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Resiliency of Environmental and Social Stocks: An Analysis of the Exogenous COVID-19 Market Crash

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May 2020

Rui Albuquerque
Boston College, CEPR and ECGI

Yrjo Koskinen
University of Calgary

Shuai Yang
University of Calgary

Chendi Zhang
University of Exeter

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Abstract

The COVID-19 pandemic and the subsequent lockdown brought about a massive slowdown of the economy and an unparalleled stock market crash. Using U.S. data, this paper explores how firms with high Environmental and Social (ES) ratings fare during the first quarter of 2020 compared to other firms. We show that stocks with high ES ratings have significantly higher returns and lower return volatilities than other stocks. Firms with high ES ratings and high advertising expenditures perform especially well during the crash. This paper highlights the importance of ES policies in making firms more resilient during a time of crisis

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Keywords: ESG, COVID-19, market crash, stock returns, volatility, customer loyalty

JEL Classifications: G12, G32, M14

Rui Albuquerque*
Professor of Finance and Haub Family Faculty Fellow
Boston College, Carroll School of Management
140 Commonwealth Avenue
Chustnut Hill, MA 02467, United States
phone: +1 617 552 2825
e-mail: rui.albuquerque@bc.edu

Yrjo Koskinen
Associate Dean Research
University of Calgary, Haskayne School of Business
2500 University Drive NW Calgary
Calgary AB T2N 1N4, Canada
phone: +1 403 220 5540
e-mail: yrjo.koskinen@ucalgary.ca

Shuai Yang
Researcher
University of Calgary, Haskayne School of Business
Scuirfield Hall, 2500 University Drive NW
Calgary, AB T2N 1N4, Canada
phone:
e-mail: shuai.yang2@ucalgary.ca

Chendi Zhang
Professor of Finance and Director of Research
Universty of Exeter, Business School
Streathan Court, Renners Drive
Exeter, EX4 4PU, United Kingdom
phone: +44 139 272 4483
e-mail: C.Zhang@exeter.ac.uk

*Corresponding Author

Resiliency of environmental and social stocks: an analysis of the exogenous COVID-19 market crash[1]

Rui Albuquerque[2], Yrjo Koskinen[3], Shuai Yang[4] and Chendi Zhang[5]

The COVID-19 pandemic and the subsequent lockdown brought about a massive slowdown of the economy and an unparalleled stock market crash. Using U.S. data, this paper explores how firms with high Environmental and Social (ES) ratings fare during the first quarter of 2020 compared to other firms. We show that stocks with high ES ratings have significantly higher returns and lower return volatilities than other stocks. Firms with high ES ratings and high advertising expenditures perform especially well during the crash. This paper highlights the importance of ES policies in making firms more resilient during a time of crisis.

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[2] Rui Albuquerque: Carroll School of Management, Boston College, ECGI, CEPR, rui.albuquerque@bc.edu.
[3] Yrjo Koskinen: Haskayne School of Business, University of Calgary, yrjo.koskinen@ucalgary.ca.
[4] Shuai Yang: Haskayne School of Business, University of Calgary, shuai.yang2@ucalgary.ca.
[5] Chendi Zhang: University of Exeter Business School, c.zhang@exeter.ac.uk.

I. Introduction

The magnitude and the speed of the stock market crash in the U.S. and around the world caused by the COVID-19 pandemic and the subsequent economic lockdown took everyone by surprise. The stock market in the U.S. peaked on February 19, and a mere month later prices had declined by almost 30%. Yet, in this rampant stock market sell out, investors were not indiscriminate. This paper documents that stocks with high Environmental and Social (ES) ratings are more resilient during the first quarter of 2020 relative to other stocks. It then asks how ES policies help firms to survive this exogenous and unprecedented stock market crash.

Our first result is that first quarter abnormal returns are significantly correlated with ES ratings in the cross-section, even after controlling for the usual firm characteristics including size, cash to assets, Tobin's Q, dividend yield, volatility, and leverage. An increase in ES ratings equal to one standard deviation is associated with an increase in quarterly returns of 2.9%. Due to evidence (see, e.g. Berg, Koelbel, and Rigobon, 2020) of ESG ratings disagreements between different rating agencies, we use ES ratings from Thomson Reuters Refinitiv for our main results, but we find similar results using MSCI ES scores. One alternative explanation for our findings is that the oil price decline in the first quarter of 2020 affected particularly firms in the energy sector, which are known to score low in some dimensions of ES. We repeat the analysis excluding firms in the energy sector from our sample. We find even stronger results. Another alternative explanation is that some businesses were considered "essential" and kept on operating in a normal fashion. We show that the documented resiliency of high ES rated firms applies also within each industry, ruling out the "essential" firms argument.

