an Arellano-Bond panel data method. Z statistics are provided in parenthesis.

Table 6 investigates the inconsistent nature of the impact of ESG disclosure components on returns (left panel) and volatilities.[7]

Table 6. Portfolio's annualized excess return and volatilities of ESG disclosure over different time windows.

	Dependent Variable: Excess Return									**Dependent Variable: Excess Return Volatility**								
	2008–2011	**2009–2012**	**2010–2013**	**2011–2014**	**2012–2015**	**2013–2016**	**2014–2017**	**2015–2018**	**2016–2019**	**2008–2011**	**2009–2012**	**2010–2013**	**2011–2014**	**2012–2015**	**2013–2016**	**2014–2017**	**2015–2018**	**2016–2019**
$R_{b,t}$	1.210 (34.65)	1.184 (33.69)	1.680 (29.11)	1.560 (29.88)	1.469 (27.01)	0.817 (87.15)	0.813 (87.07)	0.837 (81.17)	0.880 (77.54)	0.502 (15.42)	0.551 (19.32)	1.062 (34.70)	2.313 (13.30)	2.480 (12.54)	1.504 (12.58)	−0.0472 (−2.20)	0.158 (7.63)	0.361 (10.57)
MKTval	0.112 (0.38)	1.178 (2.85)	−0.285 (−4.75)	−0.327 (−4.50)	−0.297 (−3.83)	−0.106 (−7.42)	−0.0937 (−6.75)	−0.118 (−6.26)	−0.275 (−9.39)	0.965 (1.62)	3.469 (3.57)	0.931 (1.91)	−0.407 (−2.91)	−0.672 (−3.45)	−0.118 (−1.85)	0.0004 (0.03)	−0.0710 (−4.37)	−0.155 (−6.23)
BTM	0.0198 (0.07)	0.310 (1.22)	0.157 (1.86)	0.128 (2.01)	0.113 (1.69)	−0.0289 (−1.80)	−0.0134 (−1.01)	0.00237 (0.16)	−0.163 (−5.91)	−2.425 (−6.33)	−0.638 (−1.49)	0.760 (2.28)	0.478 (3.40)	0.0802 (0.58)	0.233 (2.83)	0.0713 (5.73)	0.0522 (3.61)	0.0750 (3.40)
PER	0.616 (1.83)	1.150 (3.50)	−0.0289 (−0.29)	−0.0728 (−0.68)	−0.193 (−1.64)	0.0472 (2.34)	0.0263 (1.24)	0.0207 (0.83)	−0.107 (−3.57)	0.209 (0.66)	1.897 (4.50)	0.508 (1.43)	−0.332 (−2.61)	−0.470 (−2.76)	−0.326 (−3.05)	0.0228 (1.35)	−0.0030 (−0.19)	−0.0441 (−2.02)
EVEBIT	0.0231 (0.59)	−0.163 (−3.86)	0.0089 (1.38)	−0.0011 (−0.17)	0.0125 (1.87)	0.0171 (7.76)	0.0133 (5.11)	0.0235 (6.54)	0.0158 (3.18)	−0.297 (−3.32)	−0.385 (−3.42)	−0.0761 (−1.92)	0.0116 (1.80)	0.0068 (1.58)	0.0061 (2.38)	−0.0000 (−1.15)	−0.0002 (−0.95)	0.0004 (1.23)
EVEBITDA	0.0438 (0.64)	0.216 (6.53)	−0.0326 (−5.25)	−0.0177 (−2.40)	−0.0103 (−1.43)	−0.001 (−0.19)	−0.001 (−0.32)	0.004 (1.40)	−0.000 (−0.11)	0.0390 (1.31)	0.147 (3.55)	−0.0149 (−1.32)	0.0145 (4.58)	0.0082 (2.61)	−0.005 (−3.16)	0.0001 (2.81)	−0.0001 (−0.23)	−0.0001 (−1.30)
