ESG ratings and Stock Market Performance under COVID-19 event.

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Abstract

The purpose of this study is it to measure the impact of ESG ratings, as well as its components to the firms' abnormal returns, during a crisis period such as the COVID-19 pandemic. The methodology pursued is an event study approach, which is trying to identify the impact that COVID-19 announcement day had on stock prices, its changes and speed of changes, given the firm's ESG ratings, both as an aggregate figure, as well as their individual pillars. Two different sets of data are used; the listed US S&P 500 firms and the UK FTSE-100 firms. A multivariate analysis, is also employed in order to assess the effects of ESG scores on the abnormal returns of listed companies' stock prices. The results obtained, differ among the two markets. In US there is an immediate positive response to the event, while the low ESG firms are the ones that perform better under crisis conditions. In the UK market, a negative effect is observed on firm's performance, including those with firms that have low ESG scores. Examining each ESG individual component, only the US market's 'S' component demonstrates a positive response. The results of the multivariate analysis conducted revealed positive effect on abnormal returns only on high ESG and high G score for US companies. In UK no pattern was noted. The key contribution of this study in literature, is the identification of the effect that ESG ratings have on firms' stock prices in a crisis period, noted by COVID-19. Investors and business stakeholders can utilize the results of this study to further support their decision-making process.

Keywords ESG, COVID-19, abnormal returns, event study, regression analysis

1. Introduction

The importance of Environmental, Social, and Governance (ESG) considerations in corporate decision-making process, has increased significantly over the last years, generating significant both academic and professional interest in identifying their impact on the companies' stock price and financial performance. Based on regulations that define the way that ESG scores are measured, thus evaluate a company's commitment to both sustainable and ethical practices, such scores have become critical benchmarks for the listed companies, investors and regulators, indicating resilience and risk control. On the other hand, the reaction of the capital markets towards events that caused significant value decrease to the listed companies, classified as "financial crisis" (caused by financial & non-financial events, such as the COVID-19 pandemic), has been explored extensively by academics and policy makers, so as to avoid the negative consequences in case of future repetition. In an effort to combine these two areas of interest, the purpose of this study is to assess the impact of COVID-19 on abnormal returns for firms in light of their ESG rating status. For the purpose of the study, two sets of samples of US S&P 500 and UK FTSE-100 firms are utilized, and abnormal returns of stock prices are estimated by applying an event study methodology, and the effects of ESG on these returns are assessed with linear regressions. The findings of this study aim to contribute to the growing body of literature on ESG and crisis connection, by offering quantitative results of how ESG scores affect stock price performance in periods of crisis, such as the COVID-19. Moreover, the individual analysis of ESG components individually, namely E, S, and G, allow for a deeper understanding of the distinct roles that such dimensions play in shaping the post-crisis stock price performance.

The approach that is followed, is twofold. On one hand, using monthly data for a period 2016-2024, event studies are implemented, for both US and UK markets (on the companies that consist the most important indices per market, namely S&P 500, respectively FTSE-100 index), setting as event date the month that the lockdowns where announced (March 2020), and event window 5 months prior, and 10 months after the event. To explore the actual impact of ESG level, the event study was implemented for all companies together, but also in tranches of high, medium and low ESG, E, S and G scores, the statistical properties of which are also presented. The results provide different conclusions for the two markets. In the case of US, the market recovers immediately after the first shock of the pandemic, while during the event window, low ESG-score companies apparently seem to have better after COVID-19 performance compared to the high ESG score. In the case of UK, the negative impact remains in the post event period, while low ESG-score companies depict similar performance. As far as the individual components are concerned, in the US only S exhibits positive relation with the abnormal returns, while in the UK, all components depict negative relation with the abnormal returns.

On the other hand, taking the results of the event studies, and more specifically the Cumulative Abnormal Returns of the event date (CAR(0)) and the incorporated ESG, E, S, and G scores, a multivariate analysis is conducted, to investigate the effect of pre-COVID ESG scores (for the year 2019), both total ESG and its individual ESG pillars, in connection to the COVID announcement period excess returns, for both US S&P 500 and UK FTSE 100 firms. The analysis also incorporates control variables accounting for size, value, age and sector of the companies under investigation. The results are in line with current references, as in the case of US, positive relation is documented only between CAR (0) and high ESG and high G score, while in the case of UK, there is not a clear pattern for the ESG components.

The rest of this paper is organized as follows: Section 2 reviews the related literature and addresses the challenges when examining ESG performance in crisis, event studies during crisis periods, as well as ESG investing in the markets under investigation. Section 3 describes presents the data and methodology used in our analysis, while Section 4 presents the empirical findings based on the methodology pursued, and Section 5 discusses the conclusions of the paper and suggests policy implications, as well as potential areas for further research. Finally, overall conclusions are presented in Section 6.

2. Literature Review

The literature review begins by examining the COVID-19 setting, continues with looking at ESG investing and assessing these investments in times of crisis. It continues by exploring the literature of ESG performance in times of recent crisis and concludes with discussion of key event studies in crisis settings.

2.1. ESG Performance in Crisis Settings

COVID-19 is the primary event of our study. The year 2020 was a pivotal year where people's lives globally were affected by the COVID-19 pandemic crisis. On March 11, 2020 World Health Organization (WHO) after 3,000,000 infections and 207,973 deaths in 213 countries declared COVID-19 as a global pandemic (World Health Organization, 2022). This pandemic was the reason, due to a health crisis, for severe worldwide economic consequences. Although the 20th and 21st century had witnessed historic pandemics, such as the Spanish influenza of 1918, the Asian Flu of 1957, the Hong Kong flu of 1968, SARS in 2002, the Bird Flu in 2009, MERS in 2012 and Ebola in 2013-2014, COVID-19 is unique (Golubeva, 2021). This pandemic's speed of change and its effect on both the private and public sectors of the worldwide economy made it distinctive. An almost complete stop of worldwide economic activities led to an exceptional effect on global equity markets, investment funds and commodity markets (Rubbaniy et al., 2022). The outbreak of COVID-19 led the US to create a $2.2 trillion bailout package, an amount that greatly exceeded the bailout package of $750 billion during the global financial crisis in 2008 (Bongini et al., 2019; Golubeva, 2021; Kells, 2020; Mather, 2020). Similarly, in the UK, as a result of the sharp increase

in 5-year maturity Credit Default Swaps in March 2020, Chancellor Sunak announced a GBP 330 billion stimulus package. Over 500 announcements by UK ministers were made involving spending decisions related to COVID-19, resulting in over GDB 124 billion support measures in areas such as health, social and public services (Flynn et al., 2020; Mitha, 2020; Wood et al., 2023). This emerging worldwide health crisis triggered an unexpected market-wide financial crisis, that resembled more the great depression of 1929-1933 than that of the global financial crisis of 2007-2008, leading to global markets experiencing huge declines (Broadstock et al., 2021).

Regarding the second component of the study, investors during the last decade value sustainability, with increased investments in assets with high ESG (environmental, social and governance) ranking. In the US in 2019, portfolios focused on ESG in major markets exceeded US$30 trillion (Broadstock et al., 2021). ESG investing is chosen not only to support ethical investment practices, but mainly due to the increased returns and reduced portfolio risk of these investments (Broadstock et al., 2021; Ferriani & Natoli, 2021). The work of Hartzmark & Sussman, (2019) also indicates that investors value sustainability; in the US mutual fund market, firms characterized as having low sustainability led to outflows of over $12 billion, while those characterized as highly sustainable led to net inflows of over $24 billion.

The changes established in the Corporate Governance code 2018 in UK, had as a purpose to engage firms' corporate teams with their workforce. This engagement was further supported from the UK's Stewardship code 2020 that offered opportunities and commitment to ESG. It was revealed that firms that want to support further their workforce they need to offer not just suggestions but give the power to shareholders and the boards to achieve it (Johnston & Samanta, 2023). What was revealed is that in UK, there is no pressure on boards to support further the workforce's engagement in corporate policies development. It was also revealed that due to the absence of workforce's bargaining power, an increased production efficiency was achieved because of the alternatives generated in a more competitive environment. This could be achieved through introducing into their Companies Act, governance structures that would reinforce workforce participation (Johnston & Samanta, 2023).

From a survey conducted by Moussa & Elmarzouky, (2024) on non-financial companies listed in the UK, FTSE all share Index, for the period 2014-2018, revealed a reduced level of risk and cost of capital due to an increased and high quality ESG reporting level. Firms with high rating in ESG score and implementing exceptional governance practices, could manage to reduce their cost of capital emphasizing the importance UK gives to ESG (Moussa & Elmarzouky, 2024).

Similarly, an increase in US funds invested in ESG is observed from 2018 and onwards. Inflows in ESG funds increased from $5 billion in 2018 to $50 billion in 2020. Sustainability investing records a growth

of 42% since 2018, whereby $17.1 trillion in aggregate investments, which constitute more than 1/3 of professionally managed assets, where made based on sustainability criteria. The threat of climate changes mainly led to changes in managerial and investing strategies that companies follow, in an effort to support their long-term business sustainability. These changes would make them take more environmental, social and governance friendly decisions. Exemplifying firms' interest in ESG issues when taking corporate decisions is that in 2018, around 11.6 trillion dollars, which is approximately 25% of total assets worldwide incorporated ESG considerations into their investment decisions (Atz et al., 2023; Bofinger et al., 2022; Shackleton et al., 2022).