Next, we inspect more closely the relation between the returns for firms with high ES ratings and the COVID-19 pandemic. We estimate a difference-in-difference regression of firm-level daily abnormal returns with a COVID event date of February 24,[1] when the stock market decline started. We include a second event date of March 18, when President Trump signed the second Coronavirus Emergency Aid Package, which is the start of an aggressive fiscal and monetary policy response to the pandemic. We control for the second event because we wish to have a cleaner identification of the effect of the COVID-19 pandemic. We find that firms with high ES ratings earn an extra daily return of 0.45% from February 24 until March 17 relative to firms with low ES ratings, for a cumulative difference of 7.2%.

[1] The S&P 500 peaked on February 19, 2020. On Friday, February 21, several municipalities in Northern Italy went into lockdown and subsequently the decline in the S&P 500 accelerated.

We complement the difference-in-difference regressions with a less parametric look into the relation between the returns to ES ratings and the COVID-19 pandemic. Following Ramelli and Wagner (2020), we estimate daily cross-sectional regressions of cumulative abnormal returns of U.S. listed firms and inspect the evolution of the loading on ES ratings over time. We find that the loading on ES ratings is flat from January 1, 2020 until the end of February, which suggests no significant return difference between high- and low-ES firms prior to the COVID shock.[2] It then increases steadily until it plateaus around mid-March, consistent with ES stocks being more resilient during the COVID-19 market crash.

Consistent with the resiliency hypothesis, we also document that high ES rated firms display lower volatility of stock returns during the first quarter of 2020, using the standard deviation of daily log returns, raw and CAPM adjusted, for the first quarter of 2020.[3]

To answer the question of how ES policies help build resiliency, we consider two mechanisms that have been studied in the literature. Albuquerque, Koskinen, and Zhang (2019) present a model where firms with credible ES policies have more loyal customer base and face less price-elastic demands for their products. This in turn leads to reduced exposure for firms to systematic risk and increased valuations. In other words, customer resiliency drives firm's stock resiliency. Heinkel, Kraus, and Zechner (2001) develop a model of segmented capital markets where a polluting firm, held by only a subset of investors, carries greater systematic risk. Consequently, green firms, arguably firms with high ES ratings, would have higher valuations. We use advertising expenditures as a proxy for customer loyalty and show that the effect is twice as large for firms with high ES ratings coupled with high advertising expenditures compared to firms with high ES ratings but low advertising, consistent with Servaes and Tamayo (2013) and Albuquerque et al. (2019). For the second mechanism, we construct a variable that measures the ES preferences of institutional investors. If firms with high ES ratings have owners with a preference for those stocks, then these firms should perform relatively better during a market sell-off. We do not find evidence for this second mechanism.

[2] The online appendix contains a formal test of the parallel trends assumption by regressing daily abnormal returns from January 1, 2020, to February 23, 2020, on a dummy for high ES firm and finds an insignificant coefficient. We conclude that the difference-in-difference specification satisfies the parallel trends assumption.
[3] In addition, in the online appendix, we show that range based volatility of stock returns (daily high price minus the daily low price divided by the average price) declines for high rated ES firms relative to low ES rated firms in a difference-in-difference specification. We also show that daily trading volume increases for high ES rated firms relative to other firms. Both are consistent with the greater resilience of high ES firms.

The evidence in Ferrell, Liang, and Renneboog (2016) that well-governed firms invest more in ES policies supports this view. We show that our results on ES cannot be explained by a good corporate governance effect. In a contemporaneous paper, Shan and Tang (2020) document that Chinese firms with greater employee satisfaction appear to endure the COVID-19 stock market downturn better than other firms, supporting employee satisfaction as one dimension of ES policies creating shareholder value (Edmans, 2011). In our data, there is not enough variation in the employee channel relative to broader ES policies to separately identify their effects.

Stocks with high ES ratings were not the only stocks that perform better during the first quarter of 2020. Acharya and Steffen (2020) provide evidence that firms with access to liquidity perform better during the 1st quarter. Ramelli and Wagner (2020) show that non-financial firms with higher cash holdings and lower financial leverage are less affected than other firms. In a cross-country analysis, Ding, Levine, Lin, and Xie (2020) provide evidence that firms with stronger balance sheets, less exposure to COVID-19 and more sustainable operations perform better during the 1st quarter.

In their paper studying the Great Recession of 2008-2009, Lins, Servaes, and Tamayo (2017) show that U.S. non-financial firms with high ES ratings had better financial performance than other firms.[4] The current crisis is very different from the Great Recession for the speed and nature of the shock. We believe that COVID-19 pandemic provides a cleaner test for the effects of ES policies on stock market performance. First, the speed of the COVID crisis creates the opportunity for an event study analysis in a very short window of time. Within this short window of time firms have very limited ability to respond. In contrast, for the two years that the Great Recession lasted there was plenty of opportunity for firms to adjust to the crisis making it a noisier setting to identify the effect of ESG on stock market performance. Second, the current shock is an unpredictable public health shock that is exogenous to the US economy. In contrast, the Great Recession was economically driven and its origins in the financial sector led to widely held mistrust for financial firms. The implication is that there is potentially a confounding effect between ES policies and trust that limits our ability to discern whether the good performance of firms with high ES ratings in 2007-2008 is attributable to ES policies or to trust: perhaps firms with high ES ratings were somehow less connected to the financial sector and were thus more trusted firms.