GPA	0.293 (2.32)	−0.0169 (−0.20)	0.0244 (0.95)	−0.0651 (−1.22)	0.0525 (0.66)	0.102 (4.13)	0.0742 (2.92)	0.0259 (0.99)	−0.0262 (−0.69)	−0.192 (−0.86)	−0.530 (−2.54)	−0.142 (−1.04)	0.131 (1.80)	0.0378 (0.26)	0.160 (2.47)	0.0949 (4.77)	0.0806 (3.55)	0.0782 (3.12)
ROC	−0.0319 (−0.44)	−0.0085 (−0.20)	0.0910 (5.37)	0.0339 (2.06)	0.0962 (5.86)	−0.004 (−1.30)	−0.0069 (−2.81)	−0.0157 (−4.51)	−0.0391 (−3.88)	−0.0742 (−0.77)	0.0176 (0.23)	0.340 (5.84)	0.170 (6.14)	0.276 (7.17)	0.0674 (3.95)	−0.00849 (−4.25)	−0.0137 (−5.03)	−0.0145 (−3.00)
ROCD	0.152 (1.65)	−0.0320 (−0.53)	−0.0021 (−0.08)	0.0013 (0.06)	−0.0066 (−0.31)	−0.0106 (−2.58)	−0.0076 (−2.27)	−0.0023 (−0.55)	0.0624 (3.68)	0.195 (1.81)	−0.335 (−3.30)	−0.0970 (−1.52)	0.0884 (3.49)	0.0167 (0.51)	−0.0079 (−0.43)	0.0008 (0.38)	−0.0018 (−0.57)	0.0019 (0.38)
MOM	−0.810 (−4.38)	−0.738 (−5.65)	−0.307 (−5.61)	−0.317 (−6.36)	−0.211 (−6.52)	−0.0434 (−6.87)	−0.0623 (−8.75)	−0.0219 (−2.53)	−0.113 (−6.83)	−0.996 (−3.18)	−1.731 (−7.84)	−1.383 (−9.43)	−0.557 (−5.96)	−0.352 (−5.70)	−0.102 (−3.96)	−0.0245 (−5.24)	−0.0221 (−3.16)	−0.0315 (−2.83)
Environmental Disclosure	0.9440 (1.88)	0.6040 (1.78)	0.3228 (2.95)	0.3863 (4.52)	0.4369 (4.48)	0.1594 (7.50)	0.0707 (2.93)	0.1855 (5.94)	0.2928 (5.90)	0.0303 (0.28)	−0.0288 (−0.36)	−0.3247 (−5.18)	−0.0105 (−4.84)	−0.1799 (−7.33)	0.6789 (4.99)	0.0176 (1.08)	0.0059 (0.29)	0.1803 (4.42)
Social Disclosure	0.3414 (0.65)	0.2281 (0.67)	−0.2624 (−2.69)	−0.4096 (−6.20)	−0.3999 (−6.23)	−0.0506 (−2.93)	0.0032 (0.13)	−0.1875 (−5.18)	0.0132 (0.21)	0.4852 (3.50)	0.2749 (3.08)	0.4467 (7.34)	0.0785 (4.61)	0.1346 (7.83)	−0.0542 (−5.20)	−0.0510 (−3.92)	−0.0136 (−5.59)	0.0127 (0.27)
Governance Disclosure	−0.1042 (−6.44)	−0.1513 (−1.43)	0.1948 (5.55)	0.2664 (8.89)	0.2111 (5.73)	0.0423 (4.30)	0.0477 (4.39)	0.1457 (10.31)	0.0315 (1.11)	−0.3743 (−8.02)	−0.1561 (−4.56)	0.2699 (10.63)	0.0280 (3.67)	0.0030 (0.49)	0.0155 (4.57)	0.0036 (5.14)	−0.0071 (−7.97)	−0.0044 (−2.50)
Constant	0.0843 (0.469)	−0.0164 (−0.427)	−0.0915 (−0.733)	−0.0916 (−0.756)	−0.0836 (−0.460)	−0.0482 (−0.115)	−0.0446 (−0.121)	−0.0535 (−0.114)	−0.0115 (−0.119)	−0.0507 (−0.12)	−0.1230 (−0.275)	−0.6389 (−0.808)	−0.2591 (−0.740)	−0.1770 (−0.631)	−0.1279 (−0.773)	0.0066 (0.327)	−0.0224 (−0.674)	−0.0480 (−0.748)