The two main benefits derived from investing in ESG, according to US investors, is the support of a long-term attitude approach and the development of best investment practices. Still there are some benefits derived due to regulatory restrictions and/or due to peer burden (Eccles et al., 2017). Investing in ESG improves their scoring, resulting in a higher ratio of book to market value, that signifies that investing in ESG supports firms' valuation (Bofinger et.al. 2022).

There is a strong belief that investing in ESG practices will contribute to stock price resilience during times of crisis. ESG activities help firms build social capital and trust that motivate stakeholders to remain loyal to the firm even during times of crisis (Demers et al., 2021). Although investors trust and confidence decline during a crisis period leading to lower stock prices, firms investing in ESG can reverse this trend. ESG activities improve the firm's social image creating a sense of reliance and trust by investors. Examining non-financial information of firms via their ESG ratings can reflect a firm's values and integrity and create a sense of trustworthiness that is the basis that creates a premium for the firm's stock. Thus, ESG scores act as a safeguard for maintaining stock prices during economic downturns. Investors have a higher demand for firms with high ESG scores that can even lead to increased stock prices for these firms during times of crisis (Liu et al., 2023).

As COVID-19 spread during the first quarter of 2020, the financial markets both in the US and worldwide became extremely volatile. The VIX index on March 16, 2020 reached a price of 82.69, while the second highest was at 80.86 on November 20, 2008, a few weeks after the initiation of the Troubled Asset Relief Program (worth $700 billion) during October 2008. During such volatile times investors turned to ESG investment strategies, whereby 1/3 of all European fund sales from April to June 2020 were in ESG funds, whereby sustainable equity funds showed a 63% increase compared to traditional funds. Similarly, on a global scale, ESG funds during the same period (April to June 2020) derived inflows of $71.1 billion and reached $1 trillion in market capitalization in 2020 (Díaz et al., 2021). The pandemic and the disruption caused as a result of it, has led investors not only to examine accounting practices but also examine governance and social impact of firms measured via ESG ratings. Firms that ignore social responsibility,

are environmentally unfriendly or lack appropriate governance mechanisms are considered to have increased hidden costs for investors. Firms with high ESG scores have a greater chance of avoiding such costs. These firms are considered more robust during these crisis periods, such as the COVID-19 pandemic (Díaz et al., 2021).

The studies examining ESG performance during times of crisis are limited. During the 2008-2009 global financial crisis, Lins et al., 2017 studied US non-financial firms and found that firms with higher ESG scores outperformed those with lower ESG scores during this period. Similarly, Cornett et al., 2016 illustrated a positive relationship between ESG scores and financial performance for their sample of US bank firms during the financial crisis. Nofsinger & Varma, (2014) also examine the performance of mutual funds in a crisis setting, which is set for both the technological bubble bust (March 2000-October 2002) and the financial crisis (October 2007-March 2009) and find that socially responsible mutual funds outperform conventional funds during crisis periods.

Similar results are also seen during the COVID-19 crisis. Omura et al., (2021) examine the performance of ESG investments and conventional investments during COVID-19. Utilizing samples from the US, Japan and Europe, they find that during the pandemic ESG investments outperformed the conventional ones. Albuquerque et al., (2020) examine the relationship between US stocks and the E (environmental) and S (social) component of ESG and find that stocks with higher E and S ratings have higher returns, less volatility and higher profits during the first quarter of 2020. Broadstock et al., (2021) employing a sample of China's CSI300 constituents examine the return of ESG portfolios during COVID-19. Their findings generally conclude that high ESG portfolios outperform low ESG portfolios. The positive role of ESG performance is highlighted in times of crisis, where ESG practices mitigate financial risk and their importance is confirmed. Díaz et al., (2021) examine the S&P 500 ESG portfolios to investigate the importance of ESG ratings to explain different industry returns during COVID-19. They find that ESG factors significantly explain industry returns, whereby the E (environmental) and S (social) components of ESG are the main drivers of the ESG impact. Their study highlights the importance of ESG factors in making investment decisions. Additionally, using data from 6,700 firms from 61 economies, Ding et al., (2021) find that firms with more corporate responsibility activities during the pre-COVID years (pre-2020) have a moderate drop in stock returns as a result of the pandemic. Additionally, Liu et al., (2023) examine the relationship between ESG performance and the stock market during the COVID-19 pandemic, based on a dataset of Japanese listed firms from the period 2016 to 2021. They find that a positive association exists between these two elements, contributing to Japan's stock market stability and increased market liquidity. As such they conclude that firms should adopt ESG practices that foster sustainable growth and contribute to both stability and liquidity. Moreover, utilizing four major ESG indices from global and

emerging stock markets, Rubbaniy et al., (2022) investigate safe-haven properties of ESG stocks during the COVID crisis. Their study confirms hedging and safe-haven properties of ESG stocks for some indices but not for all. Singh, (2020) examine the return spillover effects of three different safe investment strategies during COVID-19, one being an ESG related portfolio. They find that the relative outperformance of ESG portfolios during crisis times is due to investors increased attention to investments that focus on long term sustainability of firms.

Conversely, Bae et al., (2021) using a sample of US firms find no evidence that CSR affected stock returns during the COVID period. Additional tests conducted examining the effectiveness of firms with high pre-COVID CSR ratings during a crisis period, showed that high CSR ratings do not shield firms from the adverse effects of the crisis. Similar results are also seen in Demers et al., (2021) who also examine US firms and find that ESG does not provide resilience to share prices during COVID-19.

2.2. Event studies in crisis settings

Events study analysis is extensively used in crisis settings. One such event is Japan's most devastating natural disasters in history (on March 11, 2011), namely a 9.0 magnitude earthquake which caused a catastrophic tsunami, resulting in extensive damage in the northeastern coastline of Japan. Such disaster led to a crisis to the Fukushima-Daiichi nuclear plant, the loss of cooling systems causing a nuclear meltdown and release of radioactive material, that led to a serious potential environmental (and social) disaster, as it affected both the local population and economy, while at the same time bringing serious considerations in all economies worldwide regarding the mix of energy resources to be used. Setting the event window in the period March 11-18, 2011, the first market examined is the Japanese stock market (Tokyo Stock Price Index - TOPIX). The market showed a significant decline in abnormal returns shortly after the disaster, however such returns were not statistically significant, indicating that the market did not react heavily to the subject event (Luo, 2012). Contrary to this market, the Hong Kong stock market demonstrated a more pronounced response, namely a mild negative impact on stock returns at the event window and a sharper decline after a few days in the post-event window (Luo, 2012), an outcome that could be attributed to the fact that Hong Kong is close to Japan, indicating high exposure and sensitivity to the aforementioned crisis. One reason for such reaction could be the disruption of supply chains across different industries, such as the automotive and electronics sectors (sectors with great exposure to Japan). On the other hand, the US stock market was relatively uninfluenced by the event, attributed most probably to the geographical distance between the US and Japan, with the exception of a few number of stocks such as Toyota and ExxonMobil, due to the disruptions in supply chains and volatility in the energy prices (Ferstl et al., 2012). A similar situation was also seen in Canada, again with the exception of a number of stocks such as RIM and Cameco, due to their activity connected to the Japanese economy and the corresponding supply chain (Luo, 2012). Finally, the

UK stock market's reaction was similarly characterized by small volatility around the event window, but still statistically insignificant, with the exception of few companies (such as Unilever and Barclays) (Ferstl et al., 2012). Summarizing the analysis of a crisis event, it is clear that the massive impact of this negative event was towards the country that the crisis event started, but had little (or no) impact to economies located away from the event, despite the economies' connection through strong supply chains and capital flows.

Another event that is worth mentioning and that was studied by many researchers (without having the core characteristic of "crisis" but still an important disruption in EU and global markets), is Brexit, namely the decision of the United Kingdom to step out of the European Union following the 2016 referendum. Given the important of the market to the global financial system and markets, examining the markets evolution and volatility of the capital markets is of great interest (Belke et al., 2018). To start with, the FTSE 100 had a negative abnormal return of 4.9% on the day following the vote. However, after a few days the UK market immediately recovered (Breinlich et al., 2018). The banking sector in UK and EU was an important sector to be examined, given the change of status of UK market as non-EU market, and the analysis reveals that the banking sectors of the eurozone experienced negative abnormal returns in their stock prices following the event, but the decline was milder than that of the UK.