[4] Cornett, Erhemjamts, and Tehranian (2016) show that U.S. banks' financial performance during the Great Recession is positively related to their ESG score.

The next section describes the data. Section 3 presents the results and Section 4 discusses robustness. Section 5 concludes.

II. Data

Our main data source on firms' ES performance is Thomson Reuters' Refinitiv ESG database. Refinitiv collects information from corporate annual reports, sustainability reports, non-governmental organizations, and news sources for publicly traded companies at an annual frequency. Refinitiv ESG evaluates firms' environmental (E) performance in three areas: resource use, emissions, and innovation. Social (S) commitments are measured in four areas: workplace, human rights, community, and product responsibility. Governance (G) is evaluated in three dimensions: management, shareholders, and corporate social responsibility strategy. The scores are based on the relative performance of ESG factors within the firm's sector (for E and S) and country (for G) and range from 0 to 100. They have been used in the prior literature, e.g. by Ferrel, Liang and Renneboog (2016) and Dyck, Lins, Roth, and Wagner (2019). Our main measure, ES, is the average of the environment and social scores in 2018 expressed in percentage terms. We thus omit the governance score. As an alternative measure, we show in the online appendix that using firm-level data from MSCI's ESG Research database yields very similar results.

We construct a firm-level investor ES measure based on revealed preference from institutional investors. Investors' ES preference is estimated using institutional investors' equity holdings, following recent studies (Starks, Venkat, and Zhu, 2018, and Gibson, Glossner, Krueger, Matos, and Steffen, 2019). We measure institutional ownership using Thomson Reuters' 13F database, which reports institutional investors' equity holdings. To construct the measure, we first measure an investor's ES preference as the value-weighted average Refinitiv ES score of its portfolio holdings for each quarter in 2018 and then average across the four quarters. Investor-based ES score of a firm is measured as the weighted average of its investors' ES preference based on first quarter of 2019 holdings.

We obtain daily stock returns from Capital IQ North America Daily for the first quarter of 2020 and CRSP from 2017 to 2019. CAPM-adjusted return is estimated as the difference between the daily logarithm return of a stock and the CAPM beta times the daily logarithm market return. The CAPM beta is estimated by using daily returns from 2017 and 2019, where the market index is S&P 500.

Accounting data for 2019 is obtained from Compustat, which are used to construct control variables, i.e. Tobin's Q, Size, Cash, Leverage, Return on Equity, Advertising, and Dividend Yield. We winsorize all control variables at the 1% level in each tail. All variables are described in the Appendix. After matching all datasets, our sample consists of 134,689 firm-day return observations for 2,171 distinct firms. Summary statistics are presented in Table 1.

III. Results

Average return effects

Table 2 presents results of regressing quarterly log returns on firms' ES ratings and other firm characteristics. In column (1) we use ES ratings as the only independent variable. In column (2) we add industry fixed effects, and in column (3) we add firm controls as independent variables. Standard errors are robust to heteroskedasticity. The effect of ES ratings on stock returns is significant at the 1% level or better, even after controlling for all the variables. The magnitude of the coefficient estimate suggests that one standard deviation increase in ES ratings leads to a higher stock return of 2.9% on average (13.6 x 0.212). Firms with high Tobin's Q, larger firms, firms with high cash, lower leverage, lower historical volatility, and lower dividend all perform better (see Ramelli and Wagner, 2020, for a discussion of the role of cash and leverage).

Next, we conduct a difference-in-difference estimation that attempts to demonstrate a tighter link between the performance of firms with high ES ratings and the COVID-19 pandemic. We construct a COVID-19 event dummy. Dummy _COVID equals 1 for each day on or after February 24 until the end of the quarter, and zero otherwise. February 24 is the start of the 'fever' period in Ramelli and Wagner (2020). It is also the first trading day after the first lockdown on European soil, in Northern Italy. We construct a second event dummy to isolate the effect that the U.S. fiscal and monetary policy response to the pandemic had on firms' stock returns. Dummy_Fiscal equals 1 for each day on or after March 18 until the end of the 1st quarter, and zero otherwise. March 18 is the day that President Trump signs the second Coronavirus Emergency Aid Package (CEAP) (the Families First Corona Response Act). The first CEAP signed on March 6 into law is a very small package of $8.3 billion targeted to combat the spread of Coronavirus. The third and largest CEAP (the Coronavirus Aid, Relief, and Economic Security Act) is signed by President Trump on March 27. March 18 is also the date the Federal Reserve begins making purchases under the Commercial Paper Funding Facility to alleviate the strain in short-term credit markets. Our treatment group of firms are represented by a dummy variable (Dummy_ES_High)

that equals one for the top quartile of ES-rated firms and zero for other ES-rated firms, i.e. the control group. A similar identification strategy is used in Lins, Servaes, and Tamayo (2017).

