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Should risk-averse investors target the portfolios of socially responsible companies?

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Abstract

Research background: Companies are required to implement Corporate Social Responsibility (CSR) policies to mitigate the adverse social and environmental effects of their activities and gain legitimacy in the eyes of society. Sustainability initiatives are costly for companies but, at the same time, they are important value-creation drivers. Retail and institutional investors are increasingly choosing portfolios based on CSR performance. However, the relationship between CSR and market beta has hardly been studied at all in the literature, and no direct comparison of the U.S. and European markets has been conducted.

Purpose of the article: The two fundamental variables that define an investment are return and risk, and the appropriate risk-return combination depends on the profile of the investors. This research aims to analyze the relationship between CSR and market risk, understood as price volatility and measured by market beta in the U.S. and European markets.
Methods: Companies listed in the S&P 500 and Euro Stoxx 300 indexes from 2015 to 2019 were examined using OLS regressions with instrumental variables (IV) and fixed effects panel data.
Findings & value added: The results show that those companies with higher CSR have betas below the market index in the U.S. market as well as lower volatility, and are, therefore, more appropriate choices for risk-averse investors. However, this relationship was not confirmed in the European market. This difference may be justified by two reasons: 1) The non-adherence of the United States to the Kyoto Protocol, resulting in less strict legal regulations than in Europe; 2) In the U.S. market, betas are more aggressive, while in the European market they are more defensive, with little margin for reduction. This research contributes to the current state of knowledge by providing empirical evidence that social, environmental, and corporate governance sustainability practices reduce stock volatility in the U.S. capital market, which is highly relevant for private and institutional investors who make their investments based on moral criteria. The results are current and reliable since they cover a broad and recent period for two of the most important stock market indexes.

Introduction

According to Carroll (1979), corporate social responsibility (CSR) includes economic, legal, ethical, and discretionary pillars. Indeed, companies are the backbone of society, producing the goods and services needed by the population and providing employment. At the same time, companies must obviously obtain an economic benefit in order to survive. Moreover, business activity takes place within an institutional system subject to legally binding regulations, and companies are also expected to comply with a series of ethical standards which are not legal obligations, such as adopting measures to reduce waste and water consumption, and using renewable energy. Finally, there are certain discretionary responsibilities which society in general believes that companies should fulfil, including making philanthropic donations to cultural activities, fighting against poverty, and promoting gender equality and social justice.

CSR entails monetary costs for companies and, consequently, for shareholders, who see their remuneration reduced. In addition, any rise in costs implies an increase in company bankruptcy risk (Bouslah *et al*., 2013). Therefore, companies would not implement CSR policies if they were not rewarded for their socially and environmentally responsible behavior (Mainelli, 2004). Indeed, the reward comes, on the one hand, from avoiding negative consequences, such as criticism from NGOs, certain government impositions, boycotts in specific markets or regions, and the loss of important employees with high ethical values. On the other hand, the positive aspects include strengthening the brand; facilitating access to contracts

requiring ethical values; improving public relations with customers, NGOs, and governments; and lower capital costs, among others.

In short, investment in CSR policies creates value for a company as it increases its opportunities to obtain resources in the capital markets, strengthens its governance, improves its relationships within the wider community (employees, customers, suppliers, investors, the State, etc.), and reinforces its competitiveness. CSR strategies reduce a company's risk of adverse social and environmental events whose consequences, were they to occur, would be mitigated since less reputational damage would take place and fewer lawsuits would be filed against the company.

In recent decades, the establishing of CSR activity ratings through environmental, social and governance (ESG) scores by specialized analysts and entities has proliferated. Based on these ratings, there is a growing trend among retail and institutional investors towards selecting financial asset portfolios with high ESG scores. At the beginning of 2020, sustainable investments totaled $35.3 trillion, which represented a 55% increase in just four years (Global Sustainable Investment Alliance, 2020). Investment and pension funds, i.e., institutional investors, own considerable shareholdings and therefore exert significant influence on company policies developed by managers and corporate governance, these being the main drivers of CSR performance. Indeed, institutional investors generally prefer companies with a solid CSR, thus promoting investment in sustainable corporations (Motta & Uchida, 2018). The fact that institutional investors are interested in investing in companies with high CSR is an attractive incentive for companies to implement CSR policies. Managers decide to execute CSR actions to protect shareholders' interests and, ultimately, prevent losses. Therefore, their real aim is one of selfish monetary interest rather than a moral or ethical issue (Petersen & Vredenburg, 2009).

What are the factors that drive investors to select companies with a solid CSR? According to Beal *et al*. (2005), they can be classified into three well-differentiated groups; 1) financial returns, derived from both higher accounting or market valuation and lower risk; 2) social and environmental returns resulting from philanthropic acts or environmental protection; 3) psychological returns resulting from feeling satisfied with one’s performance and behavior.

The moral reasons are undoubtedly the most significant, since the origin of socially responsible investment dates back to the mid-20th century in the United States. Certain religious groups objected to their savings being invested in unethical companies dealing in alcohol, tobacco and gambling. A few years later, another movement arose that refused to allow the finan-

cial institutions that managed their money to finance companies with activities linked to apartheid or the Vietnam War (Valls Martínez *et al*., 2020a).

In the 1990s, the pioneering ESG indices emerged: the Domini 400 Social Index and the Dow Jones Sustainability Indices, created in 1991 and 1999, respectively. Since then, the number of indices that only include companies with high ESG scores has grown steadily. Sustainable market indices have lower volatility, i.e., lower betas, than non-sustainable ones, while their returns are similar or even higher (Lupu *et al*., 2016; Sudha, 2015; Ur Rehman *et al*., 2016; Valls Martínez & Martín Cervantes, 2021).

The global economic environment has become extremely volatile in recent years, especially in the wake of the COVID-19 pandemic. Companies are operating in an unstable environment and are under pressure to behave transparently and sustainably (Erokhin *et al*., 2019). Now, more than ever, many investors are looking for safe, low-volatility investments rather than risky assets with volatile prices.

Previous studies have analyzed the link between CSR and financial performance, establishing a significant positive relationship between the two variables (Cupriak *et al*., 2020; Deng *et al*., 2013; Krüger, 2015; Servaes & Tamayo, 2013). However, the extent to which CSR affects a company's financial risk has not been studied sufficiently, and a direct and automatic relationship between ESG measures and risk has not been clearly established (Becchetti *et al*., 2016; Bosch-Badia *et al*., 2018; Chen *et al*., 2015; Orlitzky & Bejamin, 2001; Schaeffer *et al*., 2012). Hence the timeliness of this article.

Risk-averse investors seeking low-risk financial assets, i.e., reduced betas, should invest in the stocks of companies that implement CSR policies, provided that a negative connection between CSR and beta has been demonstrated. This research aims to analyze the relationship between CSR and market risk, understood as volatility and measured by market beta. For this purpose, companies listed on the S&P 500 and Euro Stoxx 300 indexes from 2015 to 2019 are examined through OLS regressions with instrumental variables and fixed effects panel data. The results show that higher CSR involves lower market risk for U.S. companies, but not for European companies.

This study contributes the following improvements to the current research: Firstly, it offers empirical evidence on whether social, environmental and corporate governance sustainability practices reduce stock volatility in the capital market. A key metric used by investment analysts and provided by sizeable financial market research firms is the beta of a stock; this article is therefore highly relevant for private and institutional investors. Secondly, the study is based on two of the most important financial market

indexes, the S&P 500 and the Euro Stoxx 300, so the results obtained faithfully reflect the present global situation. Thirdly, the analysis covers a broad and recent period, and so the results are current and reliable.