Finally, COVID-19 and event study methodology was analyzed by a number of studies. The market's reaction to Pfizer's COVID-19 vaccine announcement and validation towards the end of 2020, which would eventually be a reversal event to the pandemic, providing the first signals of potential exit from lock down requirements, and restart of the economies worldwide. The event had major positive impact on almost all financial markets, thus quick recovery in most of the stock prices especially in sectors such as travel, leisure and hospitality that were harmed the most due to the lock downs, exhibited positive abnormal returns (Kapar et al., 2022). On the other hand, certain segments that were benefited from the pandemic and the lock downs, such as pharmaceuticals and personal protective equipment manufacturers, had the opposite evolution, with price corrections of -6% to -8% as the demand for their products would start diminishing (Prabhong & Hensawang, 2024).

3. Methodology

This study utilizes event study methodology to examine the cumulative abnormal returns of firms' stock prices as of the announcement date of COVID-19 (March 2020), in light of the firm's pre-COVID ESG scores (for the year 2019). To investigate the effect of pre-COVID ESG scores, both total ESG and its individual ESG pillars (E, S, G) are utilized for both US S&P 500 and UK FTSE 100 firms. Additionally, to substantiate the event study methodology, a linear regression is applied to examine the effect of the firm's ESG ratings on their abnormal returns.

3.1. Event study methodology

An event study analysis is a statistical method used to assess the impact of a specific event on the value of a stock or financial asset. Typically employed in finance and economics, it examines the effect of either positive or negative events like earnings announcements, mergers, regulatory changes, the COVID-19 pandemic or economic policy shifts on stock prices or returns.

The essence of an event methodology, as a tool of market efficiency testing as well, gives the chance to researchers to identify market reactions, their speed and their size or any other variable's effects, due to a particular event. The subnormal or unexpected returns, their size and their frequencies are what needs to be recorded and analyzed (Gavalas et al., 2022).

The analysis compares the actual returns of the asset to its expected returns (if the event had not occurred) over a window of time around the event. Any significant deviation is attributed to the event, helping researchers determine whether and how much the event affected the market. This methodology is able to measure the effect of this particular event on a firm's value and on a company's stock reaction at different event windows (i.e. -1, -7, +1, +7).

Several events were examined, positive and/or negative, related to COVID-19 pandemic. In particular, a negative event in March 2020, the closing of all schools and universities, on the 23/3/20 the restriction to all citizens to stay in their homes and a positive one on the 4/5/20 the de-escalation of all restrictive measures is an example of an event.

Different sectors have shown different behaviors, like in the shipping industry where the effect that the COVID-19 event had on the dry market, the tanker market and the shipping stock market were totally different (Gavalas et al., 2022). Comparatively, an event study revealed that individualism, the habit of being independent and self-supportive, was the main factor imposing changes to Hospitality firms due to COVID-19 (Clark et al., 2021).

In China, the event study revealed that the bad news regarding COVID-19 (number of Deaths, inability of the vaccine to reduce the number of deaths etc.) had a negative effect on the stock market prices compared to good news that brought growth in prices. Differences were also recorded on the strength of those responses. The firm's size that issues the shares and the sector that it operates has a direct impact (positive/negative) on the type of COVID-19 news announced influencing directly and their profitability (Yu & Xiao, 2024). In particular Material, Energy and Health care industries are more sensitive to positive COVID-19 news and the Utilities, real estate and consumer products are more sensitive to negative COVID-19 news. These effects have a direct consequence on their profitability (Yu & Xiao, 2024). Similar results

were also found from the analysis of major Greek Bank stocks that showed positive results when positive health news was announced (Patsoulis, 2024). Similar results were also revealed from the event study analysis conducted by Singh et al., 2024 who examined the effect of COVID-19 to the G-20 countries. The analysis revealed the cause of the panic situation recorded due to the increased number of COVID-19 positive cases and their retrieval when the COVID-19 cases start to be reducing. It is also vital to refer to the event study analysis conducted on the economies of Gulf Corporations (Kuwait, Dubai, Asudi Arabia, Qatar, Bahrain, Oman, Abu Dhabi stock exchange indexes) and their abnormal returns behavior due to COVID-19. Both abnormal returns and Cumulative abnormal returns showed significant positive and negative responses revealing the dynamic consequences of COVID-19 events (growth and decline in the recorded COVID-19 cases) (Said et al., 2024).

Airline business in US was also affected from the COVID-19 pandemic. Three main events were selected, in particular the Case reported in mainland of China (Wuhan) was the first event, the explosion of the pandemic in Italy the second and the restriction of the US citizens to travel to European countries the third. The first event showed an overreaction and the third event an underreaction to COVID-19 to the respective announcements. Overall, in Australia, Canada, UK and US, the airline firms showed the worst stock performance in the post-event third period. This had as a consequence the development of certain policies that affected the tax level, the M&A facilitation processes and the level of government allowances (Maneenop & Kotcharin, 2020).

It is clearly noted that the major characteristic of COVID-19 that started in the year 2008, was its global character. Starting from Wuhan, China it has been expanded to Italy and to Germany at first and to the whole Europe in a period of months and then it was transferred to the United States, to Canada and to other nations.

3.2. Data Description

The analysis employs an event study methodology to evaluate the impact of Covid-19 pandemic on companies listed on two different capital markets, with different ESG scores. The listed companies analyzed are the companies that comprised the S&P 500 index, for the US stock market, as well as companies that comprised the FTSE 100 index, for the UK stock market. Regarding the stock prices, the sample consists of monthly closing prices (retrieved from Refinitiv Eikon) from January 2016, to September 2024, from which the logarithmic monthly returns are calculated. Both ESG scores, as well as individual E, S and G scores were collected from FactSet dataset, for the year 2019. The selection of this year's annual ratings, was due to the fact that the event selected, namely COVID-19, is the official announcement of the lock downs in these markets, due to the pandemic, as such the date of the event is March 2020 for both markets [23 March 2020 for United States and 19-24 March 2020 for United Kingdom]. It needs to pointed out that

only companies that were traded during the whole period, remained in the sample, namely 487 companies for US market, and 94 for UK market. The specifics of the event study are the following:

Event Window Definition

The event window is set to span from 5 months before the event to 10 months after the event, capturing both the anticipation effects and post-event adjustments. Additionally, an estimation window of 45 months prior to the event window is used to calculate the normal returns. The purpose that the estimation window did not extend before 2016, so as not to capture any impact of the aftermath of the global financial crisis of 2007 and the prolonged recovery process of several economies connected with the markets under analysis. (IMF WP/19/83)

Abnormal Return Calculation

Normal returns are estimated using the Single Index Model, where:

$R_{it}=\alpha_i+\beta_i R_{mt}+e_{it}$,

where R_{it} represents the return of asset i at time t, R_{mt} denotes the market return, and e_{it} is the error term. Abnormal returns (AR) are computed as the difference between the actual returns and the expected returns:

$AR_{it}=R_{it}-(\alpha_i+\beta_i R_{mt})$

Cumulative Abnormal Returns (CAR)

To assess the overall impact of the event, we first compute the average abnormal returns (AAR) over the event window for all stocks, and then compute the Cumulative abnormal returns of the event window:

$$CARi = \sum_{1}^{i} ARi$$

Statistical Testing

To determine the statistical significance of abnormal returns, t-tests are applied to aggregated CARs. The test statistics account for cross-sectional dependence when necessary.

Interpretation

The results provide insights into market reactions to COVID-19 pandemic lockdowns, by comparing pre- and post-event performance. Positive (negative) significant CARs indicate that the event had a favorable (unfavorable) impact on the market price of the stocks under investigation.

Approach of analysis

For the purpose of the analysis, apart from analyzing all companies in a single group per index, the companies are split in three different tiers, for all ESG measures, namely ESG, E, S and G, according to the respective score level, in High, Medium and Low score (same number of companies in each tier). As a

result, the event study analysis offers outcomes for the following cases (a total of 13 cases per market – US and UK):

	ESG	E	S	G
Total Number of shares	x	x	x	x
Low score		x	x	x
Medium score		x	x	x
High score		x	x	x

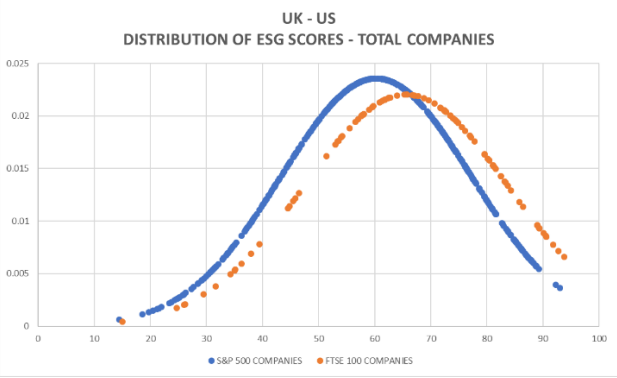
(x – indicates an event study execution)

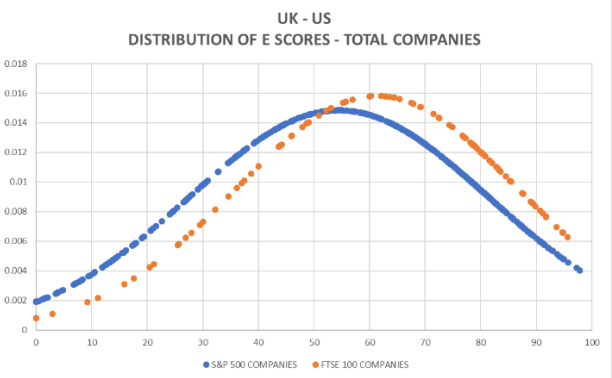
ESG scores statistics

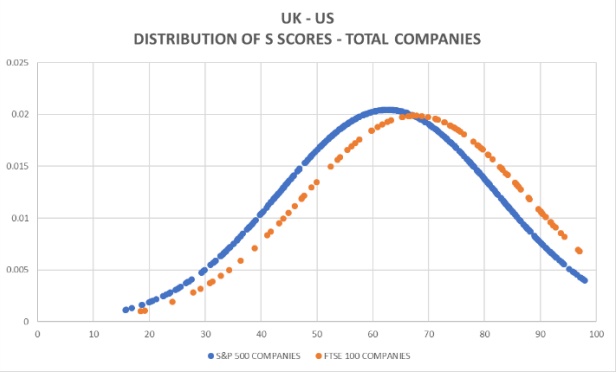
Before proceeding to the event study approach, a statistical analysis of the ESG scores was conducted of the companies incorporated in the sample (for both S&P500 and FTSE100 index). The table below mentions the average score and standard deviation of ESG, E, S, and G indices for both markets.