Table 3 contains the results. Column 1 is with no fixed effects and column 2 has both firm and day fixed effects. Standard errors are clustered by firm and day. The results show that the coefficient associated with the interaction between Dummy_COVID and Dummy_ES_High is positive and significant at the 1% level. High ES rated firms earn an average abnormal daily return of 0.45% relative to other firms from February 24 to March 17, for a cumulative effect of 7.2% (0.45% x 16). The results also show that the fiscal response dummy interacted with the high-ES dummy is insignificant. Overall, investors pay more for firms with higher ES ratings as the market collapses in the first quarter of 2020.

To further document the resiliency of stock returns of high ES rated firms, we conduct daily cross-sectional regressions of cumulative stock returns (from start of the quarter to the day) on ES ratings, Tobin's Q, firm size, cash to assets, financial leverage, return on equity and advertising expenditures, and industry fixed effects (as in Ramelli and Wagner, 2020). Figure 1 plots the daily loading on ES ratings, cash to assets, and leverage with 90% confidence bands constructed using heteroskedasticity-robust standard errors. The advantage of this analysis relative to the difference-in-difference regressions is that we do not commit to a particular treatment date to see how the relevancy of ES ratings changes over time. The disadvantage is that it does not give an estimate of the average change in stock returns. The figure shows the loading on ES ratings increasing dramatically sometime at the end of February until it plateaus in mid-March. It describes the building up towards the effect we eventually find in the cross-sectional regressions of quarterly returns (note that the last point estimate in Figure 1 is the point estimate in column 3 of Table 2).[5] Prior to the COVID shock, there is no significant return difference between ES firms and others. The loading on cash to assets also increases reaching similar levels to that of ES, whereas the loading on leverage is negative and falls precipitously post February, consistent with Acharya and Steffen (2020) and Ramelli and Wagner (2020). The reasons for the dramatic effect of ES on returns are analysed next.

Two mechanisms of resiliency

We study two mechanisms that can potentially explain the resiliency of firms with high ES ratings: customer loyalty and investor segmentation. Both mechanisms predict lower systematic risk of high

[5] During the first quarter of 2020, many high-dividend stocks suspended dividend or share repurchase programs. Based on news headline searches on Factiva, the earliest article with such news is dated March 20 from Dow Jones Newswire. It is therefore unlikely that it affects our results for the first quarter.

ES stocks. Luo and Bhattacharya (2009) and Albuquerque, Koskinen, and Zhang (2019) propose that customers are more loyal to firms with a strong reputation and credibility to pursuing ES policies. In Albuquerque et al. (2019) these firms benefit from a lower price elasticity of demand to obtain higher profit margins. These higher profit margins lower operating leverage and reduce firm systematic risk. Intuitively, it is customer resiliency that delivers firm's stock resiliency. Albuquerque et al. (2019) present direct evidence of their mechanism by showing that changes in ROA are less positively correlated with the business cycle for high ES firms. We follow Albuquerque et al. (2019) and others in using advertising expenditures as a measure of customer loyalty. We expect that the effect we find is concentrated on those firms with high advertising expenditures.

The second mechanism adapts the segmented capital markets model of Heinkel, Kraus, and Zechner (2001) where polluting firms are only held by a subset of investors since ES investors choose not to hold them. The lack of diversification that polluting firms have is linked to their higher systematic risk. Also, similarly to customer loyalty, investor loyalty can contribute to the resiliency of ES stocks. The literature on Sustainable and Responsible Investments (SRI) shows that investors are more loyal, and less performance-sensitive to SRI funds than to conventional mutual funds (Bollen, 2007, and Renneboog, Ter Horst, and Zhang, 2011). [6] Our proxy for ES investor preferences is constructed using the idea of revealed preference.[7] We expect that stocks with investors with a preference for ES have less systematic risk.

Table 4 displays the results. In our tests, we expand the difference-in-difference regressions of Table 4 to a triple interaction between Dummy_COVID, Dummy_ES_High, and a dummy indicating the firms in the top quartile of advertising expenditures (in columns 1 and 2), and to a triple interaction between Dummy_COVID, Dummy_ES_High, and a dummy indicating the firms in the top quartile of ES investor preference (in columns 3 and 4). In columns 1 and 2, we find positive estimates of the triple interaction linked to advertising expenditures. Column 2 adds firm and day fixed effects to the regression. In both columns standard errors are clustered by firm and day. Consistent with the predictions from the first mechanism, there is a significant average abnormal return earned by firms with high ES ratings and high advertising expenditures relative to firms with low ES ratings or low advertising expenditures after February 24. The effect is 0.53% in daily returns, which is 76% larger than the effect for low

[6] Using data from Morningstar on the sustainability of mutual funds that explores how their investments are made, Hartzmark and Sussman (2019) show evidence that investors value sustainability.