The rest of this article is organized as follows: Section 2 includes a literature review and the theoretical framework that allows the establishment of the research hypothesis; Section 3 presents the data, variables, and methodology applied; Section 4 displays the results derived from the empirical study; and finally, in Section 5, the main conclusions are presented.

Literature review and theoretical framework

The literature has studied in depth the relationship between the level of CSR and a company's financial performance, generally finding that compliance with environmental, social and corporate governance criteria increases accounting profitability and market valuation (Garcia-Castro *et al*., 2010; Gimeno-Arias *et al.*, 2021; Hou, 2019; Jia, 2019; Lin *et al*., 2018; Miralles-Quiros *et al*., 2017a; Nollet *et al*., 2016; Palacios-Manzano *et al.*, 2021). The influence of board composition, especially the presence of women directors, on the implementation of CSR policies has also been analyzed from both an empirical and theoretical point of view (Valls Martínez *et al.*, 2019; Valls Martínez *et al.*, 2020b). However, there is relatively little current research linking CSR to company market risk. In this sense, it could be said that practice precedes research since, in recent years, there has been a growing tendency to select socially responsible investment portfolios, and ESG criteria are becoming increasingly important in financial asset management.

A company's risk profile is a crucial investment parameter and it is therefore essential to establish the relationship between CSR and market risk. CSR fosters ethical behavior among managers, which could positively influence a company's reputation and indirectly increase its value and reduce risk (Devie *et al.*, 2018; Lu *et al*., 2020).

It is claimed that the influence of up to five different factors may reduce risk when CSR measures are applied (Cai *et al*., 2016; Jo & Na, 2012): 1) Socially responsible companies may obtain a kind of "insurance-like" protection derived from the creation of goodwill and moral capital that would allow them to maintain their financial performance (Godfrey, 2005; Godfrey *et al*., 2009); 2) CSR implementation can reduce the cost of capital (Sharfman & Fernando, 2008); 3) CSR can strengthen a company's market acceptance and increase the value of its shares (Porter & Kramer, 2011). 4) Managers who are more committed to CSR are more likely to disclose their

activities, and this enhanced transparency reduces information asymmetries with investors (Dhaliwal *et al*., 2011); 5) CSR engagement increases confidence in a company, which reduces its capital constraints, facilitating access to capital markets (Jo & Harjoto, 2011).

CSR policies entail costs for the company, which can be significant in some cases. However, these policies also generate tax savings, strengthen the entity's public image, attract and retain talented employees (Stojanovic *et al*., 2020), and reduce the company's risk. Previous studies have shown a reduction in equity and debt capital cost and an increase in firm value (Dhaliwal *et al*., 2012; Goss & Roberts, 2011; Jo & Harjoto, 2011, 2012).

Companies may adopt CSR measures either voluntarily or because they are required to do so by law. The long-term objective of voluntarily implemented measures is to build a good reputation for the company, resulting in improved financial performance (Durana *et al*., 2021; Kliestik *et al*., 2020) and, consequently, more satisfied stakeholders (Marakova *et al*., 2021). For example, customer loyalty will grow, thereby increasing sales (Harjoto & Jo, 2015).

The risk of falling share prices decreases with the development of CSR practices, as socially responsible companies are committed to higher standards of transparency and consequently attract less negative attention. However, if the aim of CSR practices is to repair the damage caused by inappropriate social or environmental behavior, there would consequently be a higher risk of falling share prices. In other words, CSR should be implemented *a priori* and aimed at avoiding reputational damage in order to reduce risk (Kim *et al*., 2014).

Furthermore, another reason for the lower market volatility of companies with higher CSR scores could be that institutional investors are not willing to pay a higher price for these companies' shares. However, they favor holding on to them and not selling them (Petersen & Vredenburg, 2009).

Previous studies have stated a negative relationship between CSR and systematic market risk, such as that conducted on S&P 500 companies from 1992 to 2009 (Oikonomou *et al.*, 2012), on U.S. companies from 2003 to 2015 (Albuquerque *et al*., 2019), on U.K. companies from 1994 to 2006 (Salama *et al*., 2011), on an international sample from 2001 to 2011 (Benlemlih & Girerd-Potin, 2017) and on financial companies (Paul, 2013), demonstrating that effective sustainability management reduces systematic risk. Other empirical analyses of Canadian (Boutin-Dufreste & Savaria, 2004), U.S. (Utz, 2018), and Taiwanese companies (Hung *et al*., 2019), as well as an international sample (Luo & Bhattacharya, 2009), revealed that CSR reduces idiosyncratic risk. Systematic and idiosyncratic risk reduction

have even been analyzed together, exhibiting a decline with increased CSR measures (Giese *et al*., 2019). Likewise, measures that improve environmental, social and governance issues have been found to reduce volatility in studies of companies in Brazil (de Jesus Lameira *et al*., 2013), Spain (González Sánchez & Morales de Vega, 2018), the UK (Walmsley & Bond, 2003), Taiwan (Lee, 2016), China (Xu & Liu, 2018), and the US (Bravo, 2016), as well as on an international level (Kim *et al*., 2021).

In short, sustainable companies are less volatile, so investing in them is an effective risk management strategy for investors (Sabbaghi, 2011), valued by financial markets (Feldman *et al*., 1997). Moreover, the influence of sustainability measures on company risk is felt more both in times of uncertainty (Lackmann *et al*., 2012; Ouyang *et al.*, 2017) and in the long-term (Bosch-Badia *et al*., 2018; Chen *et al*., 2015).

Table 1 summarizes the results of the main published research on CSR and market risk. Forty articles were analyzed, but only eight studied volatility as market beta. Three papers considered U.S. companies, two focused on U.K. companies, one on South African companies, and two on an international sample. The most recent years studied range from 2006 to 2015. Therefore, the empirical study developed in this article provides a current perspective of companies and the market, as the period under study was from 2015 to 2019 for the S&P 500 and Euro Stoxx 300 indexes, two of the largest and most representative markets of the world economy.

There exist certain well-established theories to support the influence of a company's CSR practices on stock price volatility. It is usual to consider a multi-theoretical framework for comparative and integrative purposes (Valls Martínez *et al.*, 2019). Most of the signaling approaches are discussed below.

According to *agency theory* (Fama & Jensen, 1983; Jensen & Meckling, 1976), managers (agents) may make decisions for their own benefit and against the general interests of the shareholders (principals). CSR disclosure would reduce the information asymmetry among managers, on the one hand, and investors and analysts, on the other, which would result in lower share price volatility (Benlemlih *et al*., 2018; Cormier *et al.*, 2009; Cormier & Magnan, 2014).

According to the prevailing value system, legitimacy is a generalized perception that a company's activities are appropriate (Suchman, 1995). In this sense, *legitimacy theory* explains how a company's fulfilment of its social and environmental responsibilities to society allows it to gain shareholder confidence and, consequently, protect itself against volatile situations. Indeed, if shareholders are interested in investing in socially responsible companies, then they will withdraw their investments from and penal-

ize those companies that do not meet the ESG criteria, resulting in increased stock price volatility (Tasnia *et al*., 2021).

Stakeholder theory (Freeman, 1984) states that managers must consider the interests of all groups with a stake in the company, known as stakeholders, who are classified into two groups. The primary stakeholders are those necessary for business operations, such as workers, customers, suppliers, and shareholders. They, therefore, exert a strong coercive influence on the company, which must diligently meet their demands. Furthermore, secondary stakeholders, such as local communities and legislative power, influence the company, but do not determine its survival, as they are not directly related to its operations(Orlitzky & Bejamin, 2001).

