

Market reaction to firms' investments in CSR projects

Victoria Cherkasova

*School of Finance, National Research University Higher School of Economics,
Moscow, Russia*

Elena Fedorova

*Financial University under the Government of the Russian Federation, Moscow,
Russia, and*

Igor Stepnov

Department of Assets Management, MGIMO, Moscow, Russia

Abstract

Purpose – The purpose of this paper is to determine the impact of corporate investments in corporate social responsibility (CSR), measured by the environmental, social and government (ESG) rating, on the market valuation of a firm's stocks and to explain the regional differences in the degree of this influence.

Design/methodology/approach – The empirical study uses linear and non-linear panel regression models for a panel sample of 951 firms listed in Asia, North America and Europe operating in innovative industries.

Findings – The CSR score was found to be significant in terms of stock excess return on the regional level. However, this finding cannot be extrapolated to the global scale. ESG rating is priced by the European and North American markets negatively, while in the Asian market, it is positive. This penalty (negative influence) is greater than the reward for one point increase in ESG rating.

Practical implications – The results of this empirical study could be used by firms' managers to adjust strategies aimed at stock value growth and by investors to select an investment strategy to maximize return.

Originality/value – The impact of investments in CSR on stock excess return over a defined benchmark is assessed. The study reveals regional differences in the impact of CSR investment using a sample of Asian, European and North American firms. The authors apply a more advanced lagged CSR performance (d.ESG) assessment based on the methodology of Zhang and Rajagopalan (2010).

Keywords Corporate social responsibility, Excess stock return, ESG score, Additive value, Market valuation, CSR performance

Paper type Research paper

1. Introduction

The relevance of the research subject is determined by the paradigm of new socially responsible investment, which has been evolving in recent decades (Aouadi and Marsat, 2018; Galema *et al.*, 2008). This means that investors expect not only profitability but also suggest some positive social changes. Now socially responsible investment is no longer only in some single cases, but a steadily growing market segment (Quazi and O'Brien, 2000; Graafland *et al.*, 2012).

Nowadays, the integrated report, which discloses non-financial information, including CSR initiatives, shows how well firms operate in their institutional environment.

JEL Classification — G11, G12, G17.

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This reporting is an additional source of information for investors and can help them to make a final decision (Biddle *et al.*, 2009). Companies which do not invest in CSR projects might lose benefits related to CSR practice. While awareness of CSR performance is growing yearly, it should be examined whether it can generate a greater value than traditional expenditures of companies operating in innovative industries (Mithani, 2017; Chang *et al.*, 2015).

The goal of the paper is to evaluate the influence of investments in CSR on the stock excess return over a defined benchmark.

This issue is widely studied in the literature. Specifically, the relationship between CSR success and firm valuation is intensely discussed (Auer and Schuhmacher, 2016; Di Giuli and Kostovetsky, 2014; Dimson *et al.*, 2015; Edmans, 2011; Nollet *et al.*, 2016; Lins *et al.*, 2017; Torre *et al.*, 2020). Investments in CSR can be motivated by the ability to compete in the industry where a firm operates. On the one hand, when peer companies actively address any kinds of CSR concerns, investors can conclude that they have lower risks and hence should be priced higher than companies non-involved in CSR. On the other hand, CSR entails the redistribution of wealth from shareholders to stakeholders which in turn can be the source of lower equity returns and make a firm an acquisition target (Deng *et al.*, 2013; Margolis and Walsh, 2003). There is no single explanation of whether CSR-related activities are significant in the deviation of stock return from a benchmark. Although some research gives evidence of a positive association between CSR ratings and firm valuation, there is a debate on how this value is expressed in share prices even if researchers agree that CSR success induces large value (Margolis and Walsh, 2003; Moore, 2001). As a result, reconciling the conflicting results on CSR characteristics and value measures remains a central topic for the research and creates a new branch of empirical studies (Gillan *et al.*, 2021).

This study contributes to the existing literature in several respects. First, it estimates an additive value of CSR which is practiced by companies for many years and is well-understood by investors (Nollet *et al.*, 2016). Secondly, we examine companies from different markets (Asia, European Union and North America). The empirical base of the study includes 951 firms listed in Asia, North America and Europe. Innovative industries are chosen because ESG investment is a particularly relevant factor for them. Thirdly, we use a more advanced methodology: we estimate not only linear but also non-linear dependence by adding a U-curve for each region. Fourth, we evaluate lagged CSR performance (d.ESG) based on the methodology of Zhang and Rajagopalan (2010) calculating each year's industry average metrics in each considered region and further calculating adjusted terms and their difference.

