DISCUSSION PAPER SERIES

DP14661

LOVE IN THE TIME OF COVID-19: THE RESILIENCY OF ENVIRONMENTAL AND SOCIAL STOCKS

Rui Albuquerque, Yrjo Koskinen, Shuai Yang and Chendi Zhang

FINANCIAL ECONOMICS

ISSN 0265-8003

LOVE IN THE TIME OF COVID-19: THE RESILIENCY OF ENVIRONMENTAL AND SOCIAL STOCKS

Rui Albuquerque, Yrjo Koskinen, Shuai Yang and Chendi Zhang

Discussion Paper DP14661
Published 24 April 2020
Submitted 23 April 2020

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

LOVE IN THE TIME OF COVID-19: THE RESILIENCY OF ENVIRONMENTAL AND SOCIAL STOCKS

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, lower return volatilities, and higher trading volumes 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.

JEL Classification: G12, G32, M14

Keywords: ESG, COVID-19, market crash, Stock returns, volatility, trading volume, Customer loyalty

Rui Albuquerque - rui.albuquerque@bc.edu
Carroll School of Management and CEPR

Yrjo Koskinen - yrjo.koskinen@ucalgary.ca
University of Calgary

Shuai Yang - shuai.yang2@ucalgary.ca
University of Calgary

Chendi Zhang - c.zhang@exeter.ac.uk
University of Exeter

Love in the Time of COVID-19: The Resiliency of Environmental and Social Stocks*

Rui Albuquerque Yrjo Koskinen Shuai Yang Chendi Zhang

April 24, 2020

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, lower return volatilities, and higher trading volumes 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.

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

JEL Classification Codes: G12, G32, M14.

*Rui Albuquerque: Boston College, ECGI, CEPR, rui.albuquerque@bc.edu. Yrjo Koskinen: University of Calgary, yrjo.koskinen@ucalgary.ca. Shuai Yang: University of Calgary, shuai.yang2@ucalgary.ca. Chendi Zhang: University of Exeter, c.zhang@exeter.ac.uk. The usual disclaimer applies.

"Life would still present them with other moral trials, of course, but that no longer mattered: they were on the other shore."

Gabriel Garcia Marquez, *Love in the Time of Cholera*

1 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 and compares the relative performance of stocks with high Environmental and Social (ES) ratings to other stocks and studies why these stocks have turned out to be so resilient during the roller-coaster first quarter of 2020.

Many previous studies show that ES policies provide cash flow and discount rate benefits to firms. In particular, Lins, Servaes, and Tamayo (2017) show that U.S. non-financial firms with high ES ratings had better financial performance than other firms during the Great Recession of 2008-2009. The current crisis is a major economic shock to the economy, like the Great Recession was. However, the COVID-19 pandemic is very different from the Great Recession as the speed and severity of the economic meltdown are unprecedented. Whereas in the Great Recession the unemployment rate in the U.S. climbed to nearly 10% by the end of the recession, in the current crisis, initial claims for jobless benefits reached 11% of the U.S. labor force in just three weeks. Do ES policies that preceded the COVID-19 crisis help firms mitigate the stock market sell out? Is the relative performance of high ES rated stocks better than other stocks, akin to the situation in the Great Recession? Why do ES policies ease the way to "the other shore" - help firms to survive the unprecedented stock market crash? We address these questions in this paper.

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, and leverage. An increase in ES ratings equal to one standard deviation is associated with an increase in quarterly returns of 2.1%. There is 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.

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 two treatment dates, February 24,[1] when the stock market decline started, and March 18, when President Trump signed the second Coronavirus Emergency Aid Package. We include the second treatment date because we wish to identify the effect the COVID-19 pandemic has on stocks. The second treatment date is the start of an aggressive fiscal policy response to the pandemic, which may affect the results from the previous treatment. We find that firms with high ES ratings earned an extra daily return of 0.41% from February 24 until the end of the 1st quarter relative to firms with low ES ratings.

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 till the end of February and then increases consistently afterwards until it plateaus around mid-March. These results are consistent with ES stocks being more resilient during the COVID-19 market crash.

We consider two mechanisms that can potentially explain the resilience of high ES firms. 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. Conse-

[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.

quently, 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 we find is stronger for firms with high ES ratings coupled with high advertising expenditures, consistent with 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. Further, the point estimates of the coefficients describing the first effect are roughly two times larger than the point estimates of the coefficients for the second effect.

We also document that high ES rated firms display lower volatility of stock returns during the first quarter of 2020. We do this in two ways. First, we compute the standard deviation of daily log returns, raw and CAPM adjusted, for the first quarter of 2020. Second, we use a range based volatility measure, high minus low daily prices, and estimate difference-in-difference regressions using daily data. We find that volatility is lower for high rated ES firms under both approaches and for the various measures of volatility. Lastly, we document that daily trading volume increases for high ES rated firms relative to low ES firms after the February 24 treatment date suggesting that some investors stepped in to stop the downward slide in prices, thus also reducing stock return volatility.