Firstly, CSR activities reduce the likelihood of adverse events. Indeed, if the company implements CSR policies, accidental contamination or occupational accidents are less likely to occur. Therefore, there will be fewer lawsuits, fines, and state interventions, while customer loyalty will increase. Secondly, CSR mitigates the impact of any possible reputational damage, acting as a kind of insurance-like protection (Godfrey *et al*., 2009; Nguyen & Nguyen, 2015). The stakeholders are willing to be more tolerant of socially and environmentally committed companies. Conversely, a company could face monetary or reputational losses if stakeholders' expectations are unmet due to insufficient CSR measures being implemented (Harjoto & Laksmana, 2018).

Thus, CSR extent is an indicator to investors of the level of risk the company is taking on certain contingencies and of the company's moral capital to mitigate any possible penalties (Godfrey, 2005).

It should be noted that institutional investors use the CSR of a company for portfolio selection, advocating socially responsible behavior (Motta & Uchida, 2018). Therefore, companies that do not wish to be excluded by large investors should implement CSR practices; otherwise, their shares would only be targeted by small investors and exposed to higher volatility.

Based on the above arguments, we predict that the implementation of CSR practices is inversely related to stock price volatility in the market. To ascertain this statement, we established the following research hypotheses:

Hypothesis I: *There is a negative relationship between the extent of a company's CSR and systematic risk (beta) in the U.S. market.*

Hypothesis II: *There is a negative relationship between the extent of a company's CSR and systematic risk (beta) in the European market.*

The existence of an inverse relationship between CSR and beta was previously found in three studies conducted on U.S. companies, with samples corresponding to the periods 1991–2010 (Jo & Na, 2012), 1991–2012 (Cai *et al*., 2016), and 2003–2015 (Albuquerque *et al*., 2019); South African companies, from 2012–2016 (Lueg *et al*., 2019); U.K. companies, from 1994–2006 (Salama *et al*., 2011); and an international sample, from 2001–2011 (Benlemlih & Girerd-Potin, 2017). However, another study carried out on U.K. companies, in the period 2005–2013 (Benlemlih *et al*., 2018), found no relationship between CSR and beta. A study conducted on an international sample, for the period 2003–2012, even found a positive relationship (Chollet & Sandwidi, 2018). In short, due to the limited number of studies conducted to date and the fact that no conclusive relationship has yet been found, it is necessary to further investigate this aspect, as it has so many practical implications for investors.

The methodology applied in this research is in line with other similar empirical studies, as shown in Table 1, where it can be observed that twelve studies used ordinary least squares regressions, nineteen articles applied panel data with fixed or random effects, four papers employed instrumental variables, and four studies relied on the lagged endogenous variable as an explanatory variable.

Research method

This study comprises the companies included in the S&P 500 and Euro Stoxx 300 indexes for the five-year period from 2015–2019, as the U.S, and European markets are key drivers of the world economy. The data were obtained from the Bloomberg database, corresponding to the end-of-year values, and firms with missing data were excluded to guarantee the reliability and accuracy of the research (Liao *et al.*, 2019). Table 2 summarizes the sample composition. In the U.S. market (Panel A), the two least volatile sectors, on average, are *Utilities* and *Telecommunications Services*, which are, in turn, the two most sustainable sectors. In contrast, the two most volatile sectors, *Basic Materials* and *Energy*, show intermediate sustainability. On the contrary, in the European market (Panel B), the least volatile sector, *Telecommunications Services*, is also the sector with the lowest ESG score. Likewise, the most volatile industry, *Financial*, has a mediocre score in CSR practices.

The S&P 500 index is mainly comprised of U.S. companies, whereas the Euro Stoxx 300 index includes companies from 13 different countries,

with the strongest economies headed by France (28.10%), Germany (23.81%), the Netherlands (9.59%), Italy (9.26%) and Spain (8.58%).

The *total company market risk* is the variation of the share price over time, which is related to the stock exchange index of the market on which the share is listed, as follows: $R_{it} = \alpha_i + \beta_i M_t + \varepsilon_{it}$, where R_t is the estimated return of stock i in period t; M_t is the aggregate return on the market index during period t; ε_{it} is a random disturbance term that includes all relevant factors that influence R_{it} and are independent of the market; α_i is the parameter to be estimated that expresses the part of the share return that is independent of the market; and β_i is the parameter to be estimated which indicates how strongly variations of M affect R_i (Sharpe, 1963).

Therefore, $\sigma^2(R_{it}) = \beta_i^2\sigma(M) + \sigma_i^2$, where $\sigma^2(R_{it})$ is a measure of the total company market risk, while $\beta_i^2\sigma(M)$ shows the systematic market risk, and σ_i^2 the idiosyncratic risk (Cotter *et al*., 2015; Messis *et al*., 2021; Miralles-Marcelo *et al*., 2012). The coefficient beta, β, reflects the share price volatility compared to the stock market's average volatility. It is used as a measure of systematic market risk.

In this study, *Beta* (BETA), which measures the volatility of a stock against the volatility of the market index, is the dependent variable. The independent variable is the *ESG Score* (ESG) assigned by the Bloomberg database, a variable that is widely used by portfolio managers to select investments and which acts as a proxy for CSR, ranging from 0.1 to 100 depending on the quality of environmental, social, and governance initiatives developed by companies and the information disclosed. Bloomberg is a reliable database used both by investors and in previous research (Charumathi & Rahman, 2019; Giannarakis, 2014; Giannarakis *et al*., 2014; Lueg *et al*., 2019; Manita *et al*., 2018; Nollet *et al*., 2016; Valls Martínez *et al*., 2020b). The literature has generally found a negative and significant relationship between volatility and corporate social responsibility (Albuquerque *et al*., 2019; Cai *et al*., 2016; Jo & Na, 2012). However, a study carried out on a sample of 37 U.S. banks from 2013 to 2017 showed a positive relationship, such that the costs of implementing CSR activities were penalized by investors (Tasnia *et al*., 2021).

Finally, the control variables are: *Operating Profit Margin* (OPM), a performance accounting variable; *Price-Earnings Ratio* (PER), a performance market variable; *Logarithm of total assets* (SIZE), a proxy for company size (Lueg *et al*., 2019); and *Indebtedness* (INDEB), an indicator variable for the company's capital structure (Valaskova *et al*., 2021b). Table 3 provides a summary of the variables and their definitions.

Studies usually consider accounting variables of results as control variables, such as return on assets, return on equity or earnings variability, simi-

lar to operating profit margin. Likewise, the market valuation is considered through dividend yield or market-to-book ratio, similar to the price-earnings ratio. Moreover, company size and indebtedness are generally used in the empirical analyses to control the effect of the independent variable. However, the sign of the relationship with *Beta* of these variables and its level of significance varies throughout the studies performed (Albuquerque *et al*., 2019; Benlemlih *et al*., 2018; Bravo, 2016; Cai *et al*., 2016; Godfrey *et al*., 2009; Jo & Na, 2012; Lueg *et al*., 2019; Tasnia *et al.*, 2021).

Finally, dummy variables were added to take into account the company's industry. Investors know that specific sectors are more stable in the face of market fluctuations (Casado-Díaz *et al.*, 2014; Giese *et al*., 2016; Lackmann *et al*., 2012; Valaskova *et al*., 2021a). Accordingly, the beta analysis should include industry fixed effects due to the different behavior of each economic activity (Albuquerque *et al*., 2019; Benlemlih *et al*., 2018; Bravo, 2016; Jo & Na, 2012).