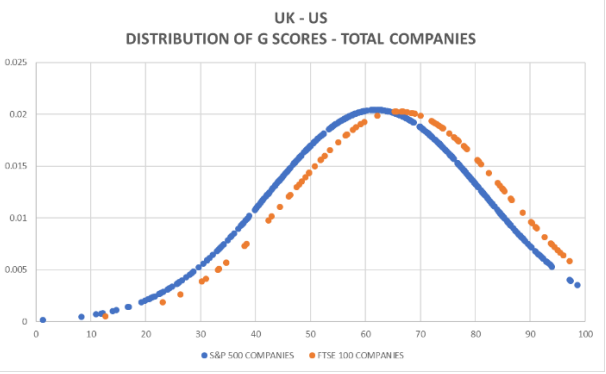
	UK (ESG)	US (ESG)	UK (E)	US (E)	UK (S)	US (S)	UK (G)	US (G)
Aver. Score	65.59	60.27	61.35	54.48	67.60	62.66	66.09	61.91
Stand. Dev.	18.11	16.93	25.22	26.88	20.06	19.51	19.68	19.53

Source: EViews calculations









Although the average market capitalization of US companies is quite higher than UK Companies (total capitalization of S&P 500 index companies is equal to 45Tr USD, while the total capitalization of the FTSE-100 index companies is equal to 2.1Tr GBP), the descriptive statistics show that the reported scores, in terms of ESG as a whole, but also in terms of E, S, G separately, are significantly better in UK rather than US. However, the proceeding results indicate that the US firms (and market overall) have a much faster recovery than the UK firms (and market overall).

Multivariate analysis

A multivariate analysis was conducted to investigate the effect of pre-COVID ESG scores (for the year 2019), both total ESG and its individual ESG pillars, in connection to the COVID announcement period excess returns, for both US S&P 500 and UK FTSE 100 firms. The analysis also controls the effect of other factors, such as leverage, size, liquidity, value, age and industry specifics.

The, a multivariate linear regression utilized is shown in the following equations:

$$CAR(0) = f\left(ESG, \frac{D}{E}, MV, WC, \frac{MP}{BV}, AGE, industry\right)$$

$$CAR(0) = f\left(E, \frac{D}{E}, MV, WC, \frac{MP}{BV}, AGE, industry\right)$$

$$CAR(0) = f\left(S, \frac{D}{E}, MV, WC, \frac{MP}{BV}, AGE, industry\right)$$

$$CAR(0) = f\left(G, \frac{D}{E}, MV, WC, \frac{MP}{BV}, AGE, industry\right)$$

The variables of study were categorized into three, dependent, independent and control variables. Abnormal returns of firms' stock prices during the announcement date of COVID-19 is the dependent variable and ESG scores (both total ESG and the individual pillars) of firms in 2019 is the key independent variable. Various control variables are used, such as the ratio of debt to equity, the firm's market value, its working capital, the ratio of market price to book value, the firm's age and industry dummy variables.

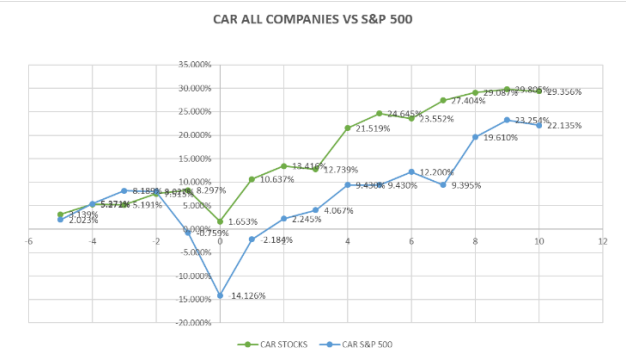
The following table illustrates the variables examined in this study.

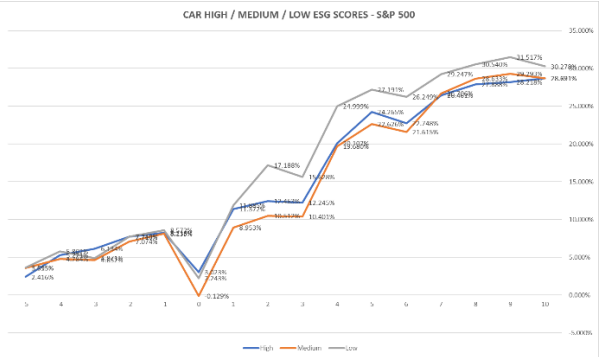
Variables	Definition
CAR (0)	Cumulative abnormal returns of firms' stock prices as of the announcement date of COVID-19 (March 2020)
ESG	ESG score as reported by FactSet database (for 2019)
E	E score as reported by FactSet database (for 2019)
S	S score as reported by FactSet database (for 2019)
G	G score as reported by FactSet database (for 2019)
D/E	Debt to equity ratio, used as a proxy for leverage
MV	Natural log of Market value, used as a proxy for size
WC	Natural log of Working capital, used as a proxy for liquidity
MP/BV	Market price to book value ratio, used as a proxy for value
AGE	The firm's age
D1-D11	Industry dummies
D1=information technology; D2=consumer discretionary; D3=communication services; D4=healthcare; D5=consumer staples; D6=financials; D7=energy; D8=industrials; D9=materials; D10=real estate; D11=utilities	

4. Discussion of Results

Event Study – ESG Analysis in the US – UK Market

a) The case of US market



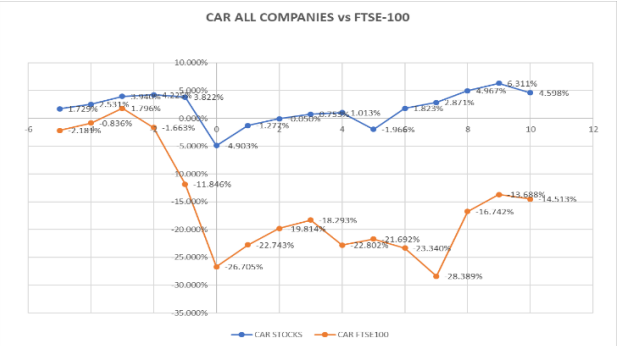


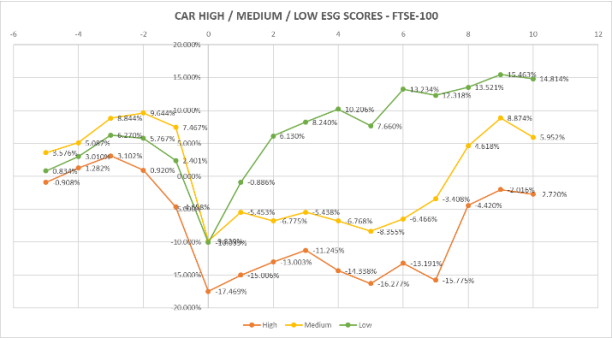
In the case of US, the main findings are the following: First of all, it is clear that the market recovers immediately after the preliminary shock of the Pandemic lockdown, regardless of the ESG score tranche (high, medium or low). In a period of less than two months, the US listed companies on average seem to recover from the negative impact of the event. Moreover, as far as the relationship between the ESG score and post-performance, it is clear that low ESG-score companies apparently seem to have better after COVID-19 performance compared to the high ESG score companies, although the reaction based on the

three different segments follow a similar pattern. This is against the expected results, as one would expect companies with high ESG score, to react better towards the event, rather than the ones with low ESG score. Companies with medium ESG scores seem to have the minimum reaction among the respective pillars.

