The impact of Sustainability Performance on Financial Performance in an international context: Evidence from the Corporate Knights global 100 sustainability ranking

Author: Jop Heens
SNR: 1273931
ANR: 395954
Supervisor: Dr. P.C. de Goeij
Chairman: Dr. F.S. Hosseini
Date of graduation: August 04, 2020
Department of Finance
Tilburg School of Economics and Management
Tilburg University

Abstract

This research examines the relationship between the sustainability performance and firm value, as measured by cumulative abnormal returns, by applying the event study methodology and ordinary least squares multiple regression models on the Corporate Knights global 100 sustainability ranking for the period 2016-2020, in an international context. Results indicate that there is no clear relationship between the environmental score and the financial performances of the firm after controlling for trading volume, industry fixed effects and firm-specific effects. Second, the results show that there are clear differences in the relationship between the individual years. However, no clear trend is visible. Third, there are clear differences in the relationship between the geographical regions. As North America is the leading region in valuing sustainability where as Asia is trailing North America and Europe. Fourth, study shows that COVID-19 has a significant influence on the year 2020 for event window [-10,30]. Lastly, the results indicate that there is no attention effect that influences the cumulative abnormal returns around the announcement.

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1. Introduction

"*How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it*" (Smith, 1759, p. 1). Adam Smith understood that a capitalist system must be based on integrity and honesty to function well. This is in alignment with incorporating Corporate Social Responsibility (CSR) policies within firms to increase sustainability. Empirical evidence is mixed as recent studies show that sustainability is positively and negatively related to firm value (Anderson-Weir, 2010; Krueger, 2015; Lyon & Shimshack, 2015; Meric et al., 2012; Murguia & Lence, 2015; Yadav et al., 2016). These ambiguous results cause a further need to study the relationship between sustainability and firm value. Therefore, this study investigates, in an international context, the effect of the Corporate Knights global 100 sustainability ranking (G100) on firm value, measured by stock market returns, for the years 2016, 2017, 2018, 2019 and 2020. Moreover, the differences across years will also be researched to determine the development of the relationship over the years. Lastly, this paper will study if the attention effect, influences the stock returns around the ranking announcement.

This study contributes heavily to the current literature, by focusing on three different regions: North America, Europe and Asia. This study expands the knowledge about the differences of the relationship between sustainability and a firm's value across multiple regions. Most conducted studies put their focus on one single country or region. Furthermore, the unique dataset adds value by using a new ranking for the event studies. The dataset uses the Corporate Knights global 100 sustainability ranking, which has not been studied thoroughly in current literature. The G100 ranking of CK is also a broader ranking than for example the heavily studied Newsweek ranking. The Newsweek ranking focuses mainly on environmental performances of a firm, whereas the CK ranking broadened its ranking methodology to all five of the CSR dimension (Corporate Knights, 2015, 2016, 2017, 2018, 2019; Newsweek, 2017). This difference in the methodology of the rankings ensures a new perspective on the influence of sustainability on firm's value. Finally, this paper will study the relationship between the attention effect, as described by Barber and Odean (2008), and the cumulative abnormal returns around the ranking announcement. This has not been studied before and therefore expands the current literature and knowledge about the Corporate Knights ranking announcement.

The findings of this study can be summarized as follows. It finds a positive relationship between the G100 ranking announcement and firm value, measured by cumulative abnormal returns (CAR's). This indicates that being in the G100 has a positive influence on the value of the firm. Second, cross-sectional analyses indicate that there is no clear relationship between the sustainability score and the stock market returns during the various event windows. Subsequently, the cross-section analyses show that there are clear differences in the relationship between the sustainability score and firm value across the years. However, it is not possible to indicate a clear trend in the development of the relationship across the three event windows. Third, the empirical results indicate that there are significant differences in the relationship between the sustainability score and firm value across the three geographical regions. Fourth, North America is the leading region in valuing sustainability in the financial markets and Asia is trailing both North America and Europe in valuing sustainability. Finally, the attention effect has no significant influence on the cumulative abnormal returns around the Corporate Knights global 100 sustainability ranking announcement.

This paper is organized as follows. Section 2 reviews the current literature and develops the research question along with five hypotheses. Section 3 describes the methodology and data that will be used. Section 4 presents the empirical results and the last section will present the conclusions, indicate the managerial and academic implications, discuss the limitations and provide ideas for future research.

2. Literature Review

This section will discuss the current state of the literature regarding sustainable firms in general. First definitions will be clarified. Afterwards the literature about long-term effects of CSR, short-term effects of CSR, investors opinion about CSR and geographical differences in CSR will be discussed. Finally, the section finishes with the research question and the hypotheses will be formulated with the help of the reviewed literature.

2.1. Definitions - CSR, sustainable firms and environmental performances

In the literature, Corporate Social Responsibility (CSR) has been studied extensively and CSR has an overwhelming amount of different definitions (Dahlsrud, 2008). This paper will use the following definition of the Commission of the European Communities: "*a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis*" (Commission of the European Communities, 2001). This definition of CSR includes all the five dimensions: economic, environmental, social, stakeholder and voluntariness. The economic dimension relates to the relationship between CSR and the economical performances of your firm. Since CSR can be costly it is essential for a firm to balance the financial health of a firm with being a good corporate citizen. The impact of a business on the environment is included by the environmental dimension. This dimension relates to the effort of the firm to contribute to a clean environment. The social dimension refers to the effect of your business on the whole society. The goal of a firm should include the contribution to a better society by integrating social concerns in their business operations. The fourth dimension, stakeholder, considers the influence of your business on all the people that are affected by your firms' actions. This includes employees, suppliers, consumers, communities, etc. The last dimension, voluntariness, refers to the motivation behind the CSR activities. It includes actions based on ethical values and that are beyond legal obligations. The rankings of Corporate Knights (CK) and Newsweek both relate to CSR as defined earlier. However, they both base their ranking on different methodologies and therefore they both relate to the CSR definition differently.