Our research and improved methodology provide both theoretical and practical implications for investing in CSR (Akisik and Gal, 2014). First, it extends the study of agency and reputation theory in terms of the impact of CSR investment on the firm's financial performance. Second, from a practical point of view, our findings can help investors to choose the most appropriate investment strategy, considering the added value of CSR.

2. Literature review

2.1 Theoretical background of CSR investments

The introduction of socially oriented practices into the corporate culture of a firm is quite expensive, complicated and time-consuming. There are several corporate finance theories that explain the impact of CSR investment on the financial performance of companies (Cronqvist *et al.*, 2009; Kim *et al.*, 2017).

Relying on the agency theory, a firm's insiders, such as executives and stockholders, may tend to heavily invest in CSR to benefit from their image at the expense of outside stockholders. Insiders' improved prestige does not increase the capital of other shareholders. As a result, CSR can be a point of controversy of interest for different shareholders (Barnea and Rubin, 2010; Cronqvist *et al.*, 2009). CSR activities might be the cause of increased costs

because of agency issues and inadequate capital distribution, putting the business in jeopardy. Although CSR may help to resolve possible disputes among different stakeholders, it also might cause tensions among them (Barnea and Rubin, 2010).

Financial theory regards value maximization which results in wealth for shareholders to be the firm's aim (Bouteska and Regaieg, 2018). As a result, CSR practices that favour stakeholders and raise shareholder capital are in line with a firm's mission. If a firm invests in the main types of CSR (environmental, social and government), most often this is a signal of a stable firm's financial condition, but further efforts are needed to reduce information asymmetry (Conte *et al.*, 2022).

Publication of non-financial statements has a positive effect on the firm's transparency. Such informational openness simplifies for the firm the process of finding additional investments and entering new markets (Akisik and Gal, 2014).

Another theory explaining the impact of CSR investment on the firm's financial performance is the theory of reputation, according to which companies integrate social and environmental strategies into the firm's business operations (commercial and business aspects) and form a higher firm's reputation in the market (García, 2021). According to the findings of Xu *et al.* (2014), CSR has a strong beneficial impact on corporate reputation and brand credibility. This theory has been tested empirically several times, for example, in a study (Song *et al.*, 2020; Mongrut *et al.*, 2021) which reveals the positive impact of information disclosure about corporate social responsibility (CSR) on the reputation of a firm, which, in its turn, significantly contributes to a firm's financial performance. Madden *et al.* (2012) suggest that the disclosure of socially responsible information about the firm may provoke the "halo effect", which means that people are willing to pay more for a well-known brand.

The conceptual analysis shows that most studies focus on empirical results. The theories described above are among the fundamental ones in explaining the impact of ESG investing and the firm's financial performance.

2.2 Market valuation of CSR investments

Most scholars show that CSR is net beneficial for businesses (Deng *et al.*, 2013; Margolis *et al.*, 2009). Some researchers find a negative association between CSR and corporate financial performance (Margolis and Walsh, 2003), while there is also evidence of a neutral relationship between them (Moore, 2001).

We limited the firm's financial performance to the profitability of shares. In the literature, firm's market value is assessed using an excess stock return dependent variable. According to a large body of research, CSR investing provides firms engaged in such practices with a positive stock return. Di Giuli and Kostovetsky (2014) discovered a strong negative association between variations in firms' ESG ratings and variations in stock return. The authors argue that if companies extend their CSR practices, their future stock performance suffers. Stock undervaluation is a clear market response to CSR with a lag arising from investor delays in studying CSR policy modifications.

Masulis and Reza (2015) argue that the equity market responds badly to the news of corporate donations initiatives, implying that investors do not support CSR. Servaes and Tamayo (2013) discover a relationship between CSR characteristics and firm's valuation that is dependent on the amount of marketing. Researchers suggest that if companies do not advertise, CSR investments have either a negative or insignificant effect on their valuation. Other researchers provide evidence of a positive correlation between stock returns to make inferences about the beneficial effects of CSR. Dimson *et al.* (2015), for instance, find that effective shareholder collaboration resolves CSR-related issues results in positive returns.