[7] We also use an alternative investor preference measure of ES, which is the institutional ownership of a firm by pension funds and endowments. Starks, Venkat and Zhu (2018) show the long-term investors have a preference for high ES stocks. We do not find that this measure has any effects.

advertising but high ES firms (0.533/0.302=1.76). Columns 3 to 4 show positive estimates on the triple interaction of interest linked to ES investor preference. However, the estimates are not statistically significant. Economically, the point estimate on the ES investor preference triple interaction is half of the effect estimated in the triple interaction with advertising expenditures. Overall, we find strong support for the first resiliency mechanism.

We end this subsection with a note that while these two mechanisms explain why high ES firms may have lower market beta, they do not fully explain the resiliency that we find, because the dependent variable in the tests above is the CAPM-adjusted stock return. It is possible that market beta may have declined during the 1st quarter for high ES firms generating the increased loading on ES as shown in Figure 1. Further analysis on the profitability and productivity of highly rated ES firms during the COVID-19 pandemic will also help shed light on the customer loyalty mechanism. We leave this avenue for future research.

Volatility of stock returns

Toward the resilience hypothesis of ES firms, we also provide evidence of how volatility of stock returns varies with ES ratings in the cross section. In Table 5 we repeat the regressions in Table 2 using as the dependent variable the standard deviation of daily raw log returns over the quarter (columns 1,2, and 3) and the idiosyncratic volatility calculated as the standard deviation of CAPM-adjusted daily stock returns over the quarter (columns 4, 5, and 6). Standard errors are robust to heteroskedasticity. We find that firms with high ES ratings experience a decrease in stock return volatility as compared to firms with low ES ratings (with the 1% or better of significance level). Overall, the resiliency of high ES stock returns appears to be displayed both in the performance of mean returns as well as in the volatility of returns.

IV. Robustness

We investigate two competing hypotheses. One such hypothesis is that the oil price decline in the first quarter of 2020 affected particularly firms in the energy sector, which are known to score low in some dimensions of ES. Energy sector firms would then have significantly lower returns and higher volatilities relative to other firms. The online appendix shows that the results are even stronger after excluding the firms in the energy sector from our sample.

Another alternative explanation for our results is that some businesses - such as utilities, telecommunication and financial industries - were considered "essential" and kept on operating in a normal fashion. This may have resulted in some resiliency of cash flows and stock returns for these businesses. We investigate the effect on stock returns by industry. We use the Fama-French classification for 12 industries. We repeat the regression specification in Table 3 allowing for triple interactions of Dummy_COVID with the Dummy_ES_High and a dummy for each of the industries. The results are shown in Figure 2. The figure shows that all but one industry display positive point estimates on the interaction between Dummy_COVID and the Dummy_ES_High. Five of those estimates are statistically significant. The one negative point estimates is statistically insignificant. Overall, the figure suggests that our findings are not associated with any particular industry, but encompass most industries. We go one step further to rule out this hypothesis. It is possible that the Dummy_ES_High is not randomly distributed across industries. We then construct a Dummy_ES_High within each industry. This way we are exploiting cross-sectional variation in ES within each industry. The results are very similar to those displayed in Figure 2.

Finally, we consider the separate roles of E and S in ES. Using Refinitiv's scores, we show that the results in the paper are very similar if we use only the E or the S scores. This is perhaps to be expected because the correlation between the two scores is 0.73, and the correlation between the aggregate score ES and either E or S is over 0.91 (untabulated results). Firms appear to do both E and S at the same time and this limits our ability to evaluate their separate contributions.[8] The last component in ESG, the governance score, has only a correlation of 0.52 with the E score and 0.43 with the S score (untabulated). When we rerun our analysis with the G score, we find that the G score explains the cross section of stock returns, but only if other firm characteristics are not included in the regression. Overall, the results with the G score serve to reassure that our main results are not picking up a good governance effect.

V. Conclusion

The first quarter of 2020 was an extraordinary time for U.S. stock markets: first calm before the storm, then the fastest collapse ever followed with a rally. This paper examines how firms with highly rated

[8] We also investigate a potential employee channel within S using Refinitiv's Workplace score. The results are similar to the main results in the paper (except that they are weak in the cross-sectional return regressions), which is perhaps not surprising given the high correlation between Workplace score and ES score of 0.78.

ES policies fare in this tumultuous marketplace. We show that stock prices for those firms perform much better than the prices for other firms. The relative performance boost is comparable to that of firms with large cash balances. The stock market performance is especially strong during the market collapse for high ES stocks with high advertising. In addition, the volatility of stock returns is lower for high ES stocks. The evidence presented in this paper is consistent with the view that consumer behavior is the main driver the resiliency effects of ES policies.