Corporate Knights (CK) use key performance indicators (KPIs) to determine the overall sustainability score of firms (Corporate Knights, 2015, 2016, 2017, 2018, 2019). Their KPIs relate to all the five dimensions, economic, environmental, social, stakeholder and voluntariness. Hence, this paper will deem previous literature about CSR comparable to the definition of sustainable firms made by CK. To further simplify, CSR and sustainable firms will be used as interchangeable definitions.

Newsweek also compiles a similar ranking as CK every year, the *Newsweek*'s Green Ranking. Their methodology shows that their ranking is primarily focused on the environmental performances of firms (Newsweek, 2017). Since they only relate to the environmental dimension of CSR, their definition of green firms is not interchangeable with the definitions of CSR and sustainable firms. However, the literature on environmental performances will be used to acquire a better understanding of the impact of CSR on financial performances.

In addition to Corporate Social Responsibility, people also frequently talk about Corporate Sustainability (CS). CS is defined as followed: "*a business approach that creates long-term shareholder value by embracing opportunities and managing risk from economic, environmental and social dimensions*" (SAM Group and PricewaterhouseCoopers, 2008). The definition of CS includes three of the five dimensions of CSR, there is no explicit mention of stakeholders and voluntariness. CS and CSR are quite similar, but still different from each other. Wempe and Kaptein (2002) indicate in their paper that CS is the ultimate goal of firms, with CSR as an intermediate stage where firms try to balance profit, people and planet all together (The Triple Bottom Line). This paper will use studies about Corporate Sustainability to gain a better understanding about the effect of sustainability on the capital market performances of firms.

2.2. Long-term effects

There have already been papers that examine the long-term effects of CSR on a firm's market value for different geographical regions by using various methodologies. This paper refers to long-term for periods of one or more years.

Nakao et al. (2007) studied the impact of environmental performances on the financial performances for Japanese firms over a period of five year. They show that environmental performances positively impact the financial performances of Japanese firms. The study of Lin et al. (2009) adds further literature about the long-term effects of CSR in Asia. They studied the R&D and charity expenditures of Taiwanese firms related to CSR between 2002 and 2004. Lin et al. (2009) identify a positive relationship between CSR and long-term financial performances (in this case, 3 years).

Lo and Sheu (2007) used panel data methodology to analyze whether Corporate Sustainability (CS) has an impact on the market value (proxied by Tobin's *Q*) of large US non-financial firms over the period 1999-2002. Lo and Sheu (2007) show that CS has a significant positive effect on the market value of large US firms.

By composing separate sustainable funds for the United States, Europe and Asia and comparing these portfolios to their respective financial markets, Hill et al. (2007) studied the long-term relationship between CSR and the stock valuation of a firm. They show that for a 3-year period only the European portfolio significantly outperformed the equity market. Even more interestingly is that for a 10-year period both the United States and European portfolios outperform their respective equity market significantly. Since the Asian portfolio was almost significant for the 10 year period, Hill et al. (2007) suggest that this can indicate that Asia is moving into the same direction as the US and Europe.

Blumenshine and Wunnava (2010) used the financial data of 2000 to 2009 of 100 firms that are included in the US500 list of *Newsweek*'s Green Ranking of 2009. They find that investors are willing to pay a premium for stocks of a firm with higher environmental performances relative to a financial comparable firm with a lower environmental ranking.

Eccles et al. (2014) studied the long-term effects of sustainability over a period of 18 years by matching high sustainability US firms with low sustainability US firms. They find that high sustainability firms significantly outperformed their counterparts, low sustainability firms, over the long run.

Klerk et al. (2015) used a modified Ohlson (1995) model to study the influence of Corporate Social Responsibility disclosure on share prices for large UK firms. They find that high levels of CSR disclosure in a firm are associated with higher share prices. Bowerman and Sharma (2016) used the same methodology as Klerk et al. (2015) and show that investors in the UK consider CSR disclosure in their decision making process using a modified Ohlson (1995) model. In addition, Bowerman and Sharma (2016) show that Japanese investors do not see the added value of CSR disclosure on top of the financial information that UK investors see.

Reviewing the current literature about the long-term effect of CSR on firm's value indicates that there is a positive relationship between CSR and a firm's value in the long haul. This positive relationship seems to be the strongest for North American and European firms.

2.3. Short-term effects

The studies mentioned above focus their attention on long-term effects. Various other papers have studied the relationship between sustainable firms and firm's market value in the short run. This paper will define short-term as periods under one year, where most of the studies look at an even shorter event period of 20 or less days. Some of these studies show a positive relationship between sustainable firms and capital market performances.

Nuzula and Kato (2011) investigated the response of the Japanese financial markets on publications of CSR reports over the time period 2005-2010 by applying the event study methodology. They show that these publications generate a significant positive stock performance over a 19-day period for Japanese firms. Cellier and Chollet (2011) used CSR ratings of Vigeo from 2004 to 2009 to conduct event studies for European firms to study the relationship between CSR and stock prices. They find a positive significant effect of the CSR rating announcement on the stock returns, for a 4-day event period. Murguia and Lence (2015) used the Global 100 ranking from Newsweek's Green Rankings announcement in 2010 to show that a higher position in the ranking increases the added value to a firm. In addition, Murguia and Lence (2015) find that this reaction is higher for non-US firms, mostly European firms, than it is for US firms. Lyon and Shimshack (2015) used the US500 list of the 2009 *Newsweek*'s Green and used an event study in their analysis. They show that the ranking has a significant positive effect on the capital market performance of large US firms. Yadav et al. (2016) also used the event study methodology but then for the US500 list of Newsweek's Green Rankings announcement in 2012. They find a significant positive relationship between the announcement of the ranking and the stock market performances of the related large US firms.