Edmans (2011) claims that CSR activities generate value as the relationship between returns and CSR output is positive. The benefit of introducing the CSR practices is the

increase in firm's intangible assets, which is due to a positive image, customer loyalty and popularization of a firm's brand (Pagin *et al.*, 2021).

Lins *et al.* (2017) explored the success of CSR companies, notably during a crisis and low confidence in businesses. During times of low confidence, they find that companies with CSR scores have better operational results and obtain greater yields on stock than other companies.

There is no consensus in the literature on whether CSR investments payoff in a certain region or not. For instance, Auer and Schuhmacher (2016) suggest that the selection of stocks with high or low CSR scores does not significantly improve or diminish the investment efficiency relative to the benchmarks in North America and Europe. The same result refers to Asian equities. Using a fixed-effect model for analyzing panel data, Torre *et al.* (2020) show that the CSR scores of companies listed on the European exchange are significant in terms of their returns. Also, greater CSR policies are not rewarded in developing Asian markets, while in Japan, investors reward companies for outstanding CSR performance, according to Yen *et al.* (2019). At the same time, Cheung *et al.* (2009) show that Asian firms are benefiting from improving CSR scoring via greater valuation. Humphrey *et al.* (2011) suggest that there are no huge discrepancies in the risk-adjusted returns of UK companies with high or low CSR scores. Nollet *et al.* (2016) find that the CSR score is insignificant regarding the excess stock return of NASDAQ companies in a linear and non-linear setting. Zhang *et al.* (2020) on the sample of China firms establish the U-shaped relationship between CSR and excess stock return.

2.3 Hypotheses

Based on the literature dealing with the relationship between CSR and firm's financial performance measured as excess stock return on a global and regional scale, the following research hypotheses were proposed. They are based on a cross-sectional approach and identify the significance of larger and contemporary terms regarding global market stock valuation. Following the previous studies, agency theory and theory of reputation, we assume a positive sign.

H1. The global market positively reacts to the firm's CSR performance.

Papers that studied the influence of CSR performance on excess stock return in different regions provide controversial results. Auer and Schuhmacher (2016) argue that CSR does not influence excess return in Asia, North America and Europe. At the same time, Torre *et al.* (2020) find a positive and significant association in Europe, while Madden *et al.* (2012) state that a high CSR score does not generate a greater return than low CSR firms in the UK. Nollet *et al.* (2016) reveal that CSR is insignificant in terms of the excess return of US firms. As for the Asian region, Yen *et al.* (2019) conclude that developing Asian firms do not benefit from CSR, while the association for Japan is positive.

The reasons for different SCR practices in different countries are explained by different social and cultural contexts (White and Alkandari, 2019). The study (Díaz-fern, 2019) assesses the impact of human values and cultural differences across countries on the perception of CSR. Cross-cultural analysis was carried out in the context of Latin America and Europe by comparing two different cultural environments. The study of Vallero *et al.* (2022) describes the difference in the CSR orientation between Asian and Western colleagues. The results show that Asian firms are more identical in CSR policy than their Western counterparts. At the same time, Asian firms are significantly less likely to participate in CSR messages concerning "organization and management", messages about "CSR interactivity" and messages about "CSR as a business justification" compared to European firms.

Jamali *et al.* (2020) also analyze institutional heterogeneity as a difference between cross-country differences in CSR. Based on the literature review, the authors explain how

institutional heterogeneity in the Middle East and North Africa affects CSR practice. Another reason for a cross-country difference in CSR practices is ethical standards and meaningful values (Hassan *et al.*, 2022). The authors find differences between the countries of the UK and Egypt, and CSR has a stronger impact on the civil behaviour of British consumers than on Egyptian customers.

At this point, we cannot find consensus in the literature for Europe and North America. Taking Asia, researchers consider only one group of countries. We are going to resolve conflicting findings by including all market participants.

H2. Market reactions which are positive to CSR performance depend on regional specifics.

The non-linear setting is also employed to explain the effect of CSR on the financial indicators of companies. Studying the sample of North American firms, Nollet *et al.* (2016) find that both ESG score and squared ESG score are not significant in a non-linear setting. Zhang *et al.* (2020) conclude that there is a U-shaped relationship for Chinese firms. However, this research direction has received relatively little attention, so we propose the following hypothesis:

H3. There is a non-linear relationship between CSR investing and market reaction in all regions.