In terms of efficiency, it is clear that we could derive two different conclusions: Regarding the behavior of the CAR prior to the event, it seems a negative reaction from [-2] period, meaning that the information regarding potential lock downs was spread prior to the event date. Regarding the behavior of the CAR after the event, although we classify the event as "negative impact" event, the reaction is negative but with instant reaction, confirming semi-strong form efficiency existence.

b) The case of UK market





In the case of UK, the main findings are the following: a totally different framework is observed after the event date - contrary to US, the recovery of the market after the Pandemic lockdown is slow, regardless of the ESG score. Again, low ESG-score companies seem to have better after COVID-19 performance, although the reaction based on the three different pillars follow a similar pattern.

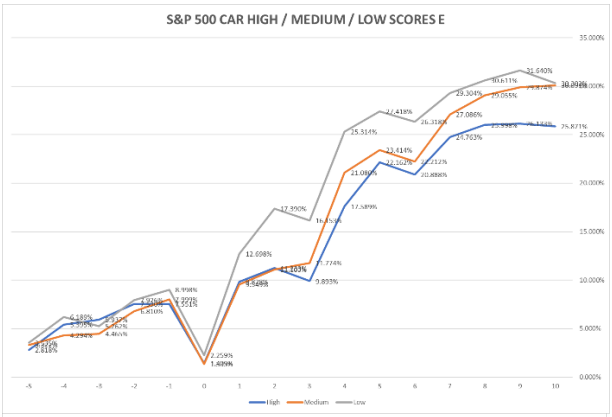
Companies with high ESG scores seem to have the minimum reaction among the respective pillars, after the event.

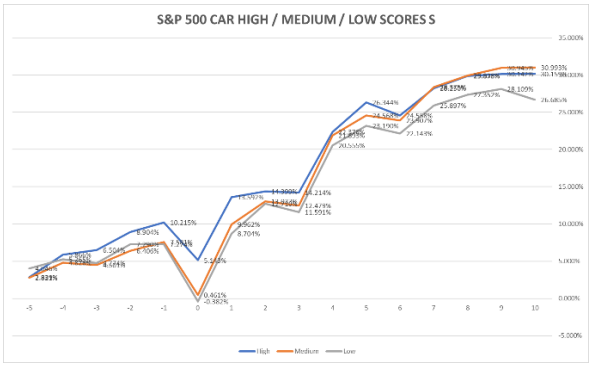
In terms of efficiency, it is clear that 2 different conclusions are established: Regarding the behavior of CAR prior to the event, it seems a negative reaction from [-2] period, meaning that the information regarding potential lock downs was spread prior to the event date. Such reaction is extremely higher in the case of UK, rather than in US. Regarding the behavior of CAR after the event, the reaction remains negative for at least [7] periods ahead, meaning that the "negative" adjustment remains for a substantial period after the event.

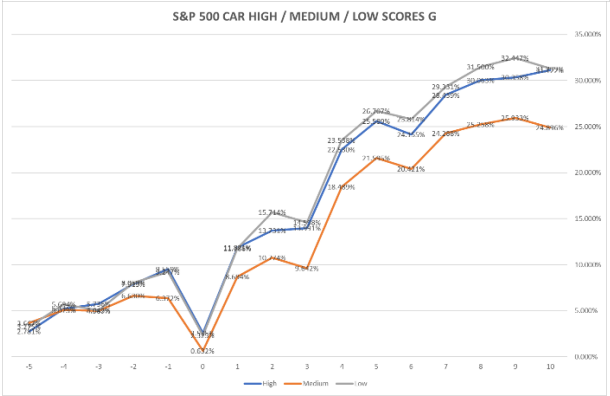
Score Breakdown to E, S, G scores

The next step is to explore such analysis for each component of ESG score, namely E, S and G subscores. What each component means for the type of event selected:

- Cases of high E subscore means superior performance in areas including environmental management system certification, water conservation, energy efficiency, and other, which may mitigate long-term environmental risks. As such, such companies would be expected to deal with negative business impacts caused by COVID-19, in a more satisfactory manner.
- Cases of strong S subscore, imply consistent performance in areas such as employee benefits, supply chain management, community engagement. As a result, high S subscore means intention by the companies to not proceed to layoffs during the crisis.
- Cases of high G subscore, require excellent performance in areas such as: board diversity, auditor independence, managing negative incidents. As such, strong G performance may imply stability to any shock, COVID-19 included.

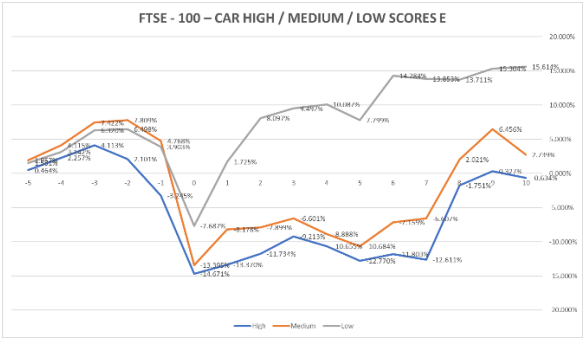


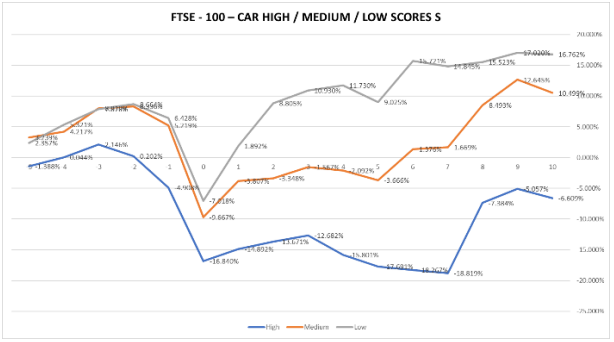


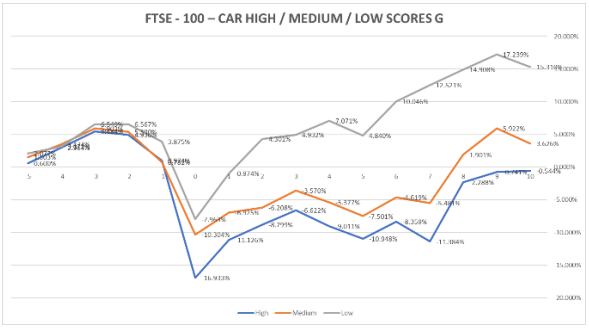


In the case of US, we have the following: Higher abnormal returns are associated with a) Low E, b) High S, and c) Low G subscores.

It is evident in the case of US that despite the expectations, companies with lower E and G subscores, present higher abnormal returns in the period after the event. This contradicts the expectations, because E and G subscores, are considered more tangible scores, and provide a "safe umbrella" to the company in the periods of crisis, but in the case of COVID-19 pandemic, this seems to be a parameter that generates lower abnormal returns. It is probably due to the fact that companies that did not invest heavily in environmental capex that would lead to a better production process, environmentally wise, had the appropriate reserves to overcome the constraints of the lock downs. Moreover, we need to point out that as discussed, the S&P 500 Index, is more services oriented, so eventually the above conclusion may not be that relevant. On the contrary, the G subscore companies' performance (in terms of abnormal returns) is better after the event, for companies that do not have the higher than average qualifications for obtaining a high G subscore. This would mean that above average governance does not seem to be a factor that will drive a company outside the turbulence of a crisis, the COVID-19 in our case. Finally, we can claim that high S subscore companies, depict higher abnormal returns, which means that the S subscore seems to be significant in periods of crisis – COVID-19 has been considered one of the worse humanitarian crises of the last 100 years, so it was important for those companies with high score to overcome the lock down consequences.







In the case of UK, we have the following: Higher abnormal returns are associated with a) Low E, b) Low S, and c) Low G subscores.

In the case of UK, and the companies included in FTSE-100 Index, the results are contrary to our expectations as well. The companies that have low all E, S and G subscores, depict higher abnormal returns. Again, we need to point out that FTSE-100 Index companies are dominantly in the services sector, so the E subscore conclusions might not be that relevant. But in the case UK, the S factor also provide better abnormal returns when the score is low. In this case, we could claim that judging by the results provided, the high E, S and G scores, do not provide the so called "corporate immunity" as we would expect (Ding et. al. 2020), but it still remains to be examined if the CAR is eventually positively affected by the ESG score, an analysis to be presented in the next section.