Per contra, other studies show a negative relationship between CSR events or ranking announcements and stock movements, like Anderson-Weir (2010), Meric et al. (2012) and Krueger (2015).

Anderson-Weir (2010) and Meric et al. (2012) used the same Newsweek's Green Ranking of 2009 as Lyon and Shimshack (2015) but Meric et al. (2012) researched the effect of the ranking on the six-month holding stock returns of US firms by using linear regression methodology. They find a negative relationship between the ranking and the six-month holding returns. Anderson-Weir (2010) also used the event study methodology and he finds a negative relationship between the ranking announcement and firms' value. Krueger (2015) used CSR events between August 2001 and April 2007 to study the relationship between CSR events and stock market movements of firms. His study shows that the financial markets react strongly negatively to negative CSR events and weakly negatively to positive CSR events. Krueger (2015) explains that the weakly negative effect on the stock prices due to positive CSR events is mainly due to agency problems that are present in the company. Schaltegger and Synnestvedt (2002) elaborated this phenomenon further in their study. They state that the relationship between environmental performances and financial benefits are dependent on contextual factors such as industry type, a firm's size, cultural setting, customer behavior and the regulatory environment.

The current literature shows that the relationship between CSR and firm performances is not straightforward, van Iwaarden et al. (2010) even show that there is no significant relationship between environmental practices and financial performances. However, most studies show that there is a significant relationship, both positive and negative. The literature leans towards a positive relationship between CSR and stock price movements. This is strengthened by Schaltegger and Synnestvedt (2002) and Krueger (2015) that both discuss in their papers that the negative relationship is mainly due to agency problems and contextual factors that act as a moderator variable on the relationship. This suggests that the relationship between CSR and firm value on itself is a positive relationship.

2.4. Investors opinion about CSR

The literature about short and long-term effects of CSR on a firm's market value indicate that sustainable firms are getting rewarded in the financial markets. This reward in the financial markets shows that investors care about CSR, especially in the long run. The paper of Nyguyen et al. (2020) emphasizes this. Nyguyen et al. (2020) show that long-term investors are essential in ensuring that CSR activities increase the value to shareholders by properly monitoring the managers. This strengthens the belief that CSR activities mainly add value to a firm in the long haul.

Petersen and Vredenburg (2009) show that institutional investors often are unwilling to pay a premium for shares of firms that engage in CSR but they are more prone to hold the shares of firms that engage in CSR. This indicates that investors are acknowledging the added value of CSR, however they are not yet willingly to pay for it in the financial markets.

Krueger et al. (2020) strengthens the idea that institutional investors care about sustainable firms by conducting a survey about the importance of climate risks for institutional investors. They find that more than 90% of the respondents believe that climate risks materialize within 10 years. In addition, Krueger et al. (2020) indicates that more than 30% of the respondents believe that the materialization of regulatory (55%), physical (34%) and technological (33%) climate risks is already happening today. Lastly, they studied the main reasons for considering climate risks. Krueger et al. (2020) find that the top three reasons, the reasons with the highest % of "strongly agree" scores, are protecting their reputation (29.7%), it is their moral/ethical obligation (27.5%) and it is a legal obligation (27.0%). The first two financial reasons are in fourth and fifth place, namely, it is beneficial to investment returns (25.2%) and it reduces overall portfolio risk (23.5%). This shows that climate risks matter for institutional investors and that institutional investors consider climate risks for both nonfinancial and financial reasons. This indicates that they also consider additional dimensions from the CSR definition in their decision process like the environmental dimension.

This shows that these last years investors fully acknowledged the importance of sustainable firms, but there is still a discrepancy about whether they are fully willing to pay for it in the financial markets or not.

2.5. Geographical differences in CSR

Various studies emphasize the importance of CSR in adding firm value and in customer opinions for all three of these regions (Blumenshine & Wunnava, 2010; Cellier & Chollet, 2011; Eccles et al., 2014; Klerk et al., 2015; Lin et al., 2009; Lo & Sheu, 2007; Lyon & Shimshack, 2015; Nakao et al., 2007; Nuzula & Kato, 2011; Yadav et al., 2016). However, following papers indicate that CSR is not exactly valued the same way around the world (Bowerman & Sharma, 2016; Hill et al., 2007; Ho et al., 2012; Maignan & Ferrell, 2003; Murguia & Lence, 2015). Ho et al. (2012) show that European firms outperform North American firms in reference to the average Corporate Social Performance (CSP) score and that Asian firms have the tendency to trail both of them. These results are in line with the results of Bowerman and Sharma (2016), Hill et al. (2007), Maignan and Ferrell (2003) and Murguia and Lence (2015) that suggest that European firms are ahead in recognizing the value of CSR in comparison to North American firms and even more in comparison to Asian firms.

2.6. Research questions and hypotheses

The literature indicates that CSR is an important aspect in the modern-day world. There is a strong indication that the economy is shifting towards a low-carbon economy. This is reinforced by the following graph that shows the strong increase in articles about CSR on Google Scholar over the period 2010-2018.