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Table 1: Summary statistics

Variable	Obs.	Mean	Std.Dev.	25%	Median	75%
Abn Return_cum	2,171	-22.971	42.482	-39.841	-17.397	2.803
ES	2,171	0.289	0.212	0.136	0.208	0.384
Investor-based ES	2,123	0.544	0.064	0.514	0.555	0.587
Tobin's Q	1,971	2.268	1.882	1.098	1.545	2.600
Size	2,156	21.555	1.628	20.421	21.438	22.542
Cash	1,972	0.156	0.209	0.023	0.067	0.191
Leverage	1,959	0.321	0.231	0.118	0.307	0.463
ROE	1,971	-0.022	0.691	-0.002	0.092	0.158
Advertising	2,171	0.007	0.020	0.000	0.000	0.002
Historical Volatility	2,171	2.328	1.274	1.451	1.962	2.793
Dividend	1,973	1.735	2.365	0.000	0.905	2.628
Volatility	2,171	6.128	2.954	4.446	5.452	7.037
Idio Volatility	2,171	4.761	3.049	2.973	4.006	5.746
Abn Return	134,689	-0.370	5.650	-1.633	-0.141	1.159

Table 2: Cross-sectional regressions of cumulative abnormal returns

	(1)	(2)	(3)
Dependent variable	Abn Return_cum	Abn Return_cum	Abn Return_cum
ES	16.568***	19.500***	13.574***
	(4.30)	(5.56)	(3.60)
Tobin's Q			3.104***
			(6.41)
Size			1.852***
			(2.94)
Cash			18.258***
			(3.33)
Leverage			-30.943***
			(-7.76)
ROE			1.393
			(0.96)
Advertising			6.759
			(0.17)
Historical Volatility			-4.527***
			(-3.60)
Dividend			-2.562***
			(-5.34)
Constant	-27.756***	-28.603***	-51.807***
	(-17.30)	(-20.25)	(-3.64)
Industry FE	No	Yes	Yes
Number of firms	2,171	2,171	1,945
adj. R2	0.006	0.229	0.368

*Table reports the results of regressions of first quarter 2020 abnormal returns on firms' ES. Standard errors are heteroskedasticity-robust. t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.*

Table 3: Diff-in-Diff regressions for daily abnormal returns

	(1)	(2)
Dependent variable	Abn Return	Abn Return
Dummy_ES_High*Dummy_COVID	0.453***	0.453***
	(3.06)	(3.03)
Dummy_ES_High*Dummy_Fiscal	-0.568	-0.567
	(-0.94)	(-0.94)
Dummy_ES_High	-0.000	
	(-0.00)	
Dummy_COVID	-1.095***	
	(-3.66)	
Dummy_Fiscal	1.280	
	(0.99)	
Constant	-0.127*	-0.397***
	(-1.72)	(-16.38)
Firm FE	No	Yes
Day FE	No	Yes
Number of firm-days	134,689	134,689
adj. R^2	0.007	0.082

*Table reports the results of Diff-in-Diff estimation of daily abnormal returns during the first quarter of 2020. Standard errors are clustered by firm and day. t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.*

Table 4: Triple interactions regressions for abnormal returns

Dependent variable	(1) Abn Return	(2) Abn Return	(3) Abn Return	(4) Abn Return
Dummy_ES_High*Dummy_COVID *Dummy_Advertising_High	0.532**	0.533**		
	(2.35)	(2.33)		
Dummy_ES_High*Dummy_Fiscal *Dummy_Advertising_High	-1.018**	-1.019**		
	(-2.47)	(-2.45)		
Dummy_ES_High*Dummy_COVID *Dummy_InvestorES_High			0.272	0.271
			(1.08)	(1.06)
Dummy_ES_High*Dummy_Fiscal *Dummy_InvestorES_High			0.125	0.127
			(0.28)	(0.28)
Dummy_ES_High*Dummy_COVID	0.302**	0.302**	0.283*	0.284*
	(2.07)	(2.05)	(1.77)	(1.74)
Dummy_ES_High*Dummy_Fiscal	-0.292	-0.292	-0.417	-0.418
	(-0.51)	(-0.51)	(-1.08)	(-1.06)
All dummies and other possible interactions included	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes
Day FE	No	Yes	No	Yes
Number of firm-days	134,689	134,689	131,654	131,654
adj. R^2	0.007	0.082	0.007	0.084

*Table reports the results of triple interactions estimation for daily abnormal returns during the first quarter of 2020. Standard errors are clustered by firm and day. t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.*