We consider two alternative hypotheses for our findings. One alternative explanation 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. This alternative explanation would also predict that highly rated ES firms display relatively lower volatility and higher trading volume. We repeat the analysis excluding the firms in the energy sector from our sample. We find very similar results. Another alternative explanation is that some businesses were considered 'essential' and kept on operating in a normal fashion. This may have resulted in some resiliency of cash flows and of stock returns for these businesses. We show that the documented resiliency of high ES rated firms is not a feature of any particular industry. Ten of the Fama-French 12 industries show resiliency of high ES rated firms during the stock market crash, though with significant coefficients for only five of the industries. Further, we account for within industry variation in ES and find the same results. These results suggest that the effect of ES policies on stock returns is not due to some businesses being considered 'essential' in combatting the pandemic.

Similarly to Lins et al. (2017), Cornett, Erhemjamts, and Tehranian (2016) show that U.S. banks' financial performance during the Great Recession is positively related to their ESG score. This evidence is consistent with a flight to quality during the market downturn. The evidence in Ferrell, Liang, and Renneboog (2016) that well-governed firms invest more in ES policies supports this view. 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). We show that our results on ES cannot be explained by a good corporate governance effect.

Stocks with high ES ratings were not the only stocks that performed better during the first quarter of 2020. Acharya and Steffen (2020) provide evidence that firms with access to liquidity, either through cash or lines of credit, 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. The availability of liquidity is of course valuable in a situation where demand is collapsing and more financially fragile firms may face bankruptcy, but our results are not subsumed by firms' cash or leverage positions. This paper addresses the more complicated question why ES policies provided firms resiliency in the midst of market collapse.

Some recent papers have addressed the relationship between epidemics and stock market developments. Baker, Bloom, Davis, Kost, Sammon, and Viratyosin (2020) show that no other infectious disease outbreak has had such powerful impact on the U.S. stock market. Alfaro, Chari, Greenland, and Schott (2020) link the stock market fall directly to epidemic model revisions of predicted infections. Toda (2020) uses an epidemic model to predict a temporary fall in the stock market of 50%. Schoenfeld (2020) shows that firms systematically underestimated their exposure to the COVID-19 pandemic.

The next section describes the data. Section 3 presents our main results. Section 4 presents robustness results, and Section 4 concludes.

2 Data

Our main data source on firms' ES performance is Thomson Reuters' Refinitiv ESG database, formerly known as Asset4. 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. Refinitiv provides materiality-weighted aggregate scores to investors for each of the three main categories: Environment Pillar Score, Social Pillar Score, and Governance Pillar Score. 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 Pillar Score.

As an alternative measure, we also obtain firm-level data from MSCI's ESG Research database, previously known as KLD. Firms are rated on a variety of strengths and concerns on seven attributes: community, diversity, employee relations, environment, product, human rights, and governance. We exclude corporate governance attributes from our analysis to focus on non-governance aspects of ESG. We measure ES as the difference between the number of strengths and the number of concerns for each firm in 2016, the last year for which data is available. Given that the number of individual concerns and strengths in each attribute varies over time and across firms, we divide the number of strengths (concerns) for each firm-year across all six ES categories by the maximum possible number of strengths (concerns) in all six categories for each firm. We then subtract the scaled concerns from the scaled strengths to obtain our alternative measure, ES-MSCI, which is bounded between -1 and 1. Our results are very similar using the alternative way of measuring firms' ES performance.

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 collected from regulatory authorities, fund reports, fund associations, and fund management companies at a quarterly frequency. 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 holdings in the first quarter of 2019.

We obtain daily stock returns, daily high and low prices, and trading volumes 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.[2] 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, and Advertising. 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. Figure 1 depicts the stock market performance of the S&P 500 during the first quarter of 2020, with both treatment dates (the 24th February and 18th March 2020) indicated.

[Insert Table 1 and Figure 1 here]

3 Results

Our first results focus on mean stock return effects.

[2] Our results are similar if instead we use arithmetic returns.

3.1 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 Tobin's Q, firm size, cash to assets, financial leverage, return on equity, and advertising expenditures as independent variables. The effect of ES ratings on stock returns is significant at 5% 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 2.1% on average (9.9×0.212). Firms with high Tobin's Q, larger firms, firms with high cash, and lower leverage all preform better (see Ramelli and Wagner, 2020, for a discussion of the role of cash and leverage).