This table depicts the impact on the portfolio's annualized excess return and volatilities of ESG disclosure over different time windows. Coefficients were estimated using an Arellano-Bond estimator. Z-statistics in parentheses.

Two conclusions can be extracted from our results.

First, the effect of governance and environmental disclosure on portfolio returns is predominantly positive and stable during our sample period. This is consistent with the idea that good corporate governance is associated with superior company profits, irrespective of the general economic environment. Note that this differs from the results reported by Halbritter and Dorfleitner (2015) who report a declining impact of all the ESG metrics for the two subsamples considered.

Secondly, we can see that there is a change in the effect of social and environmental commitment in returns volatility in the aftermath of 2015 when the Paris COP 21 international agreement was signed, and the Sustainable Development Goals established. Over the full sample period, both variables operate in opposite directions. Before 2015, an increase in the environmental disclosure harms excess return's volatility while after 2015 the effect is positive for most subsamples considered. Similarly, the impact of social disclosure on volatility is positive before 2015, and negative in the aftermath of COP 21. The literature has addressed how COP 21 determined a rising engagement of the finance industry with climate change and social considerations (see Bolton et al. 2020). However, while we find some evidence of changing volatility effects, the desired volatility reduction is only documented for the social and governance pillar. The impact of environmental and social scores on portfolio returns and volatility may signal the existence of a degree of bias in the rater's evaluations (see Berg et al. 2019). It also reveals that the challenge of accurately measuring ESG considerations remains high over our sample period. This is consistent with Bae et al. (2021) who underline the existence of disagreement among different ESG rating sources, concluding that there is no clear effect of corporate and social responsibility scores in the prediction of returns. The positive effect of governance attributes on portfolio returns is increasing over our sample period. Given that reduction in volatility is documented in the post-2015 period our results show that governance considerations improve corporate performance over our sample period. This is consistent with Tamimi and Sebastianelli (2017), who analyze the transparency in the reporting of S&P500 against ESG factors and confirm that governance exhibits the largest impact on performance, with social and environmental considerations exhibiting limited effects.

Like in Tamimi and Sebastianelli (2017), our findings also suggest that the social and environmental effects may be more difficult to measure than the governance disclosure impact. This is explained by the fact that governance related attributes (board size, board gender diversity, chief executive officer (CEO) duality) are more precisely defined than environmental characteristics.

The existence of volatile scores may be related to the difficulty in finding tangible metrics. We contend that this leads to lower score precision, delivering parameter estimates that are changing over time. The absence of accuracy in corporate and social responsibility measures leads Bae et al. (2021) to conclude there is no effect on stock performance. Their analysis suggests that the absence of agreement across ESG ratings creates an externality for both investors and companies which leads to unstable effects of corporate sustainability on performance metrics. Their findings also suggest that rating discrepancy may deliver undesirable selective reporting on social and energy matters (see Marquis et al. 2016). Our results, therefore, highlight the need for stronger regulation that establishes a concrete and common measurable categories, similar across raters (see Berg et al. 2019).

The absence of harmonization in ESG metrics constitutes a serious obstacle to their correct use in the corporate risk evaluation process. This has been highlighted by the European Central Bank (see ECB 2021, Summary of Banking and Industry Dialogue)[8] which acknowledges the challenge of measuring climate change related risks and urges banks to actively contribute to the green transition by applying ESG criteria to the evaluation of risk exposure. Common definitions of sustainability criteria are therefore expected to be demanded by the central banking system.