3. Method

3.1 Research design

The research is designed in the following way. To measure the firm's market value, we used stock excess return from a benchmark index retrieved from Bloomberg (ExRet). CSR score assessed by Bloomberg was used (ESG) as a measure of corporate social performance. Lagged CSR performance (d.ESG) was calculated using the methodology of Zhang and Rajagopalan (2010): we first calculated industry average metrics for each year in each considered region and then the adjusted terms and their difference. Also, control variables such as size (the lnMVE), a beta of a stock (Beta) and book-to-market ratio (BTM) were included in the empirical model. To estimate the effect of CSR performance on the market reaction, we used equation (1):

$$Ex.Ret_{i,t} = \alpha_0 + \alpha_1 Beta_{i,t} + \alpha_2 \ln MVE_{i,t} + \alpha_3 BTM_{i,t} + \alpha_4 d.ESG_{i,t-1} + \alpha_5 ESG_{i,t} + \varepsilon_i \quad (1)$$

The non-linear setting for estimation of the influence of CSR performance on market reaction is presented in equation (2):

$$Ex.Ret_{i,t} = \alpha_0 + \alpha_1 Beta_{i,t} + \alpha_2 \ln MVE_{i,t} + \alpha_3 BTM_{i,t} + \alpha_4 ESG_{i,t}^2 + \alpha_5 ESG_{i,t} + \varepsilon_i \quad (2)$$

3.2 Measuring excess return

Two approaches to estimating the excess return of stocks are used in the research literature: portfolio and cross-sectional. The portfolio method estimates the excess return of CSR stocks (Deng *et al.*, 2013; Fama and French, 1993). At the same time, a cross-sectional approach assesses the influence of CSR scoring on the excess return of stocks (Mănescu, 2011). As suggested by Fama and French (1993), the portfolio method could be described as follows. Firstly, companies are divided into two size groups: small and big. Next, they are sorted as value and growth according to their book-to-market ratio. According to the CSR score,

companies are divided into three portfolios applying percentiles to the whole dataset: low, medium and high. Finally, the weighted returns of these portfolios are defined. Using a cross-sectional approach, data are collected for each representative of the population and regressed yearly or monthly to define the influence and significance of variables used in the chosen parameter.

Excess return is measured in several ways. One of the methods used in empirical studies is to take stock returns and subtract a risk-free rate from them (Chen *et al.*, 2010). This approach does not consider industry-specific factors such as rapid expansion or a sharp decline in a given year due to unusual events. Another approach to arrive at this variable is the approach suggested by Nollet *et al.* (2016) and Buchanan *et al.* (2016). They use the average excess return over the benchmark index retrieved from Bloomberg. It is the return difference between the main security and the index with the defined granularity for the defined benchmark over the time frame serving as the defined relative return.

To estimate CSR performance, researchers adopt different approaches. It can be assessed via ESG rating using the following sources: KLD, Thomson Reuters and Bloomberg. Examining the effect of CSR on corporate financial performance, some authors adjust ESG scores to the industry average rate (Cavaco and Crifo, 2014; Liu *et al.*, 2020). Most empirical studies regarding CSR conclude that CSR is industry specific. Without including industry effects, a misleading positive relationship between CSR and returns can occur. In contrast, any CSR problems that can have various effects across sectors will distort their aggregate impact (Mănescu, 2011).

3.3 Analytical procedure

The cross-sectional method was chosen due to the interest in the monotonic influence of ESG rating on stock performance. The panel data model was selected based on econometric tests, which aimed to identify the most suitable estimator among random effect (RE), fixed effect (FE) and generalized least squares (GLS) method for the specific dataset. The choice between FE and RE models is conducted via the Hausman test. The fixed effects model is more suitable. As the next step of our analysis, modified Wald test for groupwise heteroskedasticity in fixed effect regression was applied. $\text{Prob} > \chi^2 = 0.00$, which is less than 0.01, so the null hypothesis is rejected on a 1% confident level heteroskedasticity presented in the model. To fix these issues, robust standard errors should be applied in the estimation FE model. The next step of our analysis is the Wooldridge test for autocorrelation in panel data. The null hypothesis of this test is an absence of first-order autocorrelation. Since $\text{prob} > F = 0.0345$, the null hypothesis is rejected, meaning that we have autocorrelation of the first order. To overcome the autocorrelation problem, GLS estimator was applied. To compare the FE model with robust s.e. and GLS model RMSEs were used. FE model has RMSE equal to 0.49, while GLS has RMSE equal to 0.48. GLS model was finally chosen. The endogeneity problem is assumed to be irrelevant for this research since there is no possible interdependence of variables from the theoretical perspective. The last test to apply is the test for multicollinearity. To test this, VIF uncentered was applied. The mean value of VIF is 5.07, so there is no multicollinearity in our sample.