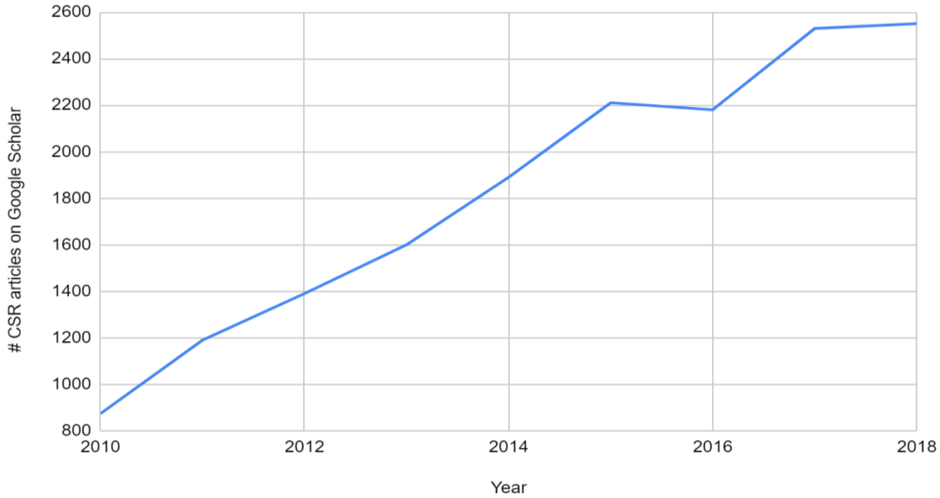

Figure 1: Number of articles on Google Scholar With "CSR" in the title (data from Google Scholar)

In the literature there is still a gap in studies that use green/sustainability rankings in the European and Asian context. Murguia and Lence (2015) use the global 100 ranking of Newsweek in 2010, however, they divide the firms in US and non-US firms. They do not look at European and Asian firms separately.

Moreover, to my knowledge, there are no studies that take the Corporate Knights global 100 sustainable ranking (G100) into account. In addition, the G100 ranks firms on their sustainability based on the five dimensions of CSR in comparison to the Newsweek ranking that mainly focuses on the environmental dimension. Therefore, the G100 is a more comprehensive measurement tool for the effects of CSR on financial performances than the often-used rankings of Newsweek. This new dataset can therefore possibly add some clarity to the direction of the relationship between sustainable firms and the value of firms in the short-term.

Besides the short-term effects, this paper will also look at the development of the short-term effects. By conducting event studies around the G100 announcement for five years, it will be possible to gain a better insight about the development of the effects of sustainability on a firms' market value over the years. The use of this methodology has two main benefits. First, it fills a gap in the literature, since there are no studies that research the development of event study results over multiple years. Second, by studying the effects of the G100 announcement for multiple years, it is possible to study the long-term development of the relationship and deal with the causality problem. Eckles et al. (2014), Lo and Sheu (2007) and Nakao (2007) all recognize that causality can be a problem in long-term effect studies. By using the G100 announcement the cause is clear and the possible problem of reverse causality is mitigated. To fill the discussed gaps in the literature, the following research question is formulated:

Is there a relationship between sustainability and financial performances using the Corporate Knights global 100 sustainability ranking announcement?

As research indicates a positive relationship between ranking announcements and short-term stock movements, it is expected that the relationship for each of the five years will be positive (Lyon & Shimshack, 2015; Murguia & Lence, 2015; Yadav et al., 2016). Since the literature provides evidence that CSR has a positive influence on short-term firm value the first hypothesis is:

H_1: *The Corporate Knights global 100 sustainable ranking announcement has a positive effect on a firms' stock performance.*

Anderson-Weir (2010), Lyon and Shimshack (2015), Meric et al. (2012), Murguia and Lence (2015) and Yadav et al. (2016) all use the overall score and/or the components scores of their ranking as a measurement of absolute environmental performance. Therefore, this paper will use the overall score of the G100 as a measurement of absolute sustainability performance. The literature suggests that the overall score is positively related to the CAR's. This results in the following hypothesis that will be tested:

H_2: *There exists a positive relationship between G100 score and announcement returns.*

By comparing different years with each other it is possible to identify the development of the relationship between sustainable firms and financial performances. The literature discussed shows the importance of CSR in the last decade. However, the general opinion in modern day news would suggest that sustainability gets progressively more important in present-day society and therefore for investors on the stock market (Deloitte, 2019; Donia, 2020; Giles, 2020; Haanaes, 2016; Pollack, 2020; Townsend, 2018). This is enforced by the literature that shows the influence of CSR on firm value in recent years and the investors opinion about climate changes (Krueger et al., 2020; Lyon and Shimshack, 2015; Murguia and Lence, 2015; Nyguyen et al., 2020; Yadav et al., 2016) This results in the third hypothesis:

H_3: *The relationship between sustainable firms and financial performances has changed over the years.*

In the literature it has been shown that Europe is the leading region of the three in the field of sustainable firms (Cellier & Chollet, 2011; Hill et al., 2007; Ho et al., 2012; Maignan & Ferrell, 2003; Nuzula & Kato, 2011). Therefore, it is expected that Europe is more likely to have a positive trend than North America and Asia. In addition Ho et al. (2012) also explicitly mention that Asia is trailing Europe and North America in CSP. Therefore, the following hypothesis is constructed and tested:

H_4: *The relationship between sustainable firms and financial performances differs across North America, Europe and Asia.*

Various studies show a positive relationship between the stock price and the attention the firm gets (Barber & Odean, 2008; Chemmanur & Yan, 2019; Hou et al., 2009). Barber and Odean (2008) find that investors have the tendency to buy stocks that are currently in the news and therefore catch their attention. This is a result of the difficulty to find information about every available firm in the financial market. A news announcement, however, provides an easy source of information and comparison between firms (Barber & Odean, 2008). This can result in inflated stock prices around the event date which will drop significantly once the news fades out because the investors do not recognize an increase in the fundamental value of the firm. Therefore, the expectation is that the attention effect is of influence on the stock movements due to the ranking announcement. This results in the last hypothesis:

H_5: *The stock prices movements around the G100 ranking announcement are influenced by the attention effect.*

3. Data and methodology

3.1. Methodology

This paper aims to investigate the relationship between sustainability and financial performances by using the event study methodology. Subsequently, cross-sectional analysis of the cumulative abnormal returns (CAR's) is used to gain a better understanding of the impact of the sustainability performances of firms.