Table 5: Volatility regressions

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Volatility	Volatility	Volatility	Idio Volatility	Idio Volatility	Idio Volatility
ES	-2.409***	-2.315***	-1.152***	-2.830***	-2.740***	-0.977***
	(-9.54)	(-9.66)	(-4.89)	(-11.06)	(-11.31)	(-4.36)
Tobin's Q			-0.110***			-0.069***
			(-4.43)			(-2.92)
Size			-0.133***			-0.310***
			(-2.68)			(-6.41)
Cash			-0.547*			-0.307
			(-1.88)			(-1.13)
Leverage			2.753***			2.937***
			(10.96)			(11.66)
ROE			-0.037			-0.097
			(-0.50)			(-1.38)
Advertising			-1.965			1.382
			(-1.05)			(0.84)
Historical Volatility			0.721***			0.680***
			(10.65)			(10.45)
Dividend			0.075**			0.111***
			(2.06)			(2.92)
Constant	6.823***	6.796***	6.950***	5.578***	5.552***	9.161***
	(59.00)	(62.78)	(6.04)	(47.02)	(50.06)	(8.14)
Industry FE	No	Yes	Yes	No	Yes	Yes
Number of firms	2,171	2,171	1,945	2,171	2,171	1,945
adj. R^2	0.030	0.140	0.336	0.038	0.143	0.376

*Table reports results for cross-sectional regressions of Volatility and Idio Volatility on firms' ES during the first quarter of 2020. Standard errors are heteroskedasticity-robust. t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.*

Figure 1. Evolution of coefficients from cross-sectional regressions

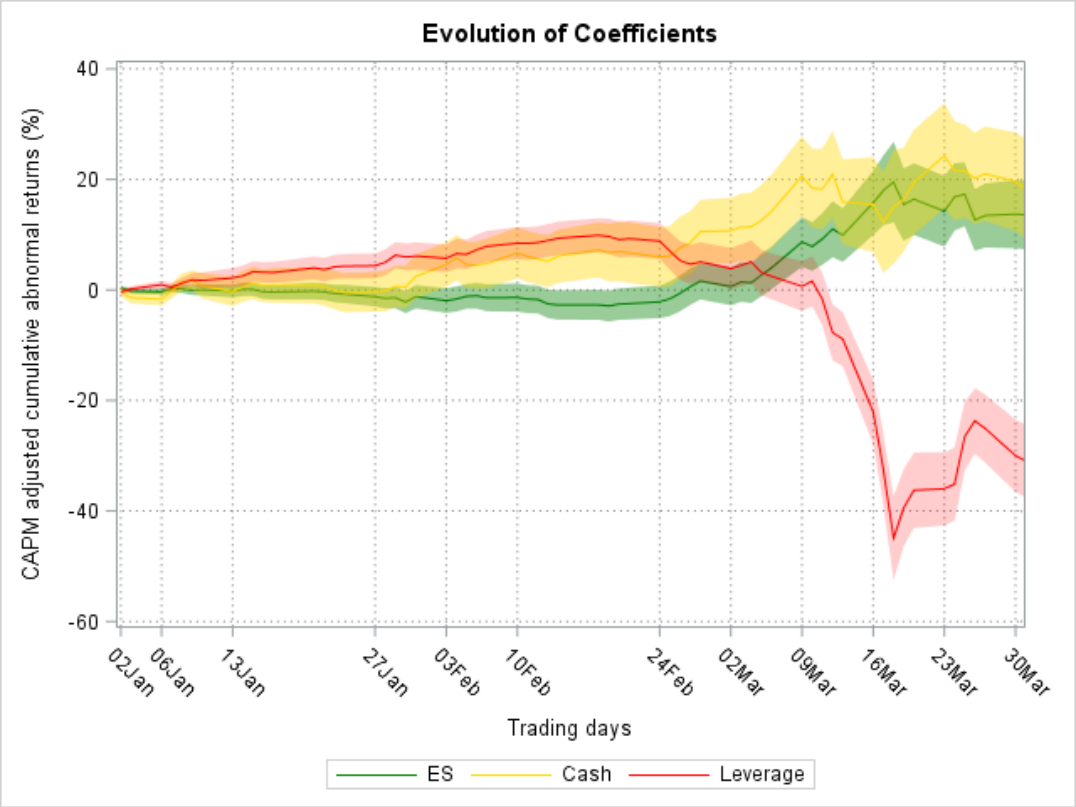
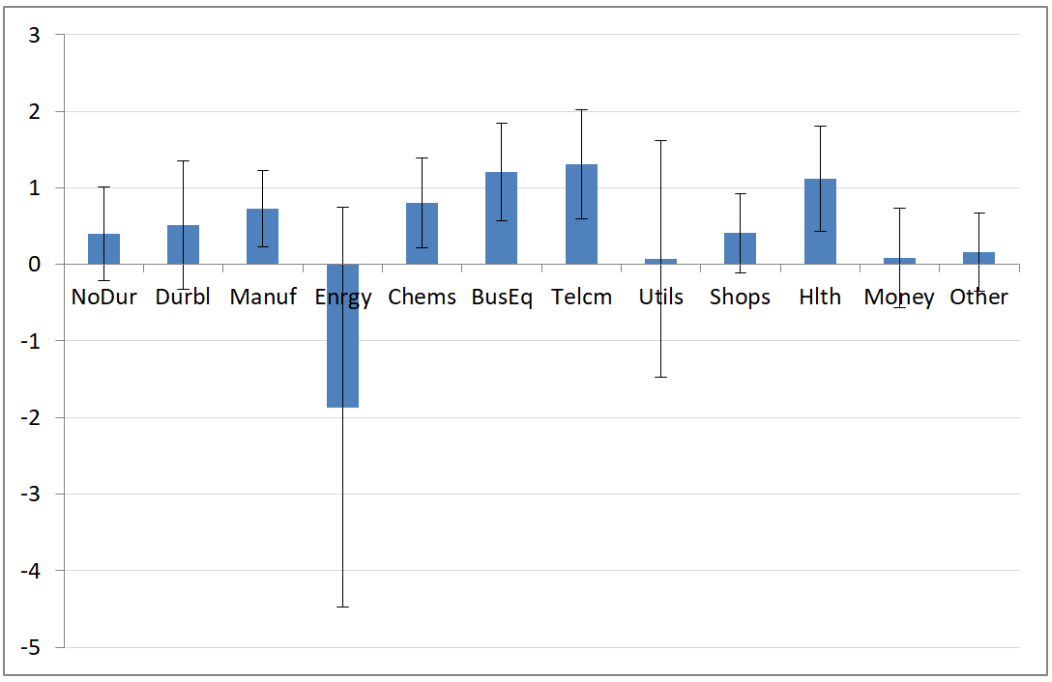