3.4 Sample and summary

The data were originally collected worldwide from 2011 to 2019 for seven industries classified under GICS: energy, materials, industrials, automobiles, health care, information technology and communication services. The search criterion was yearly revenues starting from \$300m. After aggregating data, it was decided to continue research with three of the most innovation-intensive industries: materials, industrials and information technologies. After industry selection (\$300m of yearly revenues), scanning criterion was applied to collect the set of

companies that have ESG ratings estimated by Bloomberg. After that, the data were broken down into three samples by region criterion. The Asian region encompasses developed countries of Asia as well as developing China and India. The European (EU) set of firms includes companies from all Eastern and Western Europe. North American (NA) sample comprises companies from the United States and Canada. The set of companies with ESG rating accounts for 241, 628 and 165 companies which belong to materials, industrials and information technologies industries, respectively, and a total amount of 1,034. CSR set was processed to remove outliers. Final samples CSR amounted to 951 companies (see [Table 1](#)).

To construct industry-adjusted metrics, industry average measures were calculated for each region and each year (see [Appendix](#)). Companies operating in the materials industry in all three regions have the highest average rating, while European companies have the greatest score ranging from 40 to 55. The information technology industry has the lowest ESG score in all three regions. Overall, companies in North America have lower ESG ratings in all industries compared to those operating in Europe or Asia. European firms show the greatest ESG rating in all three industries compared to the other two regions.

Descriptive statistics of the global CSR set of companies are presented in [Table 2](#). The minimum and maximum value of the excess return is almost equally distanced from zero. The mean difference is positive and equals 0.056. As for the adjusted difference of ESG rating in year t and year $t-1$, only one firm doubled its rating and at least one experienced a decrease 1.3 times of the average industry ESG score. The mean difference is close to zero. Regarding companies' CSR scores, the maximum score is 69.4, whereas the minimum score is 5.8. The average ESG rating for the sample is 26.2.

[Table 3](#) illustrates the correlations of variables for the CSR set. Excess return is positively correlated only with $\ln MVE$. With other variables such as d_ESG , ESG , $Beta$ and BTM excess return correlates negatively.

4. Results

In this section, the results of the panel data model and estimation are presented. Overall, panel data models were estimated for a global market as well as for each region.

Table 1.
Distribution of
companies involved in
CSR activities by GICS

GICS	Asia	European Union	North America	Sum
15	140	36	50	226
20	328	93	154	575
45	98	11	41	150
	566	140	245	951

Source(s): Authors' calculations

Table 2.
Descriptive statistics of
CSR companies

Variables	N	mean	Sd	min	max
ExRet	6,588	0.0557	0.465	-1.619	1.864
Beta	6,588	1.043	0.435	-0.518	2.761
ESG	6,588	26.15	13.46	5.785	69.42
BTM	6,588	0.888	0.553	0.0432	3.001
$\ln MVE$	6,588	21.00	1.361	17.90	24.33
d_ESG	5,856	0.000986	0.130	-1.302	1.986

Source(s): Authors' calculations

To test hypothesis 1 equation (1) was used. Research papers focused on the influence of CSR score on market valuation of stock employ FE and RE models. Both were estimated. The Hausman test showed that the model with FE shows the best results. Then Wald test for groupwise heteroscedasticity in fixed effect regression was used. It showed the presence of heteroscedasticity in the model. In that case, robust standard errors are applied to overcome this problem. Finally, the Wooldridge test for autocorrelation must be done to decide on the final model. This test resulted in $p = 0.18$ implying that there is no autocorrelation in the model and the inclusion of robust standard errors is our final step in defining the appropriate model. The last test to apply is the test for multicollinearity. To do it, the VIF test was applied. The mean value of VIF is 6.03, so there is no multicollinearity in our sample of global CSR firms. Results of model estimation for the global CSR dataset are presented in Table 4.