[Insert Table 2 here]

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 treatment 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 in European soil, in Northern Italy. We construct a second treatment dummy to isolate the effect that the U.S. fiscal 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 signed the second Coronavirus Emergency Aid Package (the Families First Corona Response Act). The first Coronavirus Emergency Aid Package was a very small package of $8.3 billion targeted specifically to combat the spread of Coronavirus and was signed by President Trump on March 6. The third and largest Coronavirus Emergency Aid Package (the Coronavirus Aid, Relief, and Economic Security Act) was signed by President Trump on March 27.

[Insert Table 3 here]

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 a dummy variable that equals one for the top quartile of ES rated firms (Dummy_ES_High) is positive and significant at the 5% level. High ES rated firms earn an average abnormal daily return of 0.41% relative to other firms from February 24 to March 31 (corresponding to 10% cumulative abnormal return for high ES firms relative to others). 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 (all lagged 2019 values), and industry fixed effects (as in Ramelli and Wagner, 2020). Figure 2 plots the daily loading on ES ratings, cash to assets, and leverage with two standard error bands. The advantage of this analysis relative to the difference-in-difference regressions is that we do not commit to a particular treatment date. The disadvantage is that it does not give an estimate of the average change in stock returns, but rather how the relevance of ES ratings as an explanatory variable changes over time. 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 2 is the point estimate in column 3 of Table 2). The loading on cash to assets also increases reaching similar levels to that of ES. The loading on leverage is negative and falls precipitously with the crisis. This evidence is consistent with Acharya and Steffen (2020) and Ramelli and Wagner (2020). The reasons for the dramatic effect of ES on returns are analyzed next.

[Insert Figure 2 here]

3.2 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 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 some 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). In that model, 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 then leads to higher systematic risk for these firms. Also, in parallel 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 Hort, and Zhang, 2011). Our proxy for ES investor preferences is constructed using the idea of revealed preference.[3] We expect that stocks with investors with a preference for ES have less systematic risk and are more resilient.[4]

[3]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.

[4]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.

[Insert Table 4 here]

Table 4 displays the results. In our tests, we repeat the difference-in-difference regressions of Table 4, expanding the interactions 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 point estimates on 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 0.54% in daily returns. Columns 3 to 4 show positive point estimates on the triple interaction of interest linked to ES investor preference. However, the point 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, however, possible that market beta may have declined during the 1st quarter for high ES firms and that is the reason for the increased loading on ES in the cross sectional regressions that give rise to Figure 2. 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.

3.3 Volatility of stock returns and trading volume

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. Table 5 presents the results.

In panel A, 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). In panel B, we repeat the regressions in Table 3 using as dependent variable a range measure of daily volatility, the daily high price minus the daily low price divided by the average price.

[Insert Table 5 here]

In all regression specifications, we find that firms with high ES ratings experience a decrease in stock return volatility as compared to firms with low ES ratings (1% or better of significance). Panel B, which uses a daily measure of volatility, suggests that the change in volatility can be traced to the Dummy_COVID treatment variable. There is a drop in range based volatility of stock returns for high rated ES firms relative to low ES rated firms (an amount equal to 10% of the sample average of volatility of the daily price range), even though volatility increases for all firms after the COVID-19 crisis. 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. Panel B suggests that the fiscal policy treatment dummy has an added effect contributing to even lower volatility of high ES rated firm returns relative to firms with low ES ratings.

We add one final piece of evidence consistent with our resiliency hypothesis using data on daily trading volume. Table 6 contains the results. In Table 6, we repeat the regression specifications of Table 3 but with daily stock trading volume as the dependent variable. The results in Table 6 show a strong increase on daily volume after February 24 for high ES rated firms relative to other firms (an amount equal to 2.05 million shares, which represents a doubling of the trading volume for the average firm), even though trading volume increased for all firms with the COVID-19 crisis. There is a further increase in trading volume with the Dummy_Fiscal for high ES rated firms, but it is of smaller size and only significant in the specification without fixed effects.

[Insert Table 6 here]

4 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, higher volatilities, and possibly also lower trading volumes relative to other firms if liquidity moved out of that sector. We repeat the analysis excluding the firms in the energy sector from our sample and find very similar results.

Another alternative explanation for our results is that some businesses 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 3. The figure shows that ten out the twelve industries display positive point estimates on the interaction between Dummy_COVID and the Dummy_ES_High. Five of those estimates are statistically significant. The two negative point estimates are both statistically insignificant. Overall, the figure suggests that our findings are not associated with any one industry in particular, 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 of this analysis are very similar to those displayed in Figure 3.

[Insert Figure 3 here]

We conduct several robustness tests. First, we augment the list of firm level variables in the cross sectional regressions of quarterly stock returns and quarterly volatility of stock returns with operating leverage and measures of institutional ownership. Operating leverage, calculated as in Albuquerque et al. (2019) and others, leads to a significant drop in observations. Still, our results hold and are quantitatively similar.