Firstly, multiple linear regression analysis was applied to investigate the relationship between the extent of CSR performance and market beta. Previous empirical studies found that companies with high market risk implement CSR activities in order to reduce stock volatility (Devie *et al*., 2018; Jia *et al*., 2020). Conversely, beta influences negatively on CSR performance (Mcguire *et al*., 1988). The lagged dependent variable was considered in subsequent models due to the existence of a bidirectional relationship between endogenous and exogenous variables and to address the problem of reverse causality as well as the possible presence of endogeneity (Chollet & Sandwidi, 2018; Jo & Na, 2012; Lueg *et al*., 2019; Orlitzky & Bejamin, 2001). Moreover, instrumental variables were applied to avoid biased and inconsistent estimators (Albuquerque *et al.*, 2019; Haslam *et al.*, 2010; Lee, 2016; Nguyen & Nguyen, 2015; Valls Martínez & Cruz Rambaud, 2019). In this way, CSR performance was instrumentalized by three variables: the existence of targets on emission reduction (TEM), the net employment creation over the last year (NEC), and the percentage of women on the corporate boards (BGD), representative of the environmental, social and governance dimensions, respectively. Sanderson-Windmeijer and Anderson tests confirm that the instruments used are correct and not overidentified when p-value < 0.05 (Anderson & Hsiao, 1981; Sanderson & Windmeijer, 2016).

Finally, the panel data methodology was used, which combines time-series and cross-sectional data, to solve the problem caused by omitted variables in the empirical analysis (Boulouta, 2013; Miralles-Quiros *et al.*, 2017b). If the unobservable heterogeneity between the companies is corre-

lated with the regressors, fixed-effects estimation is preferred. Otherwise, random effects would be the correct methodology. The Hausman test was applied to select the most consistent estimator model (Campbell & Mínguez-Vera, 2008), as well as the Breush-Pagan or Lagrange multipliers to test whether the fixed effects model is better than the pooled linear regression (Breusch & Pagan, 1980).

Furthermore, the goodness of fit in each model was evaluated with the F-statistic and the adjusted R^2; the first determines the joint significance of the regressors (p-value < 0.05), and the second indicates the proportion of variation of the dependent variable explained by the explanatory variables. The models were also compared using the Akaike information criterion (AIC) and Bayesian information criterion (BIC), for which smaller values denote a better model.

Results

The main descriptive statistics and correlations of the continuous variables are presented in Tables 4 and 5, respectively. During the period considered in the sample, the average beta value was higher in the U.S. market (1.021) than in the European market (0.891). Similarly, its standard deviation was also higher (0.448 and 0.367, respectively). These values indicate that it is possible to adapt a stock portfolio to an investor's risk profile. Most U.S. companies showed aggressive betas, i.e., volatilities higher than the S&P 500 market index, since the median of the distribution was 1.023. In contrast, European companies mainly had defensive betas, i.e., stocks with volatilities lower than the Euro Stoxx 300 market index, as the median of the distribution was 0.831.

The *ESG score* ranges from 20.277 to 92.659 in the U.S., and from 13.652 to 95.809 in Europe. Therefore, CSR policies vary widely among different companies, with average values of 67.982 and 72.197, respectively. However, socially responsible behavior is predominant among the companies on the S&P 500 and Euro Stoxx 300 indexes, since the medians of distribution were 70.746 and 73.943, respectively.

The Pearson correlation matrix shows no high correlation problems between the explanatory variables. It was found that the *Net Employment Creation* and *Board Gender Diversity* variables have a significant correlation with *ESG Score*, which is important if they are to be used as instrumental variables. The dummy variable *Target Emissions* presents a significant mean difference for *ESG Score*, as shown in Table 6. Therefore, it can also be considered as a valid instrument.

Among the S&P 500 companies, the Pearson correlation between *Beta* and *ESG Score* is negative but non-significant. Figure 1 illustrates the scatter graph and fitted values of these two variables, with the scatter graph appearing to show that this decreasing ratio is minimal. However, it must be considered that the range of *Beta* is 2.796, while the range of *ESG Score* is 60.382. Hence, when only the line representing the fitted values is observed, the inverse relationship between *Beta* and *ESG Score* can be much better appreciated due to the change on the axis measurement scale. It is precisely the causality of this relationship that will be tested in the regression models. On the other hand, for the Euro Stoxx 300 companies, the Pearson correlation between ESG score and Beta is positive and significant. Those companies with a higher CSR score have more volatile share prices, as can be seen in the graphs in Figure 1.

Table 7 shows the research regression analyses for the S&P 500 companies from 2015 to 2019. Firstly, ordinary least squares (OLS) estimation was applied, and the results determined that companies with a higher *ESG Score* presented lower market *Beta*, at 1% significance level and with an R^2 coefficient of 31.73%.

Secondly, OLS lagged estimation included the dependent variable *lagged one period* as a regressor and showed identical results according to the independent variable, but R^2 increased to 82.67%.

Thirdly, following previous research *(*Albuquerque *et al., 2019;* Cai *et al.*, 2016; Lee, 2016), a two-stage instrumental variable (IV) lagged estimation was carried out to deal with endogeneity and reverse causality problems. In the first stage of instrumental variable (IV) estimation (OLS), it can be observed that the three instruments are significant for determining CSR extent. However, whilst target emissions (TEM) and board gender diversity (BGD) had a positive impact, net employment creation (NEC) showed a negative influence (p-value inferior to 0.01 in all cases). The R^2 coefficient explained 44.08% of the variance. The results of the second-stage instrumental variable (IV) estimation showed that a greater CSR valuation negatively influenced the market beta at a 1% significance level, with a model adjustment of 82.63%.

Finally, panel data with lagged fixed-effects analysis was applied as the p-value in the Hausmann test was lower than 0.05, and, consequently, random effects were discarded. The results obtained were similar for the independent variable, confirming the negative relationship between *ESG Score* and *Beta*, at a 5% significance level, with 89.63% explained variance. The Breusch-Pagan test (p-value < 0.05) revealed that fixed-effects outperformed pooled models. Moreover, AIC and BIC criteria indicated that the best-estimated model was undoubtedly lagged fixed-effects, followed far

behind by lagged estimation (OLS) and lagged instrumental variable (IV) models, which had similar values. Finally, the simple estimation (OLS) model came last.

To test the validity of the results, the "robust" option was applied to the lagged fixed effects model. Likewise, the model was replicated by eliminating all non-significant variables. The results remained stable, i.e., the coefficients and significance of the remaining variables did not vary significantly. The results of both estimations are shown in table 8.

Therefore, the main finding of a negative association between CSR and market volatility remained robust in this research, which confirmed *Hypothesis I*. This result is consistent with previous studies, such as those carried out on U.S. public firms between 1991 and 2012 (Cai *et al*., 2016); listed companies in South Africa from 2012 to 2016 (Lueg *et al.*, 2019); Indonesian listed firms from 2008 to 2016 (Devie *et al*., 2018); and on U.S. companies between 1991 and 2010 (Jo & Na, 2012).

In addition, the results of the study conducted on the relationship between CSR and market beta in the Euro Stoxx 300 index are shown in Table 9. The methodology followed was the same as that for the S&P 500 index so as to obtain comparable results. The relationship was now negative, as in the U.S. case. However, in the European market, it was non-significant. Therefore, *Hypothesis II* was not confirmed.

Furthermore, it can be seen that large corporations are more volatile than small companies, which is in line with the literature (Godfrey *et al*., 2009; Kim & Park, 2019). Indeed, larger companies will typically have more frequent transactions and, therefore, assume a higher risk of undesirable outcomes or events (Kimberly, 1976). Moreover, they are more subject to public scrutiny, so the impact of any adverse event will be amplified in the market (Rindova *et al*., 2006). Finally, the results confirmed that the sector is a determining factor in market beta.