Interestingly, the RE model reveals that both CSR variables are significant, but according to the Hausman test, we should follow the FE specification. The inclusion of robust standard errors does not change the coefficients of investigation parameters. Therefore, only this FE model is presented in Table 5. One-year difference of CSR scores adjusted to industry average rate appeared to be insignificant in terms of excess stock return over benchmark index in FE model setting. The same implication is attributed to the CSR variable. As for control variables, the book-to-market ratio and logarithm of the market value of equity are significant on a 1% significance level, and they are negative. Beta is not significant in terms of excess

	Ex.Ret	d.ESG	ESG	Beta	BTM	lnMVE
Ex.Ret	1.0000					
d.ESG	-0.253	1.0000				
ESG	-0.0413	0.0331	1.0000			
Beta	-0.0180	0.0037	0.0071	1.0000		
BTM	-0.1071	-0.0175	-0.0906	-0.0146	1.0000	
lnMVE	0.0283	0.0003	0.5101	0.0266	-0.5489	1.0000

Source(s): Authors' calculations

Table 3. Correlation coefficients of variables of global ESG set of companies

Variables	RE CSR global	FE with robust s.e CSR global robust
d_ESG	-0.0922** (0.0462)	-0.0715 (0.0540)
ESG	-0.00149*** (0.000535)	-0.00158 (0.00146)
Beta	-0.0199 (0.0137)	-0.00486 (0.0200)
BTM	-0.101*** (0.0136)	-0.175*** (0.0415)
lnMVE	-0.00496 (0.00633)	-0.136*** (0.0301)
Constant	0.298** (0.134)	3.096*** (0.644)
Observations	5,856	5,856
Number of id	732	0.007

Note(s): Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' calculations

Table 4. Results of models' estimation for global datasets of CSR firms

Table 5.
Results of the FE model
estimation on the
regional data set of the
ESG companies

Variables	FE with robust s.e CSR Asia	FE with robust s.e CSR EU	FE with robust s.e CSR NA
d_ESG	-0.143** (0.0690)	0.163 (0.100)	-6.80e-05 (0.0673)
ESG	0.00532*** (0.00200)	-0.00745*** (0.00217)	-0.00577** (0.00227)
Beta	0.0670** (0.0285)	-0.149*** (0.0473)	0.0356 (0.0271)
BTM	-0.166*** (0.0443)	-0.642*** (0.138)	-0.787*** (0.145)
lnMVE	-0.318*** (0.0463)	-0.0792 (0.0643)	-0.123*** (0.0474)
Constant	6.478*** (0.971)	2.646* (1.448)	3.180*** (1.042)
Observations	4,528	1,120	1960
Number of ids	566	140	245

Note(s): Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source(s): Authors' calculations

stock return. This implies that investors do not consider the firm's ESG rating and do not assign any value to it. This finding contradicts most of the literature that suggests that ESG ratings are at least non-negative but significant. Furthermore, according to empirical papers, even in one region, investors price the CSR performance of companies differently. Hence, *hypothesis 1 is rejected*. At this point, investigating the regional dataset dependence of excess stock returns over benchmark index on ESG ratings is of great interest.

Separate regressions for each region were estimated to test *hypothesis 2*. The selection of the best model to estimate regional datasets can be aggregated as follows. According to the Hausman test, for each of the three datasets, the FE model is more appropriate than the RE model. Then, in each model, we have heteroskedasticity confirmed by the Wald test. Wooldridge test which was applied to check the first-order autocorrelation resulted in the rejection of the null hypothesis. So, the FE model with robust standard errors was applied for each dataset. Results of estimation are presented in [Table 5](#).

Difference between contemporaneous and lagged CSR scores adjusted to the industry average rate is significant at a 5% significance level and negative only in the Asian region. In all three regions, the ESG rating is significant in terms of the deviation of a stock return from a benchmark. In the Asian and European regions, this is significant at a 1%, while in the North American region, it is significant at a 5% significance level. As for the sign of this variable, it is positive only in the Asian region, while in the European and the North American region it is priced negatively. In Europe, this coefficient has the highest absolute value, and if a firm increases its ESG rating by 1 point, it results in a 0.007 percentage points decrease of excess return over the benchmark. The excess stock return also decreases in the North American region but slightly less, on 0.006 percentage points, while in the Asian region excess return is positive in that case and equal to 0.005.

The results in the European region and North America turned out to be the same in sign. Companies' interest in investing in ESG is growing, but the drivers for this are different in different regions. European companies mainly implement ESG projects based on personal beliefs and pressure from external factors – environmental and social. Unlike the companies of North America and Asia, they are less likely to be driven by business opportunities, such as revenue growth through the creation of new, sustainable products and services. In the Asian

region, the dominant factors are customer demand, brand and reputation, as well as regulatory requirements. For companies in North America, the main drivers are employee and brand engagement, while external factors have a minimal impact.