4. Conclusions

This paper analyzes the impact of ESG disclosure on corporate performance using the Bloomberg database over the 2006–2019 period. In doing this we revisit the evidence from the perspective of a European investor using the universe of 6211 European corporates that exhibit an increasing commitment to ESG disclosure over the sample period.

A preliminary analysis applying the ESG filter to value profitability and momentum metrics shows that the Governance pillar provides high and significant portfolio returns. The classification based on social scores provides lower but significant returns, while the environmental criteria do not contribute to the generation of abnormal returns.

A panel-based approach is applied using standardized metrics to control for the existence of heterogeneity of the ESG metrics and financial ratios. We apply the Arellano and Bond (1991) estimator to robustly analyze the impact of different metrics in portfolio returns and volatility. Results show that when the whole sample is considered the governance and environmental metrics exhibit a positive and significant effect on portfolio return growth and a negative and significant effect on portfolio volatility. This latter effect is also recorded for the global ESG measure, while the social score has a negative effect on returns and a positive and significant effect on volatility. Our analysis does, therefore, offer some evidence signaling a positive effect of ESG investing on corporate performance in line with the literature (see Orlitzky et al. 2003), but does not support the existence of a positive impact when the social pillar is incorporated.

When the panel approach is applied to different subsamples, we find a time-changing effect of individual ESG pillars on corporate returns and volatility. While the impact of governance and environmental disclosure on portfolio returns is predominantly positive, the effect on volatility changes over time. The positive effect of the social pillar on portfolio volatility is not robust when later subsamples are considered. We observe that there is a 2015 effect, but we are unable to confirm a reduction in volatility in the aftermath of the Paris agreement in any of the ESG pillars considered.

We suggest that the documented instability of parameter estimates when different samples are considered manifests the difficulties underlying ESG rating precision. We associate our findings with the literature that addresses ESG measurement divergence (see Berg et al. 2019) and with the forecasting literature that links divergences in forecasting to the existence of economic uncertainty. Our results, therefore, suggest that existing limitations in measuring ESG attributes may be responsible for the changing effects of ESG considerations in portfolio return volatility over time. This also reflects the challenges that arise when incorporating ESG issues in investment decisions. The 2015 documented effect suggests that, as more companies disclose ESG information, it becomes more difficult to obtain the desired performance results.

We report a strong effect of governance characteristics on portfolio performance which is consistent with the literature and implies that corporates are more likely to disclose transparent information of governance characteristics. While the study is limited by using a single ESG data provider, we contend that our results suggest that information related to environmental and social attributes is more likely to be selective and subject to the rater´s evaluation bias.

Our results hence call for the introduction of homogeneous ESG standards and ratings designed to rigorously guide investors in their allocation decision under uniform rules. This will allow clear, consistent, and auditable processes for data collection across enterprises. It will also enhance the recently introduced Sustainable Finance Strategy (See Ainger and Krukowska 2021) which is to be adopted by ESMA (European Securities Markets Authority) to boost transparency in the ESG information disclosure process.

According to the US SIF 2020 report, the number of ESG assets under management has reached 20 trillion in 2020. In a context in which stakeholders, analysts, individual banks and shareholders are increasingly examining corporates´ ESG disclosures, our results suggest that that governance practices are most important in determining corporate equity return growth. Investors should therefore guarantee that they have access to the tools and

data sources that allow scrutiny of governance characteristics in the investment allocation process.

In a context in which addressing climate change becomes a global challenge in the finance industry, our results suggest that Central Banks should contribute to the harmonization of the ESG measurement process by demanding that banks use common sustainability measures to assess current and future risk exposures.

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Appendix A

(1) ESG_DISCLOSURE_SCORE defined as: "Proprietary Bloomberg score based on the extent of a company's environmental disclosure as part of Environmental, Social and Governance (ESG) data. The score ranges from 0.1 for companies that disclose a minimum amount of ESG data to 100 for those that disclose each one of the fields collected by Bloomberg."