Discussion

The major financial crises of recent decades were generated by unethical behavior resulting from a loss in society's values. Furthermore, severe ecological disasters caused by preventable accidents, as well as economic inequalities among the population have led companies to become more responsible with regard to their activities. Thus, it is no longer sufficient to provide public information on their financial results and equity situation. They must now also disclose non-financial information, from corporate governance actions to social and environmental responsibility measures.

Although companies are becoming increasingly socially responsible, many see their CSR activities as "the right thing to do" rather than the way to achieve better returns for their shareholders (Harjoto & Jo, 2015). Nevertheless, there is evidence that socially responsible behavior adds economic value to a company. The markets reward these socially accountable efforts with higher or more stable returns. Therefore, these CSR activities are of a financial rather than a philanthropic nature (Petersen & Vredenburg, 2009).

The two fundamental variables that define an investment are return and risk. Both move in the same direction, i.e., a higher expected return is associated with a higher level of risk, which the investor must be willing to take. The appropriate risk-return combination depends on the profile of the investors. If investors are risk-averse, they will be willing to sacrifice return in exchange for lower risk when choosing financial assets, which means they will prefer portfolios with lower betas. Conversely, investors with a higher propensity for risk will be willing to invest in assets with higher betas. The results of this research show an inverse relationship between CSR scores and the beta of stocks listed on the S&P 500 index, but the same cannot be said for those companies included in the Euro Stoxx 300 index. Therefore, in the US, conservative investors should select the shares of those companies with higher ESG scores. However, in Europe, this relationship has not been proven.

Why this difference between the US and Europe? It may well be due to the fact that in 2005 the European countries signed the Kyoto protocol on the reduction of greenhouse gases, whereas the U.S. did not ratify this protocol (Valls Martínez *et al*., 2020b). European companies are subject to compliance with stricter measures on environmental pollution, an essential facet of CSR. In contrast, U.S. companies have laxer regulations in this regard. Investors, therefore, prefer those companies that are more socially responsible, resulting in smaller betas. Furthermore, corporate social activities could increase market risk due to implementation costs, especially in those industries considered less harmful to the environment. On the contrary, the development of corporate responsibility measures could reduce market risk in the more polluting industries (Cai *et al*., 2016). On the other hand, as shown in Table 4, most companies in the US have aggressive betas (beta >1), whereas, in Europe, most have defensive betas (beta <1). In other words, the betas of European companies are generally low, so CSR measures do not have much scope to lower them further.

Both in volatile environments and during times of crisis, companies that want to achieve better economic results are increasingly turning to implementing and disclosing sustainable activities (Erokhin *et al*., 2019). CSR

has proven to be an effective way of strengthening relationships with stakeholders (Devie *et al*., 2018). Indeed, a socially responsible company can achieve greater trust with and among its internal and external stakeholders (Orlitzky & Bejamin, 2001).

We may, therefore, conclude that the investor who selects portfolios of financial assets corresponding to socially responsible companies is making an investment in which everyone wins (Sudha, 2015): the companies, whose financial performance is improved; the investors, who have greater security without sacrificing profitability, at least in the U.S. market; and the society in general, which benefits from social and environmental policies.

ESG ratings can be seen as predictors of long-term company risk and, therefore, should be considered in portfolio selection policies (Giese *et al*., 2019) in those markets where the relationship between CSR and risk has been demonstrated, such as the U.S. market. In our view, such ESG ratings should be incorporated into the financial analyses of companies as a fundamental measure for obtaining valuation models that are in line with the stock market valuation. CSR initiatives involve costs for companies, but may well produce better returns, attract investment, and reduce the volatility of performance measures.

Conclusions

This study analyzes the relationship between the implementation and disclosure of CSR practices, measured using the ESG score published by Bloomberg, and the market volatility represented by the beta parameter. The selected sample covered those companies included in the S&P 500 and Euro Stoxx 300 indexes from 2015 to 2019. The results confirmed that, in the U.S. market, companies with higher CSR scores had lower values of beta, which implies that the application of CSR policies tempers volatility. Nevertheless, the same cannot be said for the European market.

The results of this study have future implications for investors and portfolio managers who, when selecting less volatile investments in the U.S. stock market, should target the shares of those companies that implement improved CSR practices. However, this risk reduction goal cannot be reached in the European market.

Collaterally, research has shown that larger companies exhibit significantly more volatile share prices, indicating that risk-averse investors should select smaller entities. Indeed, many portfolio managers have recently been changing their investment techniques and are focusing their

attention on small and medium-sized companies, claiming that higher returns can be obtained due to the growth potential of these companies.

Finally, both the sample size and the length of the study period could be considered as limitations. Future research should explore these aspects in depth. Indeed, it would be desirable to extend the study over a longer period to see whether the results remain consistent or if there is an evolution. Likewise, the sample size should be increased to include U.S. and European companies that are not on the S&P 500 and Euro Stoxx indexes, since size influences volatility and some of these companies are among the largest in the world. It would also be interesting to carry out a study on a national level within the European continent and to analyze companies belonging to other markets, such as the Asian market.

Furthermore, given the current concern about environmental pollution and considering the United Nations Sustainable Development Goals, future empirical research should explore the role of the Kyoto Protocol in these results.

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Annex

Table 1. Summary of the leading literature

Reference	Research results related to CSR and risk	Sample	Methodology	Journal
(Kim et al., 2021)	CSR is associated with low risk (out-of-the-money options volatility on the company stocks)	International sample from 2002 to 2008	Fixed effects regression	Strategic Management
(Cupriak et al., 2020)	The incorporation of commodities in socially responsible investment reduces market risk (volatility of profits)	ESG and non-ESG indices from 2012 to 2019	GARCH procedure	Sustainability
(Tasnia et al., 2020)	CSR exerts a positive influence on the stock price volatility of banks	37 U.S. banks from 2013 to 2017	Random effects regression	Journal of Financial Reporting and Accounting
(Albuquerque et al., 2019)	CSR reduces systematic risk (beta)	U.S. companies from 2003 to 2015	Fixed effects regression and instrumental variables	Management Science
(Erokhin et al., 2019)	In volatile economic environments, such as times of crisis, companies implement and publish sustainable activities to increase economic performance	Russian companies from 2002 to 2013	Survey with no relevant statistical treatment	Sustainability
(Jia et al., 2020)	Companies invest in CSR to reduce risk affecting the share price	U.S. companies from 2003 to 2006	Fixed effects regression	Strategic Management Journal
(Hung et al., 2019)	CSR reduces company risk (measured by return on assets volatility)	Taiwanese food firms during 2007–2017	Multiple-regime panel smooth transition regression	Agricultural Economics
(Lueg et al., 2019)	CSR reduces systematic risk (beta), but the relationship with total and idiosyncratic risk is not significant	South African companies from 2012 to 2016	Fixed effects regression	Journal of Cleaner Production
(Benlemlih et al., 2018)	Social and environmental disclosure is no related to systematic risk (beta) and have a negative relationship with idiosyncratic risk	U.K. companies from 2005 to 2013	Fixed effects regression	Journal of Business Ethics
(Bosch-Badia et al., 2018)	The effects of CSR on risk are more likely to be felt in the long term than in the short term.	Theoretical analysis	Conceptual analysis	Sustainability