Considering control variables, beta is significant at a 5% significance level and positive in the region. It is also significant on 1% significance level but negative in the European region, while it is insignificant in the American region. Book-to-market is significant at a 1% significance level and negative in all three regions. The logarithm of the market value of equity is significant at a 1% significance level and negative in the Asian and North American regions. *The second hypothesis is confirmed* because regional specifics were revealed.

To estimate, whether the firm's CSR performance follows a U-shape, equation (2) was used on the global and regional datasets. Results of estimation are presented in Table 6. FE model with robust standard errors was estimated on each dataset since Hausman tested the suggested FE model. The results of the Wooldridge test showed an absence of the first-order autocorrelation.

On the global scale, there is no support for the non-linear interaction of ESG rating and excess return. There is weak evidence of a U-shaped relationship on the 10% significance level in the European region. The European companies can increase their investments in ESG projects, and it can result in an increase in stock return but only up to a certain level. If this level is exceeded, the effect might be negative. Financial analysts will have to review the corporate strategy and portfolios more often based on information about ESG. Since we test the significance of variables on a 5% significance level, it can be concluded that there is no region where market valuation could follow the U-shaped relationship pricing CSR performance of a firm. Therefore, *hypothesis 3 is rejected* for all regions except the EU market.

5. Discussion

5.1 Theoretical implications

Thus, the paper has theoretical implications for the issues related to investment in CSR. Our results extend the ideas of the authors (Feng et al., 2021), who also explained the impact of the

Variables	FE with robust s.e CSR global	FE with robust s.e CSR Asia	FE with robust s.e CSR EU	FE with robust s.e CSR NA
ESG	-0.00225 (0.00353)	7.73e-05 (0.00425)	0.0112* (0.00621)	-0.00904 (0.00654)
sq_ESG	7.48e-06 (5.17e-05)	-3.74e-06 (6.30e-05)	-0.000186** (7.92e-05)	0.000107 (9.65e-05)
Beta	-0.0337* (0.0195)	0.0344 (0.0292)	-0.180*** (0.0425)	0.0110 (0.0272)
BTM	-0.113*** (0.0365)	-0.0983** (0.0392)	-0.530*** (0.109)	-0.661*** (0.130)
lnMVE	-0.135*** (0.0253)	-0.280*** (0.0405)	-0.0949 (0.0603)	-0.134*** (0.0376)
Constant	3.087*** (0.541)	5.814*** (0.847)	2.531* (1.390)	3.370*** (0.817)
Observations	6,588	5,094	1,260	2,205
R-squared	0.007	0.017	0.058	0.033
Number of ids	732	566	140	245

Note(s): Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' calculations

Table 6. Results of estimation of non-linear model using CSR datasets

ESG rating on the financial performance of companies based on agency theory and reputation theory.

Hypothesis 1 is confirmed, and our results are inconsistent with some authors. For example, a study (Eng and Fikru, 2021) showed that ESG scores are positively associated with market value and price. Sustainability disclosure in the form of metrics and firm-tailored narratives provides the incremental information content on market value and/or price. Disclosure of information about the sustainable development of the firm provides additional information about the market value and/or price.

This reaction is a result of aggregating firms in one worldwide sample, and it is not the right strategy since in one region it might be significant, while in other regions it is insignificant, and the therefore reliable univocal results cannot be produced. Moreover, in some regions, ESG ratings can be valued positively, while in the other regions investors react negatively.

Hypothesis 2 is confirmed. We can see that the firm's ESG rating in any of these three regions is significant, meaning that investors rely on it. One important point here is that only in the Asian region ESG rating of an enterprise adds value to the firm's stock pricing, while in other two regions, ESG rating generates a negative yield. Another interesting insight we got is that an increase in the one-year difference of ESG rating adjusted to the industry average rate in the Asian region will result in a decrease in stock excess return. This negative influence in absolute terms is greater than a one-point increase in ESG rating. It implies that increasing ESG rating above the industry average rate will be seriously penalized by investors, and this will not be obscured by a positive attitude to a simple one-point increase in ESG rating. Overall, punishment in European and North American regions due to a decrease in excess return or reward for an increase in ESG rating in the Asian region does not appear to have a great impact on returns. On the one hand, the results of the study are partially in line with other studies. For example, the authors (Qoyum *et al.*, 2021) showed the influence of the Islamic label on CSR indicators. On the other hand, a study (Yu and Luu, 2021) found that firms' characteristics explain most of the differences in Bloomberg CSR disclosure by companies, while differences in country factors such as corruption and political rights explain less. The differences in the perception of investors in different countries of CSR information in the study (Eliwa *et al.*, 2021) are explained by the legitimacy and institutional theories. In the short term, it will have a significant impact on portfolio investments, and in the medium term, on the operating models of companies and the economies of many countries. **Hypothesis 3** is partially confirmed.