3.1.1. Event study for Abnormal Returns

An event study will be used to study the market returns that are associated with a specific event, for this paper this will be the announcement of the G100. The reason that this methodology is widely used arises from the fact that, given rationality in the marketplace, the effects will be reflected immediately in security prices (MacKinlay, 1997).

First, the estimation window and the event window size needs to be determined. The estimation window predates the ranking announcement and is used to estimate the normal returns. For the estimation window this paper will use the window that is used by Campbell et al. (2010), Klassen and McLaughlin (1996), Krueger (2015), Lyon and Shimshack (2015), Park (2004) and Roslen et al. (2017) which is a estimation window of 250 days. Note, days in the context of estimation and event window refer to the trading days. To ensure that the estimation window is not influenced by the event in any way, the estimation window ends ten days prior to the event. This gives T_1 =-260 and T_2 =-11.

The event window is the period where abnormal returns are calculated to measure the effect of the ranking announcement. The first event window is a 3-day window. The 3-day event window [(2011)(2015)t_1 =-1 up till t_2 =1] captures the reaction of the market that is caused by the announcement (Mcnichols & Dravid, 1990). For the second event window this paper will follow Cellier and Chollet (2011) and Krueger (2015) with an 11-day event window [-5,5].
A longer event window can help identify a possible attention effect that Barber and Odean (2008) discuss in their paper. Therefore, to be able to get an idea of the possible presence of the attention effect, this paper will include a 41-day event window that looks at more trading days after the

event day [-10,30]. The timeline of the estimation window and the three event windows are shown in Figure 2.

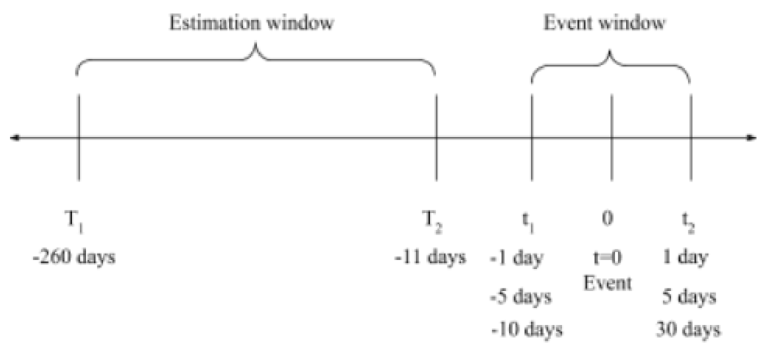

Figure 2: Graphical overview of the estimation and event window

Abnormal returns are used to measure the effects of the Corporate Knights global 100 sustainability ranking on market value. Abnormal returns capture the difference between the actual returns and the normal (expected) returns. The normal returns are defined as the returns that are expected when the event would not take place. The literature shows various methods to measure the normal returns (Crego, 2019). Literature indicates that the market model is the most frequently one used (Anderson-Weir, 2010; Campbell et al., 2010; Harvey et al., 2004; Klassen & McLaughlin, 1996; Krueger, 2015; Lyon & Shimshack, 2015; Murguia & Lence, 2015; Park, 2004; Roslen et al., 2017). However, the literature is ambiguous about which market model best fits a multi-country event study. The literature shows use of the world market model of Park (2004), a market model using a global market index or a market model using local indices (Campbell et al., 2010; Harvey et al., 2004; Murguia & Lence, 2015; Roslen et al., 2017). The difference lies in the way the market is defined. This paper will use a market model using regional indices, since this will account for geographical differences across stock markets. The influence problem discussed by Renner (2011) is avoided, since indices for North America, Europe and Asia are used instead of country indices. For the formulas in this section, this paper will follow the book of Brooks (2014) and the lecture notes of Crego (2019). The parameters for the normal returns for firm i are estimated by regressing the following equation with OLS:

$$R_{i,t} = \alpha_i + \beta_i Rm_{g,t} + \varepsilon_{i,t} \quad (1)$$

Where $R_{i,t}$ is the stock return of firm i on day t, $Rm_{g,t}$ is the return of the market index for geographical region g on day t and $\varepsilon_{i,t}$ is the random-error term for firm i on day t with $E[\varepsilon_{i,t}] = 0$ and $Var[\varepsilon_{i,t}] = \sigma_{\varepsilon}^{2}$.

Normal returns are calculated as followed:

$$NR_{i,t} = \hat{\alpha}_i + \hat{\beta}_i Rm_{g,t} \tag{2}$$

With the use of the normal returns, the abnormal returns are calculated with the following formula:

$$AR_{i,t} = R_{i,t} - NR_{i,t} \tag{3}$$

Where $AR_{i,t}$is the abnormal return of the stock of firm i on day t. The $AR_{i,t}$ is used the calculate the cumulative abnormal returns (CAR) for the event window $[t_1,t_2]$ with the following formula:

$$CAR(t_1, t_2)_i = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{4}$$

Finally, the cumulative average abnormal returns (CAAR) are defined as followed:

$$CAAR(t_1, t_2) = \frac{1}{N}\sum_{i=1}^{N} CAR(t_1, t_2)_i \tag{5}$$

Testing abnormal performances

Once the abnormal returns are computed, the next step is to test the statistically significance of the results. Results will be deemed significant if the t-value is larger than the corresponding critical value. This paper will test if the CAR's are significantly different from zero to explain abnormal returns over the event period. This will not be tested for each event separately, but it will be tested for all the events of one year at the same time. This gives the following null hypotheses for each year:

$$H_o: CAAR(t_1, t_2) = 0 \tag{6}$$

These hypotheses will be tested with the use of t-tests. These t-tests will be used to test H_1. However, there is an adjustment of the standard errors necessary due to overlapping event dates for each year separately in the dataset, which results in event clustering issues. This clustering issue influences the standard errors which results in biased results since the abnormal returns are not uncorrelated. To correct for the cross-sectional correlation, this paper will use cluster robust standard errors (Crego, 2019). The following steps will be used to determine the cluster robust standard errors. First, the daily AR will be regressed during the estimation window using pooled OLS. This regression will be clustered by date. The regression is stated below:

$$AR_{it} = \gamma + \varepsilon_i \tag{7}$$

From here, the standard error clustered by date will be computed ($\widetilde{SE}(\widetilde{\Upsilon})$). In order to make inference about the statistical significance of the coefficients the robust standard errors are calculated with the following formula:

$$s_\delta = \sqrt{(L+1)T} * \widetilde{SE}(\widetilde{\Upsilon}) \tag{8}$$

Where $L+1$ is the length of the event window, T is the length of the estimation window and $\widetilde{SE}(\widetilde{\Upsilon})$ is the standard error of γ estimated during the estimation window. With these robust standard errors, it is now possible to formulate the test statistic that will be used to test the null hypotheses stated in equation (6).

$$TS_1 = \frac{CAAR(t_1,t_2)}{s_\delta} \tag{9}$$

For H_3 this paper will use a F-test to test if there are significant differences across the years, the year 2016 will be omitted to prevent perfect collinearity. The null hypothesis is stated below:

$$H_0: CAAR(t_1,t_2)_{2016} = CAAR(t_1,t_2)_{2017} = CAAR(t_1,t_2)_{2018} = CAAR(t_1,t_2)_{2019} = CAAR(t_1,t_2)_{2020} = 0 \tag{10}$$

The following test statistic will be used:

$$TS_2 = \frac{RRSS - URSS}{URSS} * \frac{T-k}{m} \quad (11)$$

Where:

$URSS$= residual sum of squares from unrestricted regression

$RRSS$= residual sum of squares from restricted regression

m= number of restrictions

T= number of observations

k= number of regressors in unrestricted regression

If the F-test proves that there are differences across the years, then multiple two-sample z-tests will be used to compare the cumulative average abnormal returns (CAAR) across time (Yale, 2020). This will be done with a two-sided test in order to determine if the CAAR's of y_1 are significantly different than the CAAR's of y_2. The following null hypothesis will be used for all the two-sample z-tests, where y_1 refers to the first year and y_2 to the second year tested:

$$H_0: CAAR(t_1, t_2)_{y_1} = CAAR(t_1, t_2)_{y_2} \quad (12)$$

following formula will be used to calculate TS_3:

$$TS_3 = \frac{CAAR(t_1,t_2)_{y_1} - CAAR(t_1,t_2)_{y_2}}{s_3} \quad (13)$$

Where s_3 is defined as:

$$s_3 = \sqrt{\frac{s^2_{\delta y_1}}{N_{y_1}} + \frac{s^2_{\delta y_2}}{N_{y_2}}} \quad (14)$$

3.1.2. Event study for Abnormal Trading Volume

An event study will be conducted to study the possible presence of the attention effect. The estimation window will be the same as for the returns, [-260,-11]. The event windows that will be used are [-1,1], [-5,5] and [-10,30]. However, the emphasis will be on the event windows [-5,5] and [-10,30], since an event window of [-1,1] is considered to be too short to capture a possible attention effect. To calculate the trading volume, the following formula that is in line with the study of Campbell and Wasley (1996) is used:

$$V_{i,t} = LN\left(\frac{n_{i,t} * 100}{s_{i,t}} + 0.000255\right) \tag{15}$$

Where n_{it} is the number of shares traded for firm i on day t and S_{it} are the common shares outstanding of the firm i on day t.The small constant, 0.000255, is added to prevent taking a log of zero (Campbell & Wasley, 1996). To calculate the market trading volumes the following equation used by Campbell and Wasley (1996) is used:

$$\bar{V}_{m,t} = \frac{1}{N}\sum_{i=t}^{n} V_{i,t} \tag{16}$$

Where N is the number of stocks in the market index and $V_{i,t}$ is the trading volume of firm i at day t. For the indices that are used for the returns it is not possible to calculate the trading volumes, so new indices are chosen for the event study for trading volume. For North America the S&P 500 will be used as a proxy for the region. Euronext will be used for Europe and for Asia the S&P Asia Pacific Excluding ANZ Property is used.

In line with the event study conducted for the returns, the market model will be used to calculate the normal volume. Jain and Joh (1988) show that trading volume differs significantly across weekdays. In addition to Jain and Joh (1988), Lakonishok and Maberly (1990) also show that there are significant differences between weekdays and that the trading volume is the lowest on Mondays. Therefore, weekday dummies are used in the calculation of the normal volumes to account for the day-in-the-week effect. The normal volumes are calculated with the following formula:

$$NV_{i,t} = \alpha_i + \beta_1 V_{m,t} + \gamma_{1,i} Monday + \gamma_{2,i} Tuesday + \gamma_{3,i} Wednesday + \gamma_{4,i} Thursday + \varepsilon_i \quad (17)$$