Table 1. Continued

Reference	Research results related to CSR and risk	Sample	Methodology	Journal
(Chollet & Sandwidi, 2018)	CSR influence positively systematic risk (beta) and specific risk. Moreover, there is a reverse causality between risk and CSR	International sample from 2003 to 2012	Generalized method of moments regressions	Global Finance Journal
(Devie et al., 2018)	CSR has a negative impact on company stock risk	Indonesian companies from 2008 to 2016	Ordinary least squares regression	Social Responsibility Journal
(González Sánchez & Morales de Vega, 2018)	News that negatively affects the company's reputation has a positive influence on stocks price volatility	Spanish companies from 2010 to 2015	GARCH procedure	Corporate Social Responsibility and Environmental Management
(Harjoto & Laksmana, 2018)	CSR decreases over-risk-taking	U.S. companies from 1998 to 2011	Fixed effects regression	Journal of Business Ethics
(Utz, 2018)	CSR reduces idiosyncratic risk	International sample from 2003 to 2015	Ordinary least squares regression	Review of Financial Economics
(Xu & Liu, 2018)	CSR is negatively related to shares price volatility	Chinese listed companies from 2009 to 2011	Ordinary least squares regression	Australian Accounting Review
(Benlemlih & Girerd-Potin, 2017)	CSR reduces systematic (beta) and idiosyncratic risk in civil law countries, but there is no relation in common law countries	International sample from 2001 to 2011	Fixed effects regression	Journal of Business, Finance & Accounting
(Ouyang et al., 2017)	Favourable company reputation positively influences the shares' market value in times of corporate crisis	Chinese listed companies from 2003 to 2013	Ordinary least squares regression	Journal of Media Economics
(Becchetti et al., 2016)	CSR increases idiosyncratic risk	International companies from 1992 to 2010	Fixed effects regression	Industrial and Corporate Change
(Bravo, 2016)	CSR reduces stocks volatility	U.S. companies in 2009	Ordinary least squares regression	Spanish Accounting Review
(Cai et al., 2016)	Corporate environmental responsibility negatively affects company risk (measured by beta and stocks price volatility)	U.S. companies from 1991 to 2012	Fixed effects and generalized method of moments regressions	Journal of Business Ethics

Table 1. Continued

Reference	Research results related to CSR and risk	Sample	Methodology	Journal
(Lee, 2016)	CSR reduces the risk of a sharp decline in share prices	Taiwanese companies from 1997 to 2013	Fixed effects regression and instrumental variables	Managerial Finance
(Lupu et al., 2016)	Sustainable market indices are less risky than non-sustainable indices	Sustainable and non-sustainable market indices	GARCH procedure	Economic Computation and Economic Cybernetics Studies and Research
(Ur Rehman et al., 2016)	The market beta of sustainable indices is lower than the beta of non-sustainable indices	Dow Jones Sustainability index and Asian indices from 2002 to 2014	Ordinary least squares regression	Business Ethics: A European Review
(Chen et al., 2015)	CSR reduces stock volatility in the face of adverse news related to safety but non to integrity and market-competition	Trading companies in Taiwan from 2005 to 2010	Ordinary least squares regression	NTU Management Review
(Harjoto & Jo, 2015)	CSR decreases the stock price volatility	U.S. companies from 1993 to 2009	Fixed effects regression	Journal of Business Ethics
(Nguyen & Nguyen, 2015)	CSR increase corporate risk, which is measures as ROA and Tobin's Q volatility	Companies included in the S&P500 index from 1991-2003	Random effects regression and instrumental variables	Social Responsibility Journal
(Sudha, 2015)	ESG indexes have better returns and lower volatility than non-sustainable indices	Indian indices from 2005 to 2012	Generalized autoregressive conditional heteroscedasticity models	Environment, Development and Sustainability
(Y. Kim et al., 2014)	CSR decreases the share price crash risk	International companies from 1995 to 2009	Fixed effects regression	Journal of Banking & Finance
(de Jesus Lameira et al., 2013)	CSR increases company performance and value and reduces company stocks volatility	Brazilian companies from 2005 to 2009	Ordinary least squares, instrumental variables, generalized method of moments regressions, and logit and probit models	Revista Brasileira de Gestao de Negocios

Table 1. Continued

Reference	Research results related to CSR and risk	Sample	Methodology	Journal
(Jo & Na, 2012)	CSR reduces firm risk (volatility and beta) more in controversial than in non-controversial industry firms	U.S. controversial industry firms from 1991 to 2010	Fixed effects regression	Journal of Business Ethics
(Lackmann et al., 2012)	CSR increases the company's market value, and its influence is greater in riskier companies and in times of uncertainty	European companies from 2001 to 2008	Ordinary least squares regression	Journal of Business Ethics
(Oikonomou et al., 2012)	CSR has a negative but weak influence on systematic company risk	S&P 500 companies from 1992 to 2009	Fixed effects regression	Financial Management
(Sabbaghi, 2011)	Sustainable companies are less volatile, so investing in them is a risk management strategy.	Green ETFs from 2005 to 2008	GARCH procedure	Managerial Finance
(Salama et al., 2011)	Company environmental performance influences negatively systematic risk (beta)	U.K. companies from 1994 to 2006	Fixed and random effects regressions	Business Ethics: A European Review
(Godfrey et al., 2009)	CSR reduces stocks price volatility	U.S. companies from 1991 to 2002	Random effects regressions	Strategic Management Journal
(Luo & Bhattacharya, 2009)	CSR reduces company's idiosyncratic risk	U.S. companies in 2002 and 2003	Ordinary least squares and random effects regression	Journal of Marketing
(Petersen & Vredenburg, 2009)	Investors are not willing to pay more for the shares of companies with CSR policies, but they are willing to hold them and not sell them, which decreases share price volatility	Interviews	Ordinary least squares regression	Journal of Business Ethics
(Orlitzky & Bejamin, 2001)	CSR has a negative and inverse relationship with market risk (stocks volatility)	18 research articles	Meta-analysis	Business & Society
(Mcguire et al., 1988)	Beta influences negatively on CSR	U.S. companies from 1983 to 1985	Ordinary least squares regression	Academy of Management Journal

Table 2. Sample description

Panel A. S&P 500 index		**Beta**		**ESG Score**	
Sector	**Percent**	**Mean**	**SD**	**Mean**	**SD**
1. Basic Materials	5.35	1.308096	0.439024	70.535510	11.223152
2. Consumer Cyclicals	16.24	1.078656	0.415133	65.323957	15.640671
3. Consumer Non-Cyclicals	7.52	0.652528	0.277870	70.008022	13.786718
4. Energy	5.74	1.305687	0.403698	69.151055	14.448912
5. Financials	19.41	1.019259	0.456037	67.837663	14.820169
6. Healthcare	11.49	0.978199	0.358899	68.535049	14.448809
7. Industrials	14.65	1.116441	0.334902	67.322920	15.337410
8. Technology	13.27	1.129281	0.376389	67.732060	14.293605
9. Telecommunications Services	0.79	0.590138	0.241676	71.119618	15.740440
10. Utilities	5.54	0.315453	0.246614	70.683310	11.587818
Panel B. Euro Stoxx 300 index		**Beta**		**ESG Score**	
Sector	**Percent**	**Mean**	**SD**	**Mean**	**SD**
1. Basic Materials	9.47	1.057970	0.364485	72.706519	12.699324
2. Consumer Cyclicals	14.18	0.999669	0.357534	72.611499	12.678619
3. Consumer Non-Cyclicals	6.22	0.703282	0.270052	71.793999	13.328881
4. Energy	5.05	0.844116	0.304319	74.972470	11.719310
5. Financials	20.54	1.063346	0.450587	73.182485	12.951764
6. Healthcare	8.51	0.664283	0.298351	71.737662	12.136108
7. Industrials	18.67	0.858198	0.253841	71.561623	13.001687
8. Technology	5.60	0.846324	0.317881	73.636221	13.022623
9. Telecommunications Services	5.19	0.630010	0.254061	66.683170	16.403620
10. Utilities	6.57	0.732496	0.219859	71.254763	12.215302