5.2 Managerial implications

This study confirms these ideas for 3 regions – Asia, North America and Europe. It is the first to relate cultural features of ESG disclosure to its impact on market reactions for innovative industries.

From the practical perspective, our findings are of great value for managers of companies to adjust strategies aimed at stock value growth and for investors to select an investment strategy to maximize return. Our findings could be of great value for management, investors, financial analysts, regulators and various agencies providing guidance on sustainability reporting as well as for educational institutions. Learning CSR can be leveraged to meet industry demand for CSR skills, thereby closing the skills gap, enhancing student employability and increasing the relevance of business school education (Oldford and Willcott, 2022).

5.3 Limitations and future research agenda

In our study, only one CSR assessment method from the Bloomberg system was used. It is possible to add an assessment of CSR disclosure in annual non-financial reporting based on

text analysis using a bag of words. In the future, machine learning methods can be used for evaluation, for example, CART and random forest methods.

There are several directions for further research. One of them is the need to include a country variable to define a country-specific valuation of CSR performance. Some cultural characteristics of a country could increase the explanatory power of a model. Separate estimation of industrial datasets could also explain whether the market value of industries differs. In addition, the research is limited to only one industry, so it seems possible to apply the methodology to other industries.

6. Conclusions

The research examined market reactions to investments in CSR performance. The paper aimed to tackle two issues raised in the empirical studies. First, there is no consensus in the literature, on whether CSR performance is beneficial for a firm or not. Furthermore, it seems challenging to measure the additive value of CSR if it exists. Second, researchers suggest that the market evaluation of firm's CSR performance is industry-specific, and there is no univocal opinion on each of the regions.

This study contributes to the existing literature in several respects. First, considering the global market evaluation of CSR performance of firms measured by ESG score, it was concluded that both lagged and contemporaneous terms are insignificant in terms of excess stock return. On the regional scale, it was found that ESG rating is priced by the European and North American markets negatively, while in the Asian market it is appreciated. This penalty is greater than the reward for one point increase in ESG rating. Furthermore, the CSR performance additive value is close to zero. This explains why empirical studies have ambiguous results on that issue. Our findings on the significance of CSR performance are in line with most research papers.

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GICS	2011	2012	2013	2014	2015	2016	2017	2018	2019
15	24.84	26.12	27.33	27.94	28.64	28.92	30.46	31.73	32.44
20	20.38	21.07	22.33	23.06	24.04	24.47	25.93	27.37	27.99
45	18.32	20.26	21.88	22.39	22.95	23.19	24.87	27.67	28.26

Source(s): Authors' calculations

Table A1.
Industry average ESG
score from 2011 to
2019 years in the Asian
region

GICS	2011	2012	2013	2014	2015	2016	2017	2018	2019
15	40.38	43.47	45.17	45.86	50.45	50.98	52.98	55.08	55.35
20	30.42	34.26	35.72	37.40	37.82	37.92	39.06	40.45	41.37
45	23.47	26.67	28.15	29.42	30.74	30.83	32.15	32.62	32.75

Source(s): Authors' calculations

Table A2.
Industry average ESG
score from 2011 to
2019 years in the
European region

GICS	2011	2012	2013	2014	2015	2016	2017	2018	2019
15	20.64	22.19	23.35	25.24	27.80	28.14	29.98	35.08	36.89
20	15.44	16.55	17.19	17.59	19.16	19.22	20.38	22.98	24.17
45	12.93	14.40	15.60	15.91	17.10	17.21	18.62	20.15	20.60

Source(s): Authors' calculations

Table A3.
Industry average ESG
score from 2011 to
2019 years in North
American region

Corresponding author

Victoria Cherkasova can be contacted at: vcherkasova@hse.ru

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