Second, we redo the analysis with MSCI ES ratings. The latest ratings available date back to 2016 and also have a slightly smaller sample relative to Refinitiv's ES ratings. We find very similar results with the proxy for ES constructed with MSCI ES data as in Albuquerque et al. (2019). While the MSCI ratings are from 2016, firm ES ratings are fairly sticky, which may explain the results. Another possible explanation for the similarity in results despite the lag in measurement of the ES proxy is that investors care about firm reputation and credibility for ES policies and such reputation depends on a track record of ES performance.

Third, we change the Dummy_COVID to equal 1 from January 30 onwards. January 30 is the day the World Health Organization declares the outbreak a public health emergency. The results corresponding to tables 3, 4, table 5 panel B, and table 6 are somewhat weaker because the coefficients of interest are smaller, but retain significance at 10% level or higher.

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 score or if we use only the S score. 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.

The last component in ESG, the governance score, has only a correlation of 0.52 with the E score and 0.42 with the S score (untabulated). When we rerun our results 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. The G score, however, is also associated with a decline in volatility of returns and with an increase in trading volume. The magnitude of the G score effects, though, is smaller than that of either the E or S score effects. Overall, the results with the G score serve to reassure that our main results are not picking up a good governance effect.

5 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, and ending with a tremendous rally. This paper examines how firms with highly rated environmental and social policies fare in the 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 that also advertise a lot. In addition, the volatility of stock returns is lower for high ES stocks, while the trading volume is higher. The evidence presented in this paper is consistent with the view that consumer behavior is the main driver the resiliency effects of ES policies.

References

[1] Acharya, V.V., and Steffen, S., 2020. The Risk of Being a Fallen Angel and the Corporate Dash for Cash in the Midst of COVID, *CEPR COVID Economics.*

[2] Albuquerque, R., Koskinen, Y., and Zhang, C., 2019. Corporate Social Responsibility and Firm Risk: Theory and Empirical Evidence, *Management Science* 65, 4451-4469.

[3] Alfaro,L., Chari, A., Greenland, A., and Schott, P. K., 2020. Aggregate and Firm-Level Stock Returns During Pandemics, in Real Time, *CEPR COVID Economics* 4, 2-24.

[4] Baker, S. R., Bloom, N., Davis, S.J., Kost, K., Sammon, M., and Viratyosin, T., 2020. The Unprecedented Stock Market Reaction to COVID-19, *CEPR COVID Economics* 1, 33-42.

[5] Berg, F., Koelbel, J.F., and Rigobon, R., 2020. Aggregate Confusion: The Divergence of ESG Ratings, MIT Sloan School Working Paper 5822-19.

[6] Bollen, N.P., 2007. Mutual Fund Attributes and Investor Behavior, *Journal of Financial and Quantitative Analysis* 42, 683-708.

[7] Cornett, M. M., Erhemjamts, O., and Tehranian H., 2016. Greed or Good Deeds: An Examination of the Relation Between Corporate Social Responsibility and the Financial Performance of U.S. Commercial Banks around the Financial Crisis, *Journal of Banking and Finance* 70, 137-159.

[8] Dyck, A. , Lins, K.V. , Roth, L. , Wagner, H.F., 2019. Do Institutional Investors Drive Corporate Social Responsibility? International Evidence, *Journal of Financial Economics* 131, 693-714.

[9] Edmans, A., 2011. Does the Stock Market Fully Value Intangibles? Employee Satisfaction and Equity Prices, *Journal of Financial Economics* 101, 621-640.

[10] Ferrell, A., Liang, H., and Renneboog, L., 2016. Socially Responsible Firms, *Journal of Financial Economics* 122, 585-606.

[11] Garcia Marquez, G., 1988. *Love in the Time of Cholera,* New York: Alfred A. Knopf.

[12] Gibson, R., Glossner, S., Krueger, P., Matos, P., Steffen, T., 2019. Responsible Institutional Investing Around the World, Swiss Finance Institute Research Paper no. 19-67.

[13] Hartzmark, S., and Sussman, A. B., 2019. Do Investors Value Sustainability? A Natural Experiment Examining Ranking and Fund Flows, *Journal of Finance* 74, 2789-2837.

[14] Heinkel, R., Kraus, A., and Zechner, J., 2001. The Effect of Green Investing on Corporate Behavior, *Journal of Financial and Quantitative Analysis* 36, 431-449.

[15] Lins, K. V., Servaes, H., and Tamayo, A., 2017. Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility During the Financial Crisis, *Journal of Finance* 72: 1785-1824.