Therefore, the abnormal volumes are calculated with the following equation:

$$AV_{i,t} = V_{i,t} - NV_{i,t} \quad (18)$$

With the abnormal volumes it is possible to calculate the cumulative abnormal volumes (CAV's) during the event windows. This is done with the following formula:

$$CAV(t_1, t_2)_i = \sum_{t=t_1}^{t_2} AV_{i,t} \quad (19)$$

Finally, the cumulative average abnormal volumes (CAAV's) are defined as followed:

$$CAAV(t_1, t_2) = \frac{1}{N} \sum_{i=1}^{N} CAV(t_1, t_2)_i \quad (20)$$

Testing abnormal performances

Once the CAV's are computed it is possible to test if they are significantly different from zero. This will be done with the use of t-test. The t-tests will test the following null hypothesis:

$$H_o: CAAV(t_1, t_2) = 0 \quad (21)$$

However, there is an adjustment of the standard errors necessary due to overlapping event dates for each year separately in the dataset, which results in event clustering issues. This will be done with the same methodology as for the event study for returns (Crego, 2019). First, the daily AV will be regressed during the estimation window using pooled OLS. This regression will be clustered by date. The regression is stated below:

$$AV_{it} = \gamma + \delta_{1,i} Monday + \delta_{2,i} Tuesday + \delta_{3,i} Wednesday + \delta_{4,i} Thursday + \varepsilon_i \quad (22)$$

From here, the standard error clustered by date will be computed ($\widetilde{SE}(\widetilde{\Upsilon})$). In order to make inference about the statistical significance of the coefficients the robust standard errors are calculated with the following formula:

$$s_\delta = \sqrt{(L+1)T} * \widetilde{SE}(\widetilde{\Upsilon}) \tag{23}$$

Where $L + 1$ is the length of the event window, T is the length of the estimation window and $\widetilde{SE}(\widetilde{\Upsilon})$ is the standard error of γestimated during the estimation window. With these robust standard errors, it is now possible to formulate the test statistic that will be used to test the null hypotheses stated in equation (21).

$$TS_1 = \frac{CAAV(t_1,t_2)}{s_\delta} \tag{24}$$

3.1.3. Cross-sectional analysis

Cross-sectional OLS analysis will be used to test the relationship between the overall score of the G100 and the cumulative abnormal returns. In order to find the true relationship, this paper will use firm-specific control variables, industry-fixed effects and a geographical region dummy. The firm-specific variables that will be used as control variables are size, capital structure and profitability (Yadav et al., 2016). For the industry fixed effects this paper will use an industry dummy to control for the different industries. Since Corporate Knights define their industries differently across the years, this paper will use the Global Industry Classification Standard (GICS) which results in 11 different sectors (Corporate Knights, 2015, 2016, 2017, 2018, 2019; MSCI, 2020d). Corporate Knights already use the GICS for their ranking in 2017 and 2018. For the other rankings, 2016, 2019 and 2020, the firms will be assigned an appropriate GICS sector.

In addition to firm-specific variables, the industry-fixed effects and the year dummies, also the variable trading volume will be used in the cross-sectional analysis. This variable will be used to test if the trading volume of a stock has influence on the cumulative abnormal returns. Since this paper conducts event studies for five years, the cross-sectional analyses will be done of a repeated cross-sectional model to test H_2. The following regression functions as the base regression where additional variables, geographical region and year dummies, will be added to further test H_3 and H_4:

$$CAR(t_1, t_2)_i = \alpha + \beta_1 SS_i + \beta_2 SIZE_i + \beta_3 CS_i + \beta_4 ROA_i + \beta_5' GICS_i + \varepsilon_i \quad (25)$$

Where α is the regression intercept, SS_i is the overall sustainability score, $SIZE_i$ is the natural logarithm of the total assets, CS_i is the total debt ratio, ROA_i is the profitability measured by the return on assets (ROA), $GICS_i$ is the industry dummy and $\varepsilon_i$is the error term. The $GICS_i$ variable is included as fixed effects. Thus, each sector is not interpreted individually.

3.2. Data

Corporate Knights produce the Global 100 Most Sustainable Corporations in the World (G100) each year during the World Economic Forum in Davos based on their own methodology (Corporate Knights, 2015, 2016, 2017, 2018, 2019). First the companies get screened on four different aspects: sustainability disclosure practices, financial health, product categories and behavior and lastly, financial sanctions. Firms that pass all four screenings are placed on the shortlist for the G100. With the use of key performance indicators (KPIs) they compose an overall sustainability score for the firms. This score has a value between 0 and 100%. The 100 firms with the highest overall scores are then ranked in the G100 of the fitting year . The G100 of 2016 up and till 2020 will be derived from Corporate Knights. Table 1 shows the announcement dates of the G100 ranking for each year.

Table 1: Announcement dates of the G100

2016	January 20, 2016
2017	January 16, 2017
2018	January 22, 2018
2019	January 22, 2019
2020	January 21, 2020

For the financial performance of firms, the daily adjusted closing stock prices are obtained from Datastream. These stock prices will be used to calculate the stock returns of firm $i$on day t. This will be done with the following formula:

$$R_{i,t} = ln\left(\frac{P_t}{P_{t-1}}\right) \tag{26}$$

For the calculation of the normal returns this paper will use three indices: MSCI North America index, MSCI Europe index and the MSCI AC Asia index. These indices from Morgan Stanley all cover approximately 85% of the free float-adjusted market capitalization of their geographical regions (MSCI, 2020a, 2020b, 2020c). Therefore, they are a good proxy of the market return of North America, Europe and Asia. The daily adjusted closing prices of the indices are obtained from Datastream and used to calculate the return of the market index $Rm_{g,t}$ for geographical region g at day t with the use of equation (26).

The firm-specific variables of a year prior to the rankings will be used and will be retrieved from Datastream (Yadav et al., 2016). The firm-specific variables included in this study are size, capital structure and profitability. Size, capital structure and profitability (return on assets) are calculated with the following formulas:

$$Size = ln(total\ assets) \tag{27}$$

$$Capital\ Structure = \frac{Total\ Debt}{Total\ Assets} \tag{28}$$

$$Return\ on\ Assets = \frac{Net\ Income}{Total\ Assets} \tag{29}$$

So, to calculate the firm-specific variables, total assets, total debt, and net income needs to be retrieved from Datastream for each firm and their respective periods. In order to conduct regressions with the control variables, it is necessary to convert them into one common currency. Therefore, all control variables are expressed in USD.