Overall, our initial findings are controversial regarding the markets we examine:

- In the case of US, the market tends to absorb quickly the COVID-19 shock, but when it comes to separate components score analysis, the results do not confirm the theoretical conclusions expected
- In terms of efficiency, there are signals of efficiency, in terms of adjustment after the event, although we would expect a classified as "negative" shock to adjust quickly to negative returns
- In the case of UK, we have exactly the opposite situation, as the market tends to be pressed after the COVID-19 shock, but when it comes to separate components score analysis, the results apart from E, confirm the conclusions from other studies

  In terms of efficiency, there are signals of efficiency, in terms of adjustment after the event, as the shock brings for a significant period of time to negative CAR, not allowing the option of achieving abnormal returns

Linear Regressions – ESG Analysis in the US – UK Market

a. The case of US market

Dependent Variable: CAR (0)

Included observations: 401

US ALL FIRMS

Variable	**Coeff**	**t-Stat**	**Prob.**	**Variable**	**Coeff**	**t-Stat**	**Prob.**	**Variable**	**Coeff**	**t-Stat**	**Prob.**	**Variable**	**Coeff**	**t-Stat**	**Prob.**
	ESG				E				S				G		
ESG	0.00	-0.15	0.88	E	0.00	-0.02	0.98	S	0.00	-0.37	0.71	G	0.00	1.23	0.22
D/E	0.00	0.20	0.84	D/E	0.00	0.19	0.85	D/E	0.00	0.20	0.84	D/E	0.00	0.12	0.90
MV	0.00	-0.11	0.92	MV	0.00	-0.16	0.88	MV	0.00	-0.02	0.98	MV	-0.01	-0.32	0.75
WC	**0.01**	**3.94**	**0.00*** **	WC	**0.01**	**3.945**	**0.0001 *** **	WC	**0.01**	**3.93**	**0.0001 *** **	**WC**	**0.01**	**3.92**	**0.0001 *** **
MP/BV	0.00	0.57	0.57	MP/BV	0.00	0.565	0.57	MP/BV	0.00	0.57	0.57	MP/BV	0.00	0.61	0.54
AGE	0.00	0.45	0.65	AGE	0.00	0.419	0.68	AGE	0.00	0.50	0.62	AGE	0.00	0.20	0.84
D1	**0.41**	**2.31**	**0.02** **	D1	**0.41**	**2.244**	**0.0254 ** **	D1	0.40	2.29	0.0226 **	**D1**	**0.37**	**2.06**	**0.0402 ** **
D2	0.25	1.44	0.15	D2	0.25	1.412	0.16	D2	0.25	1.41	0.16	D2	0.22	1.22	0.22
D3	0.29	1.49	0.14	D3	0.29	1.451	0.15	D3	0.28	1.45	0.15	D3	0.27	1.37	0.17
D4	**0.36**	**1.98**	**0.048 ***	D4	**0.36**	**1.922**	**0.0553 ** **	D4	**0.35**	**1.97**	**0.0497 ** **	**D4**	**0.32**	**1.76**	**0.0798 ** **
D5	0.24	1.34	0.18	D5	0.24	1.312	0.19	D5	0.24	1.31	0.19	D5	0.20	1.11	0.27
D6	0.16	0.83	0.41	D6	0.16	0.806	0.42	D6	0.15	0.79	0.43	D6	0.12	0.63	0.53
D7	0.04	0.19	0.85	D7	0.04	0.194	0.85	D7	0.03	0.16	0.87	D7	-0.01	-0.03	0.98
D8	**0.33**	**1.91**	**0.0572 ***	D8	0.33	1.858	0.06	D8	**0.32**	**1.87**	**0.0622 ** **	D8	0.29	1.70	0.09
D9	0.26	1.45	0.15	D9	0.26	1.421	0.16	D9	0.25	1.42	0.16	D9	0.20	1.12	0.26
D10	0.12	0.59	0.56	D10	0.12	0.574	0.57	D10	0.12	0.58	0.57	D10	0.07	0.32	0.75
D11	-0.05	-0.29	0.77	D11	-0.05	-0.28	0.78	D11	-0.06	-0.33	0.74	D11	-0.10	-0.54	0.59
R^2	0.21			R^2	0.21			R^2	0.21			R^2	0.21		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

Dependent Variable: CAR (0)																
Included observations: 134																
US Firms with Low ESG																
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	
	ESG				E				S				G			
ESG	0.00	-1.46	0.15	E	0.00	-0.01	1.00	S	0.00	-0.02	0.99	G	0.00	-0.89	0.37	
D/E	0.00	-0.93	0.36	D/E	0.00	-1.03	0.31	D/E	0.00	-1.03	0.30	D/E	0.00	-0.99	0.32	
MV	0.03	0.95	0.35	MV	0.03	0.881	0.38	MV	0.03	0.87	0.38	MV	0.03	0.82	0.41	
WC	0.00	0.92	0.36	WC	0.00	0.645	0.52	WC	0.00	0.66	0.51	WC	0.00	0.77	0.44	
MP/BV	0.00	-0.32	0.75	MP/BV	0.00	-0.03	0.97	MP/BV	0.00	-0.03	0.97	MP/BV	0.00	-0.11	0.91	
AGE	0.00	1.40	0.16	AGE	0.00	1.119	0.27	AGE	0.00	1.13	0.26	AGE	0.00	1.24	0.22	
D1	0.19	0.53	0.59	D1	0.03	0.087	0.93	D1	0.03	0.09	0.93	D1	0.10	0.30	0.76	
D2	0.11	0.31	0.76	D2	-0.05	-0.14	0.89	D2	-0.05	-0.14	0.89	D2	0.04	0.11	0.91	
D3	0.23	0.62	0.53	D3	0.07	0.189	0.85	D3	0.07	0.19	0.85	D3	0.14	0.39	0.70	
D4	0.34	0.94	0.35	D4	0.17	0.493	0.62	D4	0.17	0.49	0.62	D4	0.25	0.72	0.47	
D5	-0.08	-0.20	0.85	D5	-0.24	-0.64	0.52	D5	-0.24	-0.63	0.53	D5	-0.15	-0.38	0.71	
D6	-0.16	-0.42	0.68	D6	-0.30	-0.82	0.41	D6	-0.30	-0.82	0.41	D6	-0.22	-0.58	0.56	
D7	-0.07	-0.18	0.86	D7	-0.22	-0.62	0.54	D7	-0.22	-0.62	0.54	D7	-0.12	-0.34	0.74	
D8	0.24	0.71	0.48	D8	0.10	0.299	0.77	D8	0.10	0.30	0.76	D8	0.18	0.52	0.60	
D9	0.01	0.02	0.98	D9	-0.17	-0.45	0.65	D9	-0.17	-0.45	0.65	D9	-0.07	-0.19	0.85	
D10	-0.34	-0.90	0.37	D10	-0.51	-1.41	0.16	D10	-0.51	-1.41	0.16	D10	-0.40	-1.06	0.29	
R^2	0.28			R^2	0.26			R^2	0.26			R^2	0.27			

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

Dependent Variable: CAR (0)															
Included observations: 134															
US Firms with Medium ESG															
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.
		ESG				E				S				G	
ESG	0.00	-0.03	0.98	E	0.00	0.50	0.62	S	0.00	-0.75	0.46	G	0.00	0.80	0.42
D/E	**0.00**	**2.06**	**0.0416 ****	D/E	**0.00**	**2.04**	**0.0439 ****	D/E	**0.00**	**1.97**	**0.0515 ****	D/E	**0.00**	**1.92**	**0.0575 ****
MV	0.04	1.05	0.29	MV	0.03	0.88	0.38	MV	0.05	1.21	0.23	MV	0.05	1.25	0.22
WC	**0.01**	**3.53**	**0.0006 *****	WC	**0.01**	**3.57**	**0.0005 *****	WC	**0.01**	**3.60**	**0.0005 *****	WC	**0.01**	**3.62**	**0.0004 *****
MP/BV	0.00	-0.73	0.47	MP/BV	0.00	-0.78	0.44	MP/BV	0.00	-0.79	0.43	MP/BV	0.00	-0.60	0.55
AGE	0.00	-0.33	0.74	AGE	0.00	-0.34	0.74	AGE	0.00	-0.37	0.72	AGE	0.00	-0.35	0.73
D1	0.01	0.02	0.98	D1	0.01	0.02	0.99	D1	0.08	0.20	0.84	D1	-0.19	-0.42	0.68
D2	-0.14	-0.27	0.78	D2	-0.15	-0.40	0.69	D2	-0.08	-0.21	0.83	D2	-0.32	-0.73	0.47
D3	-0.27	-0.48	0.63	D3	-0.28	-0.63	0.53	D3	-0.20	-0.44	0.66	D3	-0.47	-0.93	0.35
D4	-0.09	-0.17	0.87	D4	-0.10	-0.25	0.80	D4	-0.01	-0.02	0.98	D4	-0.27	-0.62	0.54
D5	-0.25	-0.47	0.64	D5	-0.27	-0.66	0.51	D5	-0.19	-0.45	0.66	D5	-0.43	-0.95	0.34
D6	-0.12	-0.23	0.82	D6	-0.12	-0.28	0.78	D6	-0.07	-0.17	0.87	D6	-0.33	-0.68	0.50
D7	-0.41	-0.76	0.45	D7	-0.42	-1.06	0.29	D7	-0.34	-0.84	0.40	D7	-0.60	-1.31	0.19
D8	-0.11	-0.21	0.83	D8	-0.12	-0.32	0.75	D8	-0.05	-0.13	0.90	D8	-0.29	-0.66	0.51
D9	-0.24	-0.46	0.65	D9	-0.25	-0.66	0.51	D9	-0.18	-0.44	0.66	D9	-0.45	-0.98	0.33
D10	-0.20	-0.35	0.72	D10	-0.19	-0.43	0.67	D10	-0.15	-0.33	0.74	D10	-0.41	-0.81	0.42
D11	-0.49	-0.94	0.35	D11	-0.51	-1.31	0.19	D11	-0.44	-1.10	0.28	D11	-0.68	-1.52	0.13
R^2	0.34			R^2	0.34			R^2	0.34			R^2	0.34		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