[16] Luo, X., and Bhattacharya, C. B., 2009. The Debate over Doing Good: Corporate Social Performance, Strategic Marketing Levers, and Firm-Idiosyncratic Risk, *Journal of Marketing* 73, 198-213.

[17] Ramelli, S. and Wagner, A. F., 2020. Feverish Stock Price Reactions to COVID-19, Swiss Finance Institute Research Paper Series no. 20-12.

[18] Renneboog L., Ter Horst, J., and Zhang, C., 2011. Is Ethical Money Financially Smart? Nonfinancial Attributes and Money Flows of Socially Responsible Investment Funds, *Journal of Financial Intermediation* 20, 562-588.

[19] Shan, C., and Tang, D. Y., 2020. The Value of Employee Satisfaction in Disastrous Times: Evidence from COVID-19, University of Hong Kong Working Paper.

[20] Starks, L. , Venkat, P. , Zhu, Q. , 2017. Corporate ESG Profiles and Investor Horizons, University of Texas at Austin Working Paper.

[21] Toda, A. A., 2020. Susceptible-Infected-Recovered (SIR) Dynamics of COVID-19 and Economic Impact, *CEPR COVID Economics* 1, 43-63.

Table 1
Summary statistics

This table reports the summary statistics (number of observations, mean, standard deviation, 25th, 50th (median) and 75th percentiles) for all variables. The Appendix provides the definition and data sources for all variables.

Variable	Obs.	Mean	Std.Dev.	25%	Median	75%
Abn Return_cum	2,171	-22.875	42.412	-39.780	-17.374	2.753
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
Volatility	2,171	6.128	2.954	4.446	5.452	7.037
Idio Volatility	2,171	4.768	3.049	2.977	4.010	5.747
Abn Return	134,689	-0.369	5.655	-1.633	-0.140	1.159
Volume	137,493	1.957	5.406	0.197	0.584	1.648
DayPrc_range	137,494	0.060	0.066	0.019	0.038	0.078

Table 2
Cross-sectional regressions of returns

This table reports the results of regressions of first quarter 2020 abnormal returns on firms' ES under several specifications: without firm controls (specification 1), with industry fixed effects (specification 2), and with industry fixed effects and firm controls (specification 3). The numbers in parentheses are t-statistics. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The Appendix contains a detailed description of all the variables.

	(1)	(2)	(3)
Dependent variable	Abn Return_cum	Abn Return_cum	Abn Return_cum
ES	15.283***	18.251***	9.913**
	(3.58)	(4.71)	(2.40)
Tobin's Q			3.638***
			(7.11)
Size			3.019***
			(5.13)
Cash			10.559**
			(2.02)
Leverage			-39.450***
			(-11.68)
ROE			1.817
			(1.62)
Advertising			-2.019
			(-0.05)
Constant	-27.289***	-28.147***	-87.750***
	(-17.81)	(-20.46)	(-7.29)
Industry FE	No	Yes	Yes
Number of firms	2,171	2,171	1,945
adj. R^2	0.005	0.229	0.346

Table 3
Diff-in-Diff regressions for abnormal returns

This table reports the results of Diff-in-Diff estimation of daily abnormal returns during the first quarter of 2020. *Dummy_ES_High* equals one for high ES firms, and zero otherwise. *Dummy_COVID* equals one from 24th February to 31st March 2020, and zero before this period. *Dummy_Fiscal* equals one from 18th March to 31st March 2020, and zero before this period. Firm and day fixed effects are (not) included in Specification 2 (1). Standard errors are clustered by firm and day. The numbers in parentheses are t-statistics. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The Appendix contains a detailed description of all the variables.

Dependent variable	(1) Abn Return	(2) Abn Return
Dummy_ES_High*Dummy_COVID	0.410**	0.410**
	(2.63)	(2.60)
Dummy_ES_High*Dummy_Fiscal	-0.522	-0.522
	(-0.86)	(-0.86)
Dummy_ES_High	0.002	
	(0.06)	
Dummy_COVID	-1.077***	
	(-3.57)	
Dummy_Fiscal	1.261	
	(0.98)	
Constant	-0.128*	-0.393***
	(-1.73)	(-16.00)
Firm FE	No	Yes
Day FE	No	Yes
Number of firm-days	134,689	134,689
adj. R^2	0.007	0.082

Table 4
Triple interactions regressions for abnormal returns

This table reports the results of triple interactions estimation for daily abnormal returns during the first quarter of 2020. *Dummy_ES_High* equals one for high ES firms, and zero otherwise. *Dummy_COVID* equals one from 24th February to 31st March 2020, and zero before this period. *Dummy_Fiscal* equals one from 18th March to 31st March 2020, and zero before this period. Specifications 1 and 2 (3 and 4) are triple interaction regressions for high *Advertising* (*Investor-based ES*) firms. Firm and day fixed effects are (not) included in Specifications 2 and 4 (1 and 3). Standard errors are clustered by firm and day. The numbers in parentheses are t-statistics. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The Appendix contains a detailed description of all the variables.