Panel C. Euro Stoxx 300 index by countries			
Country	**%**	**Country**	**%**
France	28.10	Republic of Ireland	2.82
Germany	23.81	Austria	2.35
Netherlands	9.59	Luxembourg	2.28
Italy	9.26	Portugal	1.34
Spain	8.58	United Kingdom	1.34
Finland	5.37	Switzerland	0.34
Belgium	4.83		

Table 3. Definition of variables

Abbreviation	Variable	Definition
BETA	Beta	Volatility of a stock against the volatility of the broader market (it is calculated based on trailing 5-year prices, on a monthly basis, relative to the S&P 500)
ESG	ESG Score	ESG score assigned by Bloomberg
OPM	Operating Profit Margin	Operating profit to total revenue, per cent
PER	Price Earnings Ratio	The company's stock price divided by the earnings per share (daily time series ratio)
SIZE	Company Size	Logarithm of total assets
INDEB	Indebtedness	Total debt to total equity, per cent
TEM	Target Emissions	Dummy variable, 1 if the company has set targets or objectives to be achieved on emission reduction and 0, otherwise
NEC	Net Employment Creation	Employment growth over the last year
BGD	Board Gender Diversity	Percentage of board members who are women

Table 4. Descriptive statistics of the continuous variables

Panel A. S&P 500 index					
Variable	**Mean**	**Median**	**SD**	**Minimum**	**Maximum**
BETA	1.02123	1.02335	0.448188	-0.06179	2.73409
ESG	67.98241	70.74625	14.56559	20.27663	92.65912
OPM	16.77457	15.86832	16.33775	-165.70730	84.60224
PER	41.15110	22.07463	269.53590	2.63866	9933.33333
SIZE	23.72111	23.62322	1.37069	19.63964	28.59516
INDEB	145.51890	77.57098	341.12710	0.00000	6458.90600
NEC	3.64247	2.00023	16.73414	-82.92683	205.43060
BGD	22.67926	22.22222	8.52544	0.00000	62.50000
Panel B. Euro Stoxx 300 index					
Variable	**Mean**	**Median**	**SD**	**Minimum**	**Maximum**
BETA	0.89090	0.830946	0.36663	0.00609	2.15179
ESG	72.19650	73.94301	13.01129	13.65203	95.80855
OPM	18.92951	11.13123	41.21822	-286.02240	424.89010
PER	32.58149	19.21985	168.31520	2.10227	4519.23100
SIZE	23.56283	23.35180	1.72468	17.64333	28.36231
INDEB	109.77960	72.00279	117.39600	0.00000	757.93050
NEC	8.58293	1.726094	100.10250	-67.42481	2643.33333
BGD	32.40501	33.33333	11.10254	0.00000	63.63636

Table 5. Pearson correlations of the continuous variables

PANEL A. S&P 500 index							
Variable	**BETA**	**ESG**	**OPM**	**PER**	**SIZE**	**INDEB**	**NEC**
BETA	1.0000						
ESG	-0.0353	1.0000					
	(0.1060)						
OPM	-0.0654***	-0.0011	1.0000				
	(0.0027)	(0.9609)					
PER	-0.0351	-0.0204	-0.0776***	1.0000			
	(0.1088)	(0.3518)	(0.0004)				
SIZE	0.0771***	0.2695***	0.0708***	-0.0438**	1.0000		
	(0.004)	(0.0000)	(0.0012)	(0.0448)			
INDEB	0.0329	0.0566***	-0.003	-0.0078	0.0568***	1.0000	
	(0.1328)	(0.0095)	(0.9879)	(0.7218)	(0.0093)		
NEC	0.0285	-0.1510***	0.0375*	-0.0157	-0.0481**	-0.0231	1.0000
	(0.1940)	(0.0000)	(0.0871)	(0.4732)	(0.0281)	(0.2918)	
BGD	-0.0942***	0.3166***	-0.0031	0.0004	0.0786***	-0.0141	-0.0881***
	(0.0000)	(0.0000)	(0.8862)	(0.9869)	(0.0003)	(0.5204)	(0.0001)
PANEL B. Euro Stoxx 300 index							
Variable	**BETA**	**ESG**	**OPM**	**PER**	**SIZE**	**INDEB**	**NEC**
BETA	1.0000						
ESG	0.1248***	1.0000					
	(0.0000)						
OPM	-0.2103***	-0.0445	1.0000				
	(0.0000)	(0.1178)					
PER	0.0117	0.0313	-0.0248	1.0000			
	(0.6816)	(0.2715)	(0.3825)				
SIZE	0.5055***	0.2356***	-0.0926***	-0.0023	1.0000		
	(0.000)	(0.0000)	(0.0011)	(0.9353)			
INDEB	0.1740***	-0.0211	0.0063	0.0713**	0.3604***	1.0000	
	(0.000)	(0.4572)	(0.8243)	(0.0120)	(0.0000)		
NEC	-0.0003	0.0237	0.0134	-0.0075	-0.0359	0.0158	1.0000
	(0.9924)	(0.4088)	(0.6397)	(0.7949)	(0.1980)	(0.5826)	
BGD	0.0375	0.2386***	-0.0784***	-0.0158	0.0619**	0.0407	0.0651**
	(0.1908)	(0.0000)	(0.0062)	(0.5826)	(0.0309)	(0.1563)	(0.0231)

p-value in parentheses.
***, ** and * indicate a significance of less than 1 %, less than 5% and less than 10%, respectively.
Number of observations: Panel A = 2,095 – Panel B = 1,239

Table 6. Difference of means in the value of the ESGScore and ANOVA test in the dummy variable of Target Emissions

Panel A. S&P 500 index					
	Difference of means test (*t*-test)			**ANOVA test**	
	Mean group 0	**Mean group 1**	**Difference**	***F***	**Adjust R^2**
Mean	58.78003	76.5864	-17.80637*** (0.0000)	1429.21*** (0.0000)	0.3730
Percentage	48.33%	51.67%			
Panel B. Euro Stoxx 300 index					
	Difference of means test (*t*-test)			**ANOVA test**	
	Mean group 0	**Mean group 1**	**Difference**	***F***	**Adjust R^2**
Mean	62.22682	75.39856	-13.17175*** (0.0000)	334.98*** (0.0000)	0.1881
Percentage	24.19%	75.81%			

p-value in parentheses. *** indicate a significance of less than 1 %.

Table 7. Regressions in the S&P 500 index

Variables	**Estimation (OLS)**	**Lagged estimation (OLS)**	**IV Lagged estimation (OLS)**		**Lagged fixed effects estimation**
			First-stage IV	**Second-stage IV**	
Intercept	-0.0525031 (0.746)	-0.2216742** (0.019)	11.56591** (0.034)	-0.257354*** (0.003)	-0.0665047 (0.897)
BETA (1 lag)		0.8398738*** (0.000)	-0.8561665 (0.255)	0.8379715*** (0.000)	0.2658347*** (0.000)
ESG	-0.0018306*** (0.002)	-0.000958*** (0.003)		-0.002279*** (0.000)	-0.0006751** (0.045)
OPM	-0.0014243* (0.069)	0.0000543 (0.893)	-0.0094054 (0.682)	-0.0000254 (0.946)	0.0000673 (0.903)
PER	-0.0000984*** (0.000)	-0.0000182** (0.011)	-0.0005607 (0.614)	-0.000019 (0.295)	-9.18e-06 (0.642)
SIZE	0.0640434*** (0.000)	0.196837*** (0.000)	1.898712*** (0.000)	0.251573*** (0.000)	0.0354045* (0.098)
INDEB	0.0000661*** (0.002)	7.15e-0.6 (0.642)	0.0012346 (0.108)	9.74e-06 (0.440)	0.0000146 (0.300)
TEM			15.42181*** (0.000)		
NEC			-0.065062*** (0.001)		
BGD			0.2840794*** (0.000)		
Sector 2	-0.2268765*** (0.000)	-0.00612 (0.801)	-4.100068*** (0.005)	-0.0120236 (0.616)	
Sector 3	-0.7010444*** (0.000)	-0.0966905*** (0.000)	-3.090395* (0.075)	-0.0968996*** (0.001)	
Sector 4	-0.0613285 (0.322)	0.0058784 (0.854)	0.571707 (0.763)	0.0011435 (0.971)	
Sector 5	-0.349388*** (0.000)	-0.0740941*** (0.002)	-4.081969*** (0.006)	-0.08166*** (0.001)	
Sector 6	-0.3188344*** (0.000)	0.0153294 (0.576)	-0.6824904 (0.653)	0.0159797 (0.521)	