Figure plots the evolution of coefficients on ES ratings, cash to assets, and financial leverage from daily cross-sectional regressions of cumulative stock returns (from the start of the quarter to the day). 90% confidence intervals use heteroskedasticity-robust standard errors.

Figure 2. ES coefficients by industry from triple difference regressions



Regression specification (2) in Table 3 is extended to allow for triple interactions of Dummy_COVID with Dummy_ES_High and a dummy for each of the Fama and French 12 industries. The figure plots the point estimates of the triple-interaction terms with 90% confidence intervals based on heteroskedasticity-robust standard errors.

Appendix: Variables, definitions, and sources.

ES	Average between Refinitiv Environment Pillar Score and Social Pillar Score, divided by 100, measured in 2018. *Dummy_ES_High* is an indicator for firms in the top quartile. *Source: Thomson Reuter's Refinitiv ESG*
Investor-based ES	We first measure an investor's revealed ESG preference as the value-weighted average *ES* score of its portfolio holdings for each quarter in 2018, and then average across the four quarters. A firm's *Investor-based ES* is the weighted average of its investors' ES based on first quarter 2019 holdings. *Dummy_InvestorES_High* is an indicator for firms in the top quartile. *Source: Own calculations based on Thomson Reuter's 13F and Refinitiv ESG*
Dummy_COVID	Dummy variable that equals one from 24th February to 31st March 2020, and zero from the 1st January to 23rd February 2020.
Dummy_Fiscal	Dummy variable that equals one from 18th March to 31st March 2020, and zero from the 1st January to 17th March 2020.
Tobin's Q	Book value of assets (item 6) minus book value of equity (item 60) plus the market value of equity (item 25*item 24), all divided by book value of assets (item 6), measured in 2019. *Source: Compustat*
Size	Natural log of market value of equity (PRCCD*CSHOC) as of 31st December 2019. *Source: Capital IQ North America Daily*
Cash	Cash holdings (item 1) over book assets (item 6), measured in 2019. *Source: Compustat*
Leverage	Book value of debt (item 9+item 34) over book assets (item 6), measured in 2019. *Source: Compustat*
ROE	Ratio of net income (item 172) to book equity (item 60), measured in 2019. *Source: Compustat*
Advertising	Advertising expenditures (item 45) over book assets (item 6). Missing values are set to zero, following past literature, measured in 2019. *Dummy_Advertising_High* is an indicator for firms in the top quartile. *Source: Compustat*
Historical Volatility	Volatility of daily logarithm raw stock returns during 2019. *Source: CRSP*
Dividend	Dividend per share (item 26) over stock price (item 24), multiplied by 100, measured in 2019. *Source: Compustat*
Abn Return	Difference between the daily logarithm return of a stock and the CAPM beta times the daily logarithm market return during the first quarter of 2020, expressed in percentage. The CAPM beta is estimated by using daily returns from 2017 and 2019, where the market index is S&P 500. *Abn Return_cum* is the sum of *Abn Return* over the first quarter of 2020. *Source: CRSP, Capital IQ North America Daily*
Volatility	Volatility of daily logarithm raw returns of stocks during the first quarter of 2020. *Source: Capital IQ North America Daily*
Idio Volatility	Volatility of daily *Abn Return* of stocks during the first quarter of 2020. *Source: Capital IQ North America Daily*

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