Dependent variable	(1) Abn Return	(2) Abn Return	(3) Abn Return	(4) Abn Return
Dummy_ES_High*Dummy_COVID *Dummy_Advertising_High	0.536**	0.536**		
	(2.37)	(2.35)		
Dummy_ES_High*Dummy_Fiscal* Dummy_Advertising_High	-1.022**	-1.023**		
	(-2.49)	(-2.46)		
Dummy_ES_High*Dummy_COVID *Dummy_InvestorES_High			0.263	0.262
			(1.06)	(1.04)
Dummy_ES_High*Dummy_Fiscal* Dummy_InvestorES_High			0.135	0.137
			(0.31)	(0.30)
All dummies entered separately	Yes	Yes	Yes	Yes
All possible interactions entered	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	0.083

Table 5
Volatility regressions

This table reports the regression results for the volatility of stock returns during the first quarter of 2020. Panel A reports results for cross-sectional regressions of *Volatility* and *Idio Volatility* on firms' ES under several specifications: without firm controls (specifications 1 and 4), with industry fixed effects (specifications 2 and 5), and with industry fixed effects and firm controls (specifications 3 and 6). Panel B reports the results of Diff-in-Diff estimation for the daily price range during the first quarter of 2020. *Dummy_ES_High* equals one for high ES firms, and zero otherwise. *Dummy_COVID* equals one from 24th February to 31st March 2020, and zero before this period. *Dummy_Fiscal* equals one from 18th March to 31st March 2020, and zero before this period. Firm and day fixed effects are (not) included in Specification 2 (1). Standard errors are clustered by firm and day. The numbers in parentheses are t-statistics. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The Appendix contains a detailed description of all the variables.

Panel A: Cross-sectional regressions for volatility

Dependent variable	(1) Volatility	(2) Volatility	(3) Volatility	(4) Idio Volatility	(5) Idio Volatility	(6) Idio Volatility
ES	-2.377***	-2.271***	-0.977***	-2.814***	-2.723***	-0.810***
	(-8.19)	(-8.06)	(-3.52)	(-9.32)	(-9.27)	(-2.90)
Tobin's Q			-0.155***			-0.116***
			(-4.54)			(-3.37)
Size			-0.345***			-0.507***
			(-8.76)			(-12.76)
Cash			0.664*			0.814**
			(1.92)			(2.31)
Leverage			3.189***			3.518***
			(14.08)			(15.42)
ROE			-0.167**			-0.217***
			(-2.23)			(-2.87)
Advertising			0.549			3.599
			(0.22)			(1.44)
Constant	6.806***	6.776***	12.981***	5.582***	5.555***	14.816***
	(65.79)	(68.14)	(16.08)	(51.56)	(53.31)	(18.23)
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	0.282	0.038	0.143	0.328

Table 5 (continued)

Panel B: Diff-in-Diff regressions for the daily price range

Dependent variable	(1) DayPrc_range	(2) DayPrc_range
Dummy_ES_High*Dummy_COVID	-0.006***	-0.006***
	(-3.48)	(-3.33)
Dummy_ES_High*Dummy_Fiscal	-0.006*	-0.006*
	(-1.92)	(-1.84)
Dummy_ES_High	-0.010***	
	(-11.56)	
Dummy_COVID	0.055***	
	(5.86)	
Dummy_Fiscal	0.045***	
	(2.78)	
Constant	0.032***	0.061***
	(42.75)	(335.29)
Firm FE	No	Yes
Day FE	No	Yes
Number of firm-days	137,494	137,494
adj. R^2	0.323	0.622

Table 6
Trading volume regressions

This table reports the results of Diff-in-Diff estimation for daily trading volume of stocks during the first quarter of 2020. *Dummy_ES_High* equals one for high ES firms, and zero otherwise. *Dummy_COVID* equals one from 24th February to 31st March 2020, and zero before this period. *Dummy_Fiscal* equals one from 18th March to 31st March 2020, and zero before this period. Firm and day fixed effects are (not) included in Specification 2 (1). Standard errors are clustered by firm and day. The numbers in parentheses are t-statistics. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The Appendix contains a detailed description of all the variables.