Table 7. Continued

Variables	Estimation (OLS)	Lagged estimation (OLS)	IV Lagged estimation (OLS)		Lagged fixed effects estimation
			First-stage IV	Second-stage IV	
Sector 7	-0.1921375***	0.0127708	-2.275341	0.0112846	
	(0.000)	(0.568)	(0.117)	(0.635)	
Sector 8	-0.124278***	0.008654	0.0315085	0.0090075	
	(0.008)	(0.728)	(0.983)	(0.714)	
Sector 9	-0.8781175***	-	-6.714548**	-	
	(0.000)	0.1404401***	(0.038)	0.1516547***	
		(0.002)		(0.004)	
Sector 10	-1.072342***	-	-4.89342**	-	
	(0.000)	0.1495048***	(0.011)	0.1534141***	
		(0.000)		(0.000)	
Adjusted R^2	0.3173	0.8267	0.4408	0.8263	0.8963
F-statistic	143.78***	624.49***	76.82***	519.48***	24.79***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	2,095	1,647	1,636	1,636	1,647
Sanderson-Windmeijer test			315.59*** (0.0000)		
Anderson test				603.924*** (0.0000)	
Hausman test					766.51*** (0.0000)
Breush Pagan test					3.669*** (0.000)
AIC	1746.245	-939.4056		-915.7052	-2367.605
BIC	1830.954	-852.8982		-829.305	-2329.759

***, ** and * indicate a significance of less than 1 %, less than 5% and less than 10%, respectively.
AIC and BIC: smaller is better.

Table 8. Lagged fixed effects estimation

Variables	S&P 500		Euro Stoxx 300	
	Robust	Reduced model (robust)	Robust	Reduced model (robust)
Intercept	-0.0665047	-0.2072289	-0.6915296	-0.7511838
	(0.917)	(0.713)	(0.301)	(0.317)
BETA	0.2658347***	0.2633768***	0.3722407***	0.3805484***
(1 lag)	(0.000)	(0.000)	(0.000)	(0.000)
ESG	-0.0006751*	-0.0006904*	-0.0001909	-0.0000512
	(0.068)	(0.055)	(0.617)	(0.891)
OPM	0.0000673		-0.000243	
	(0.902)		(0.389)	
PER	-9.18e-06		0.0000202	
	(0.275)		(0.803)	
SIZE	0.0354045	0.0419608*	0.0533321*	0.0553933*
	(0.183)	(0.074)	(0.058)	(0.079)
INDEB	0.0000146		-0.0000485	
	(0.293)		(0.675)	
Adjusted R^2	0.8963	0.8912	0.9128	0.9106
F-statistic	16.61***	53.78***	22.44***	28.13***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

*** and * indicate a significance of less than 1 % and less than 10%, respectively.

Table 9. Regressions in the Euro Stoxx 300 index

Variables	Estimation (OLS)	Lagged estimation (OLS)	IV Lagged estimation (OLS)		Lagged fixed effects estimation
			First-stage IV	Second-stage IV	
Intercept	-1.142879***	-0.0424522	6.581159	-0.0297796	-0.6915296
	(0.000)	(0.570)	(0.335)	(0.693)	(0.299)
BETA (1 lag)		0.8566814***	1.55169	0.8574056***	0.3722407***
		(0.000)	(0.224)	(0.000)	(0.000)
ESG	-0.000239	-0.0000565		-0.0000671	-0.0001909
	(0.741)	(0.878)		(0.931)	(0.611)
OPM	-0.0021139***	-0.003691***	0.0175525	-0.000369***	-0.000243
	(0.069)	(0.004)	(0.160)	(0.008)	(0.529)
PER	-0.0000516***	-4.09e-06	0.006808**	-3.66e-06	0.0000202
	(0.000)	(0.659)	(0.011)	(0.903)	(0.852)
SIZE	0.0956949***	0.0091308**	2.135883***	0.0086218**	0.053321*
	(0.000)	(0.013)	(0.000)	(0.039)	(0.058)
INDEB	0.0001203	-0.000022	-0.0126479***	-0.0000219	-0.0000485
	(0.169)	(0.645)	(0.001)	(0.614)	(0.689)
TEM			10.55716***		
			(0.000)		
NEC			0.0022632		
			(0.449)		
BGD			0.1966632***		
			(0.000)		
Sector 2	-0.0767813**	-0.0010798	-0.3143911	-0.003059	
	(0.036)	(0.946)	(0.831)	(0.853)	
Sector 3	-0.3748062***	-0.0769057***	2.554869	-0.0781651***	
	(0.000)	(0.000)	(0.177)	(0.000)	
Sector 4	-0.2744771***	-0.0520973**	2.671915	-0.0516033**	
	(0.000)	(0.013)	(0.199)	(0.026)	
Sector 5	-0.1081990**	-0.0322965*	-2.399412	-0.0325637*	
	(0.011)	(0.092)	(0.141)	(0.078)	
Sector 6	-0.3399286***	-0.0218713	3.069194*	-0.0235839	
	(0.000)	(0.238)	(0.080)	(0.228)	
Sector 7	-0.1983586***	-0.029102*	-0.9814123	-0.0306134*	
	(0.000)	(0.070)	(0.498)	(0.059)	
Sector 8	-0.1436109***	0.0003458	1.877903	-0.002465	
	(0.001)	(0.987)	(0.341)	(0.911)	
Sector 9	-0.4450492***	-0.0539233**	-3.650068*	-0.0546212**	
	(0.000)	(0.017)	(0.086)	(0.024)	
Sector 10	-0.3928569***	-0.0963797***	-2.693762	-0.096593***	
	(0.000)	(0.000)	(0.173)	(0.000)	
Adjusted R^2	0.4063	0.8786	0.2738	0.8764	0.9128
F-statistic	74.07***	346.80***	22.11***	451.00***	22.44***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	1,239	971	953	953	971
Sanderson-Windmeijer test			70.16*** (0.0000)		
Anderson test				175.11*** (0.0000)	

Table 9. Continued

Variables	Estimation (OLS)	Lagged estimation (OLS)	IV Lagged estimation (OLS)		Lagged fixed effects estimation
			First-stage IV	Second-stage IV	
Hausman test					215.41*** (0.0000)
Breush Pagan test					2.577*** (0.000)
AIC	395.7884	-1286.403		-1263.815	-1964.448
BIC	472.6193	-1208.349		-1186.061	-1930.300

***, ** and * indicate a significance of less than 1 %, less than 5% and less than 10%, respectively.
AIC and BIC: smaller is better.

Figure 1. Scatter graph and fitted values Beta – ESGScore