Dependent Variable: CAR (0)															
Included observations: 133															
US Firms with High ESG															
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.
		ESG				E				S				G	
ESG	**0.01**	**1.90**	**0.0604 ***	E	0.00	-0.18	0.86	S	0.00	0.50	0.62	G	**0.01**	**3.36**	**0.00*** **
D/E	0.00	-1.02	0.31	D/E	0.00	-0.98	0.33	D/E	0.00	-0.98	0.33	D/E	0.00	-1.05	0.29
MV	-0.01	-0.46	0.65	MV	**0.04**	**1.829**	**0.07***	MV	0.02	1.19	0.24	MV	-0.01	-0.63	0.53
WC	**0.01**	**2.12**	**0.0359 ** **	WC	**0.01**	**2.33**	**0.02** **	WC	**0.01**	**2.31**	**0.02** **	WC	**0.00**	**1.89**	**0.06***
MP/BV	**0.00**	**1.65**	**0.10***	MP/BV	**0.00**	**1.813**	**0.07***	MP/BV	**0.00**	**1.76**	**0.08***	MP/BV	**0.00**	**1.76**	**0.08***
AGE	0.00	0.72	0.47	AGE	0.00	0.962	0.34	AGE	0.00	0.83	0.41	AGE	0.00	1.04	0.30
D1	**-0.21**	**-1.88**	**0.0633 ***	D1	-0.17	-1.49	0.14	D1	-0.19	-1.64	0.10	D1	-0.16	-1.54	0.13
D2	-0.19	-0.74	0.46	D2	-0.27	-1.02	0.31	D2	-0.25	-0.96	0.34	D2	-0.17	-0.69	0.49
D3	-0.15	-1.48	0.14	D3	-0.15	-1.44	0.15	D3	-0.16	-1.48	0.14	D3	-0.11	-1.15	0.25
D4	-0.12	-1.04	0.30	D4	-0.07	-0.59	0.56	D4	-0.09	-0.71	0.48	D4	-0.12	-1.05	0.30
D5	-0.19	-1.06	0.29	D5	-0.22	-1.16	0.25	D5	-0.21	-1.15	0.25	D5	-0.20	-1.16	0.25
D6	**-0.46**	**-3.45**	**0.0008 *** **	D6	**-0.43**	**-3.17**	**0.00*** **	D6	**-0.44**	**-3.28**	**0.00*** **	D6	**-0.41**	**-3.17**	**0.00*** **
D7	**-0.26**	**-2.34**	**0.021 ** **	D7	**-0.24**	**-2.1**	**0.04** **	D7	**-0.24**	**-2.18**	**0.03** **	D7	**-0.25**	**-2.38**	**0.02** **
D8	-0.13	-1.02	0.31	D8	-0.05	-0.38	0.70	D8	-0.07	-0.55	0.58	D8	-0.12	-1.03	0.30
D9	**-0.40**	**-2.56**	**0.0119 ** **	D9	**-0.32**	**-1.96**	**0.05** **	D9	**-0.34**	**-2.20**	**0.03** **	D9	**-0.34**	**-2.35**	**0.02** **
D10	**-0.42**	**-2.94**	**0.004 *** **	D10	**-0.35**	**-2.39**	**0.02** **	D10	**-0.36**	**-2.55**	**0.01*** **	D10	**-0.46**	**-3.31**	**0.00*** **
R^2	0.24			R^2	0.21			R^2	0.22			R^2	0.28		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

The Case of the US market

For the next step we run a multiple set of regressions setting CAR (0) as the dependent variable for all regressions and as independent variable ESG and the respective separate pillars (E, S and G) for each regression, as well as a number of control variables discussed earlier.

In the first set of regression all US firms (401 firm observations) are examined and no significant results between ESG, E, S, G and CAR (0) were found.

The next set of regressions regarding the US firms are separated into three categories (Low ESG (134 firm observations), medium ESG (134 firm observations) and high ESG (133 firm observations) according to their ESG scores. In the high ESG firms' regression a statistically significant positive relationship is observed between CAR (0) and ESG (at 6% statistical significance), as well as CAR (0) and G (at 0% statistical significance).

The above-mentioned results, whereby firms with high ESG scores are the ones that have higher cumulative abnormal returns, substantiate the belief that ESG activities enhance a firm's social image and creates a sense of trust that encourages stakeholders to remain loyal to firms, even in times of crisis. Firms investing in ESG practices is perceived by investors as a sign of trustworthiness, which acts as a safeguard for maintaining market prices during economic downturns (Demers et al., 2021; Liu et al., 2023). These results substantiate and confirm the results found in the event study.

b) The case of UK market

Dependent Variable: CAR (0)															
Included observations: 65															
UK ALL Firms															
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.
	ESG			E				S				G			
ESG	**-0.01**	**-2.13**	**0.0383****	E	**-0.01**	**-2.13**	**0.0386 ****	S	**-0.01**	**-1.82**	**0.0751 ***	G	0.00	-1.13	0.26
D/E	0.00	-0.11	0.91	D/E	0.00	0.059	0.95	D/E	0.00	-0.21	0.83	D/E	0.00	-0.26	0.80
MV	0.01	0.19	0.85	MV	0.01	0.145	0.89	MV	0.00	0.01	0.99	MV	-0.04	-0.65	0.52
WC	0.00	0.21	0.84	WC	0.00	0.474	0.64	WC	0.00	0.11	0.91	WC	0.00	0.17	0.86
MP/BV	0.00	0.05	0.96	MP/BV	0.00	-0.12	0.90	MP/BV	0.00	0.13	0.90	MP/BV	0.00	0.43	0.67
AGE	0.00	0.80	0.43	AGE	0.00	0.429	0.67	AGE	0.00	0.77	0.45	AGE	0.00	0.64	0.52
D1	0.30	0.57	0.57	D1	0.16	0.306	0.76	D1	0.34	0.66	0.51	D1	0.52	0.99	0.33
D2	0.27	0.58	0.57	D2	0.18	0.378	0.71	D2	0.29	0.60	0.55	D2	0.42	0.88	0.38
D3	0.13	0.24	0.81	D3	0.01	0.013	0.99	D3	0.13	0.24	0.81	D3	0.27	0.51	0.61
D4	0.39	0.66	0.51	D4	0.20	0.326	0.75	D4	0.41	0.69	0.50	D4	0.54	0.89	0.38
D5	0.46	0.88	0.39	D5	0.34	0.636	0.53	D5	0.46	0.86	0.39	D5	0.63	1.16	0.25
D6	0.19	0.34	0.74	D6	0.00	-0.01	0.99	D6	0.15	0.25	0.81	D6	0.46	0.78	0.44
D7	0.02	0.04	0.97	D7	-0.10	-0.19	0.85	D7	0.00	-0.01	0.99	D7	0.20	0.37	0.71
D8	0.16	0.32	0.75	D8	0.03	0.054	0.96	D8	0.18	0.37	0.72	D8	0.37	0.73	0.47
D9	0.59	1.20	0.24	D9	0.47	0.944	0.35	D9	0.61	1.23	0.23	D9	0.69	1.35	0.18
D10	0.51	0.98	0.33	D10	0.42	0.784	0.44	D10	0.57	1.08	0.28	D10	0.67	1.26	0.21
R^2	0.27			R^2	0.27			R^2	0.25			R^2	0.22		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

Dependent Variable: CAR (0)															
Included observations: 22															
UK Firms with Low ESG															
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.
	ESG				E				S				G		
ESG	-0.01	-1.70	0.13	E	-0.01	-1.48	0.18	S	0.00	-0.54	0.60	G	-0.01	-1.38	0.21
D/E	0.00	-0.89	0.40	D/E	0.00	-0.71	0.50	D/E	0.00	-0.07	0.95	D/E	0.00	-0.38	0.72
WC	-0.01	-1.84	0.11	WC	-0.01	-1.12	0.30	WC	-0.01	-1.43	0.20	WC	-0.01	-1.76	0.12
MV	-0.06	-0.43	0.68	MV	-0.04	-0.30	0.77	MV	-0.09	-0.59	0.57	MV	-0.15	-1.15	0.29
MP/BV	0.00	0.59	0.58	MP/BV	0.00	0.55	0.60	MP/BV	0.00	-0.08	0.94	MP/BV	0.00	0.03	0.97
AGE	0.00	-0.16	0.88	AGE	0.00	-0.27	0.79	AGE	0.00	-0.32	0.76	AGE	0.00	-0.18	0.87
D1	1.36	1.18	0.28	D1	0.85	0.70	0.51	D1	1.13	0.84	0.43	D1	1.89	1.43	0.20
D2	1.23	1.10	0.31	D2	0.90	0.76	0.47	D2	1.08	0.83	0.44	D2	1.73	1.39	0.21
D3	1.10	0.89	0.40	D3	0.43	0.31	0.76	D3	1.00	0.67	0.52	D3	1.89	1.36	0.22
D5	1.46	1.29	0.24	D5	0.95	0.80	0.45	D5	1.19	0.91	0.39	D5	2.03	1.55	0.16
D6	1.27	1.06	0.32	D6	0.66	0.51	0.62	D6	1.04	0.74	0.49	D6	1.96	1.42	0.20
D&	1.28	1.18	0.28	D&	0.80	0.79	0.46	D&	0.45	0.41	0.69	D&	1.38	1.11	0.30
D8	1.54	1.32	0.23	D8	1.02	0.84	0.43	D8	1.24	0.92	0.39	D8	2.06	1.53	0.17
D9	**2.25**	**2.01**	**0.084 ****	D9	1.71	1.47	0.18	D9	1.97	1.53	0.17	D9	**2.57**	**2.06**	**0.0783 ****
D11	2.60	1.57	0.16	D11	1.96	1.27	0.25	D11	1.34	0.79	0.46	D11	2.25	1.33	0.23
R^2	0.77			R^2	0.76			R^2	0.69			R^2	0.75		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