Dependent variable	(1) Volume	(2) Volume
Dummy_ES_High*Dummy_COVID	2.051***	2.051***
	(7.34)	(6.84)
Dummy_ES_High*Dummy_Fiscal	0.418*	0.418
	(1.78)	(1.42)
Dummy_ES_High	1.890***	
	(8.11)	
Dummy_COVID	0.695***	
	(8.38)	
Dummy_Fiscal	0.185	
	(1.55)	
Constant	0.911***	1.716***
	(19.01)	(53.77)
Firm FE	No	Yes
Day FE	No	Yes
Number of firm-days	137,493	137,493
adj. R^2	0.075	0.727

Figure 1. S&P 500 during the first quarter of 2020
This figure plots the stock market path of S&P 500 during the first quarter of 2020. The red lines mark our two treatment dates.

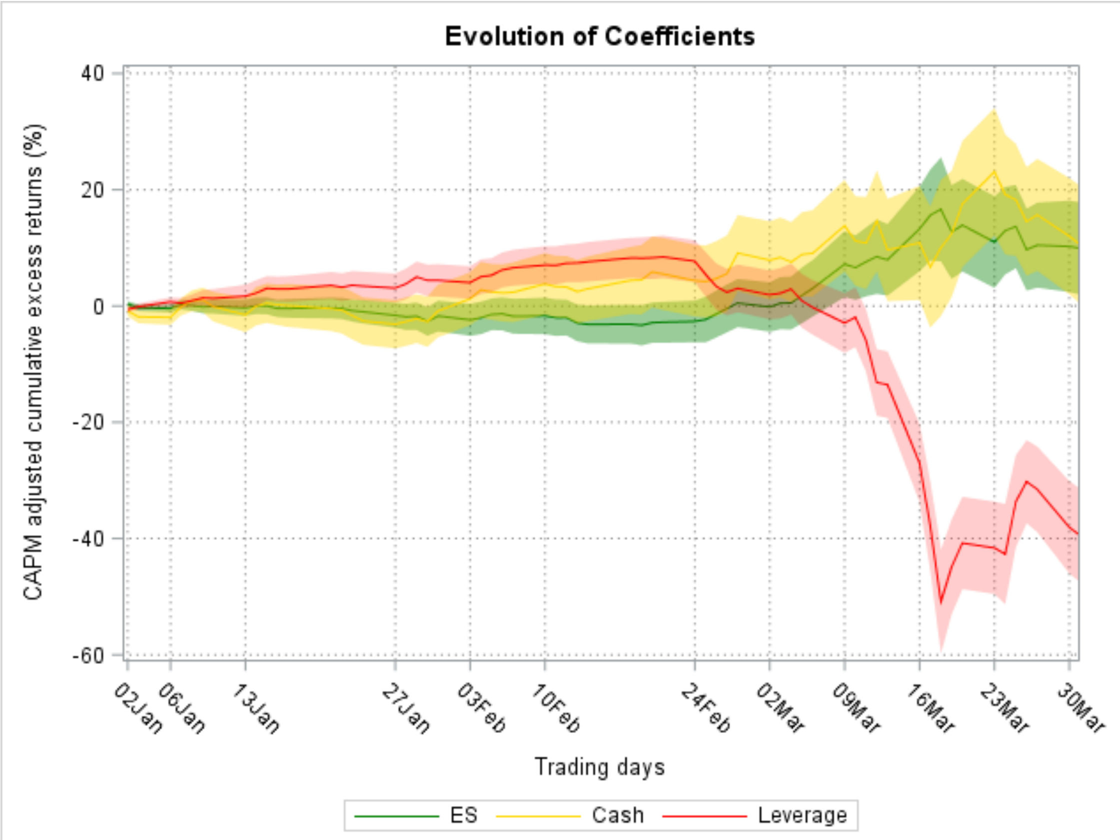

Figure 2. Evolution of coefficients during the first quarter of 2020
This figure plots the evolution of coefficients during the first quarter of 2020 from daily cross-sectional regressions of cumulative stock returns (from the start of the quarter to the day) on ES ratings, Tobin's Q, firm size, cash to assets, financial leverage, return on equity and advertising expenditures (all lagged 2019 values), and industry fixed effects. It plots the daily loading on ES ratings, cash to assets, and leverage with two-standard-error bands.