(2) ENVIRONMENTAL_DISCLOSURE_SCORE: "Each data point is weighted in terms of importance, with data such as Greenhouse House Gas Emissions carrying greater weight than other disclosures. This score measures the amount of environmental data a company reports publicly."

(3) SOCIAL_DISCLOSURE_SCORE: "The score is also tailored to different industry. In this way, each company is only evaluated in terms of the data that is relevant to its industry sector. This score measures the amount of social data a company reports publicly and does not measure the company's performance on any data point."

(4) GOVERNANCE_DISCLOSURE_SCORE: "Each data point is weighted in terms of importance, with Board of Directors data carrying greater weight than other disclosures. The score is also tailored to different industry sectors."

Notes

[1] According to the UNPRI, responsible investment should be defined as an approach to investing that: "aims to incorporate environmental, social and governance (ESG) factors into investment decisions, to better manage risks and generate sustainable, long-term returns". Consequently, ENVIRONMENTAL (E), SOCIAL (S) and GOVERNANCE (G) criteria cover the following topics: E: Climate change, greenhouse gas emissions, resource exhaustion, waste and pollution, deforestation.S: Working conditions, local communities, conflict, health & safety, employee and diversity.G: Executive pay, bribery & corruption, political lobbying & donations, board diversity, taxes. While the UNPRI is regarded as the world leader in promoting responsible investment, increasing ESG concerns also led to the surge of other global or local institutions to promote socially sustainable investments. So, for instance the 2009 Global Impact Investing Network and the Sustainable Investment Forum. The later aims to promote financial markets sustainability in Europe, through the definition of seven responsible and sustainable investment strategies: (1) Exclusion of holdings from investment universe, (2) Norms-based screening, (3) Best-in-Class investment selection, (4) Sustainability themed investment, (5) ESG integration, (6) Engagement and voting on sustainability matters and (7) Impact investing. The involvement of institutional investors in ESG related initiatives has been strong from 2013 to 2015.

[2] The scores considered are Environmental (E), social (S) and Governance (S) as well as the global ESG score.

[3] The main sources of volatility arise due to changes in regulation and global market conditions. Important episodes include the 2007–2009 Global Financial Crisis, the 2010–2012 European Financial Crisis and the 2015 Paris Agreement.

[4] Is common to use this standardasization score, for instance Stege et al. (2021), use a similar approach by considering the interval $(-1, 1)$. They build for this purpose forecasts of market swap rates to measure the financial risk in the banks portfolio.

[5] While Halbritter and Dorfleitner (2015) apply BETA, SIZE, BM and MOM as controls in their panel analysis we include, PER, Enterprise Value over EBIT and Enterprise Value over EBITDA as well as Book to Market in the value category. The profitability related variables used are GPA, ROC as well as a detailed version of ROC (ROCD) which intangible assets in the denominator.

[6] Note that this Sharpe Ratio has been calculated under the assumption of a zero risk free rate.

[7] Note that the existence of time-changing parameters suggests that a GMM estimation approach with threshold characteristics will be appropriate to deliver consistent estimates. In this context, the methodology provided by Seo and Shin (2016) will allow accounting simultaneously for the existence of endogenous (as well as exogenous) thresholds and coefficients. We have excluded this threshold approach from the paper and instead followed the related ESG literature (see Halbritter and Dorfleitner 2015) by performing estimations under subsamples.

[8] The ECB in the document "Summary of Banking Industry Dialogue on 30 June 2021" issued on 15 July 2021 notes the following on page 4: "Bank representatives argued that the most important task for banks in the coming years is related to climate change. Banks need to have an active role in helping the economy transforming onto a sustainable path. (. . .) In this context, the lack of common definitions of ESG activity was seen as hindering an efficient implementation".

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