Dependent Variable: CAR (0)															
Included observations: 22															
UK Firms with Medium ESG															
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.
	ESG				E				S				G		
ESG	0.01	0.28	0.78	E	0.00	-0.18	0.86	S	0.00	0.44	0.67	G	0.00	-0.05	0.96
D/E	0.00	-0.13	0.90	D/E	0.00	-0.06	0.95	D/E	0.00	-0.04	0.97	D/E	0.00	-0.11	0.92
MV	0.08	0.32	0.76	MV	0.09	0.36	0.72	MV	0.10	0.38	0.72	MV	0.10	0.36	0.72
WC	0.01	0.70	0.50	WC	0.01	0.69	0.51	WC	0.01	0.77	0.46	WC	0.01	0.62	0.55
MP/BV	0.02	0.80	0.44	MP/BV	0.02	0.76	0.47	MP/BV	0.02	0.88	0.40	MP/BV	0.02	0.74	0.48
AGE	0.00	-0.15	0.89	AGE	0.00	-0.12	0.90	AGE	0.00	-0.25	0.81	AGE	0.00	-0.10	0.92
D2	-1.19	-0.49	0.64	D2	-0.83	-0.35	0.73	D2	-1.24	-0.53	0.61	D2	-0.95	-0.41	0.69
D3	-1.62	-0.62	0.55	D3	-1.26	-0.49	0.63	D3	-1.71	-0.66	0.52	D3	-1.41	-0.55	0.59
D5	-1.15	-0.42	0.68	D5	-0.74	-0.28	0.79	D5	-1.19	-0.46	0.66	D5	-0.89	-0.34	0.74
D8	-1.70	-0.65	0.53	D8	-1.32	-0.53	0.61	D8	-1.77	-0.70	0.50	D8	-1.45	-0.59	0.57
D9	-1.01	-0.42	0.69	D9	-0.62	-0.27	0.80	D9	-1.09	-0.46	0.65	D9	-0.76	-0.33	0.75
D11	-0.96	-0.37	0.72	D11	-0.62	-0.24	0.81	D11	-1.06	-0.41	0.69	D11	-0.76	-0.29	0.77
R^2	0.59			R^2	0.59			R^2	0.59			R^2	0.59		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

Dependent Variable: CAR (0)															
Included observations: 21															
UK Firms with High ESG															
Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.	Variable	Coeff	t-Stat	Prob.
	ESG				E				S				G		
ESG	0.03	1.09	0.31	E	**0.02**	**2.612**	**0.031 ****	S	-0.03	-1.57	0.16	G	0.00	0.34	0.75
D/E	0.00	-0.51	0.63	D/E	0.00	-0.74	0.48	D/E	0.00	0.15	0.89	D/E	0.00	-0.28	0.79
MV	0.07	0.49	0.64	MV	0.00	-0.03	0.98	MV	0.11	0.79	0.45	MV	0.08	0.47	0.65
WC	-0.01	-0.62	0.55	WC	-0.01	-1.15	0.28	WC	0.00	-0.07	0.94	WC	0.00	-0.45	0.67
MP/BV	-0.04	-0.80	0.45	MP/BV	-0.03	-0.82	0.44	MP/BV	-0.05	-0.94	0.38	MP/BV	-0.04	-0.71	0.50
AGE	0.00	-0.24	0.81	AGE	0.00	-0.17	0.87	AGE	0.00	-0.60	0.57	AGE	0.00	-0.24	0.82
D2	-2.64	-1.11	0.30	D2	-1.16	-1.1	0.30	D2	1.90	0.98	0.36	D2	-0.88	-0.48	0.64
D3	-2.72	-1.10	0.30	D3	-1.10	-0.93	0.38	D3	1.54	0.80	0.45	D3	-1.01	-0.50	0.63
D4	-2.73	-1.05	0.33	D4	-0.88	-0.74	0.48	D4	2.13	1.00	0.35	D4	-0.86	-0.41	0.69
D5	-2.60	-1.00	0.35	D5	-0.97	-0.83	0.43	D5	2.19	1.06	0.32	D5	-0.72	-0.35	0.74
D7	-3.25	-1.15	0.28	D7	-1.45	-1.05	0.32	D7	1.60	0.71	0.50	D7	-1.33	-0.56	0.59
D8	-2.03	-0.88	0.40	D8	-0.49	-0.46	0.65	D8	2.21	1.19	0.27	D8	-0.37	-0.20	0.85
D9	-2.74	-1.05	0.33	D9	-1.16	-0.96	0.36	D9	1.87	0.93	0.38	D9	-0.87	-0.41	0.69
R^2	0.38			R^2	0.61			R^2	0.45			R^2	0.29		

*, **, *** denote the statistical significance at the 10, 5 and 1 per cent level, respectively

The Case of the UK

Similar regression, as in the case of the US were run for the UK. The first set of regression for all UK firms (66 firm observations) are examined and a statistically significant negative result between ESG (at 4% statistical significance), E (at 4% statistical significance), S (at 7% statistical significance) and CAR (0) were found. These results indicate that firms that high ESG ratings do not shield firms from the adverse effects of the crisis. Share price resilience is not provided to UK firms, despite their efforts via ESG investing. While investing in ESG is a sign of a company's commitment to sustainability, ethics, and governance, their benefits are primarily long-term. In crisis periods, external factors, immediate financial pressures, and market dynamics often dominate these advantages. Companies must balance ESG priorities with financial and operational needs so as to deal with crisis situations effectively (Bae et al., 2021).

The next set of regressions concerning UK firms, are separated into three categories (Low ESG (22 firm observations), medium ESG (22 firm observations) and high ESG (21 firm observations), according to their ESG scores. In the low and medium ESG regressions, no significant results between ESG, E, S, G and CAR (0) were found. However, in the High ESG firms' regression a statistically significant positive relationship (at 3% statistical significance) between E and CAR (0) is observed, whereby firms that heavily invest in ESG, have their E pillar positively affecting the cumulative abnormal returns of firms' stock prices as of the announcement date of Covid-19 (March 2020). Investing in environmental activities motivates investors to remain loyal and therefore creates a premium for the firm's stock, that not only maintains the stock prices during a crisis period, but can even increase them (Liu et al., 2023).

5. Conclusion

This study aims to examine the importance of Environmental, Social, and Governance (ESG) ratings as an indicator of resilience and risk control, in a financial crisis setting, such as COVID-19. Utilizing two sample sets for both US S&P 500 and UK FTSE-100 firms, the study assesses the effect of COVID-19 on the abnormal returns for firms in light of their ESG scores.

In order to quantify how ESG affects stock price performance in times of crisis, the study initially employs an event study methodology to estimate abnormal returns of stock prices. Thereafter, the effects of ESG on these returns are assessed with linear regressions. The study examines not only ESG as an aggregate amount, but also looks at its individual three pillars, namely E, S, and G. Additionally, to examine the actual impact of ESG, both the event study and the multivariate regressions are implemented not only for all companies together, but also by grouping firms into high, medium and low ESG, E, S and G scores, the statistical properties of which are also presented.

The results provide different conclusions for the two markets. In the case of US, the market recovers immediately after the first shock of the pandemic, while during the event window, low ESG-score companies apparently seem to have better post COVID-19 performance compared to the high ESG score. In the case of UK, the negative impact remains in the post event period, while low ESG-score companies show similar performance. As far as the individual components are concerned, in the US only S exhibits positive relation with the abnormal returns, while in the UK, all components show negative relation with the abnormal returns.

The cumulative abnormal returns of the event date (CAR (0)), taken from the event study, is included in a multivariate analysis. More specifically in an effort to examine the effect of pre-COVID ESG scores - both total ESG scores and their individual respective pillars- on CAR (0), all firms included in US S&P 500 and UK FTSE 100 are included in the regressions. The analysis also includes various variables to control for leverage, size, value, age and industry specification. The results are in line with the literature, in the case of the US, whereby, a positive relationship is observed between CAR (0) and high ESG and high G scores, while in the case of UK, there is not a distinct pattern for the ESG components.

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