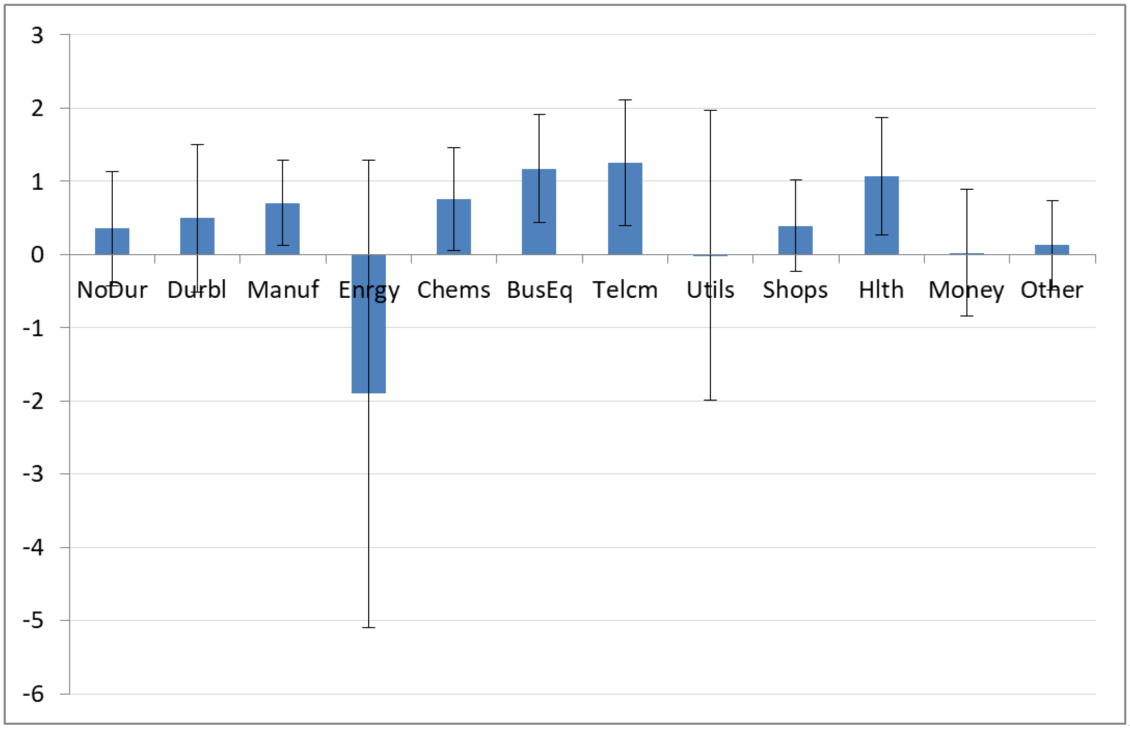

Figure 3. Abnormal returns from ES by industry

We extend the regression specification (2) in Table 3 by allowing 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 two-standard-error bands.

Appendix: Variables, definitions, and sources.

This table presents the variable definitions and data sources. Compustat and CRSP items are in brackets.

ES	The average between Refinitiv Environment Pillar Score and Social Pillar Score, divided by 100 and measured in 2018. Environment (Social) Pillar Score is the weighted average relative rating of a company based on the reported environmental (social) information and the resulting three (four) environmental (social) category scores. *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. *Investor-based ES* of a firm is measured as the weighted average its investors' ES based on holdings at the first quarter of 2019. *Dummy_InvestorES_High* is an indicator for firms in the top quartile. *Source: Own calculation based on Thomson Reuter's 13F and Refinitiv ESG*
ES-MSCI	We divide the number of strengths (concerns) for each firm-year across all six ES categories excluding governance by the maximum possible number of strengths (concerns) in all six categories for each firm-year, to ensure comparability over time and across firms. We then subtract the scaled concerns from the scaled strengths to obtain a net measure. It is measured in 2016. *Source: MSCI's ESG Research*
Dummy_COVID	A dummy variable equals one from 24th February to 31st March 2020, and zero from the 1st January to 23rd February 2020.
Dummy_Fiscal	A 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	The book value of assets (item 6) minus book value of equity (item 144) plus the market value of equity (item 25* item 24), all divided by book value of assets (item 6). It is measured in 2019. *Source: Compustat*
Size	The natural log of the 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 operating income (item 13) to book equity (item 144), measured in 2019. *Source: Compustat*
Advertising	Advertising expenditures [XAD] over total assets [AT]. Missing values are set to zero, following the past literature. *Dummy_Advertising_High* is an indicator for firms in the top quartile. It is measured in 2019. *Source: Compustat*
Abn Return	The 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	The volatility of daily logarithm raw returns of stocks during the first quarter of 2020. *Source: Capital IQ North America Daily*
Idio Volatility	The volatility of daily *Abn Return* of stocks during the first quarter of 2020. *Source: Capital IQ North America Daily*
Volume	Daily trading volume [CSHTRD] of a stock during the first quarter of 2020. Daily trading volume is adjusted for stock splits and dividends. CSHTRD is divided by 1 million to reflect daily trading volumes in unit of millions. *Source: Capital IQ North America Daily*
DayPrc_range	Daily high-low price range of a stock during the first quarter of 2020, scaled by the midpoint of high and low daily prices. The high (low) price [PRCHD] ([PRCLD]) is the highest (lowest) trade price for the date. *Source: Capital IQ North America Daily*