To calculate the trading volume of each firm and for the three indices, the common shares outstanding and the turnover by volume are retrieved from Datastream.

In the beginning the sample consisted of the 100 most sustainable firms according to the Global Knights ranking for the years 2016-2020. However, firms that are not based in the regions North America, Europe and Asia are dropped from the sample. This results in a drop of seven firms of the 2016 ranking, four firms in 2017, seven in 2018, six in 2019 and six in 2020. In addition, eight firms with a lack of financial information and inconsistent information due to for example a merger/acquisition in the given year are also dropped from the sample. This results in a sample of 462 firms.

4. Empirical Results

4.1. Descriptive statistics

The descriptive statistics of the period 2016-2020 for the firms' sustainability score, size, capital structure and return on assets (ROA) are displayed in Table 2 below. The mean of the sustainability score is 64.09% out of a possible 100%. The mean value of size is 17.32, the average capital structure is 25.22% and the mean ROA is 5.95%. The three firm-specific variables are all skewed to the right since the mean is higher than the median. The sustainability score is also skewed to the right, however there is only a marginal difference between the mean and the median.

Table 2: Descriptive statistics for the period 2016-2020

	mean	sd	min	median	max
Sustainability Score	64.09%	8.63%	38%	64%	86%
Size	17.32	1.64	13.43	17.11	21.76
Capital Structure	25.22%	16.72%	0%	22.91%	166.62%
Return on Assets (ROA)	5.66%	6.60%	-20.57%	4.61%	49.70%

Note: N=462 firms

Table 3 presents the descriptive statistics of the firms' sustainability score, size, capital structure and ROA for each year separately. Looking at the years individually it shows that the variables size, capital structure and ROA are all skewed to the right for each year. However, for the variable sustainability score this is not the case. This is in line with the fact that the mean over the whole period is more or less the same as the median. 2018 is on average the "greenest" year with the highest average sustainability score of 67.09% and 2017 is on average the least "greenest" year with an average score of 59.43%. The variable size is on average the highest in 2018, capital structure in 2020 and ROA in 2016.

Table 3: Descriptive statistics of each year separately					
	2016	2017	2018	2019	2020
Sustainability Score	62.97% (63%)	59.43% (59%)	67.09% (67%)	64.43% (66%)	66.45% (67%)
Size	17.43 (17.19)	17.39 (17.14)	17.45 (17.34)	17.17 (16.92)	17.18 (17.07)
Capital Structure	24.46% (22.25%)	25.18% (23.57%)	24.48% (22.09%)	24.39% (20.01%)	27.05% (25.14%)
Return on Assets (ROA)	5.95% (4.63%)	5.29% (4.30%)	5.67% (4.90%)	5.83% (4.53%)	5.59% (4.25%)
# of firms	89	95	90	94	94

Note: The mean and the (median) values are reported

4.2. Event study returns

The values for CAR represent the abnormal returns that are obtained during the event window. Table 4 presents the descriptive statistics of the CAR's and Figure 4, 5 and 6 shows a visual representation of the CAR for each event window. Figure 6 shows that the mean of CAR[-1,1] is 0.35%, CAR[-5,5] is 0.32% and CAR[-10,30] is -0.11%. This shows that the CAR is decreasing when the event window is increasing. In addition, it is clear that CAR[-1,1] and CAR[-5,5] are skewed to the right and CAR[-10,30] is skewed to the left.

Table 4: Descriptive statistics of the CAR's					
	mean	sd	min	median	max
CAR[-1,1]	0.35%	2.35%	-12.23%	0.16%	14.29%
CAR[-5,5]	0.32%	4.84%	-30.34%	0.22%	20.79%
CAR[-10,30]	-0.11%	10.59%	-50.31%	0.06%	62.94%

Note: N=462 firms

Figure 3, 4 and 5 shows an increase when the line moves from t=0 to t=1 for each duration of the event window. This suggests that the ranking announcements increase the CAR of firms quickly. CAR[-10,30] starts to make a sharp decline at [-10,20]. This decline can have various explanations that will be more elaborately discussed later in this section. Figure 3 and 4 show that CAR[-1,1] and CAR[-5,5] are positive and that a great part of their values are obtained after the ranking announcement. Which is a promising indication of a positive relationship between the ranking announcement and the value of a firm.

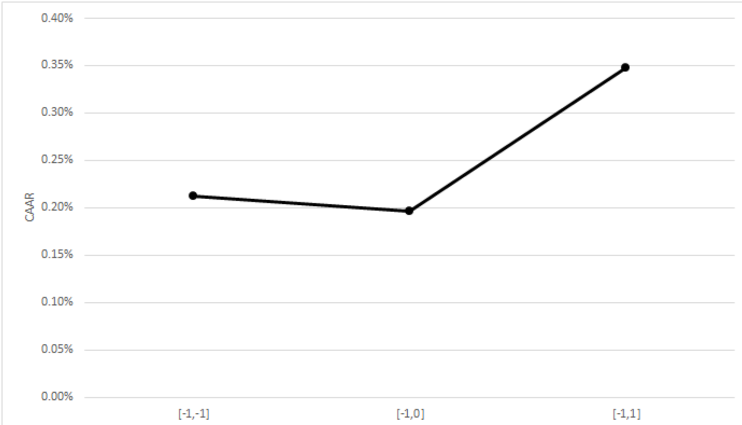

Figure 3: Visual representation of CAR[-1,1] for period 2016-2020

Figure 4: Visual representation of CAR[-5,5] for period 2016-2020

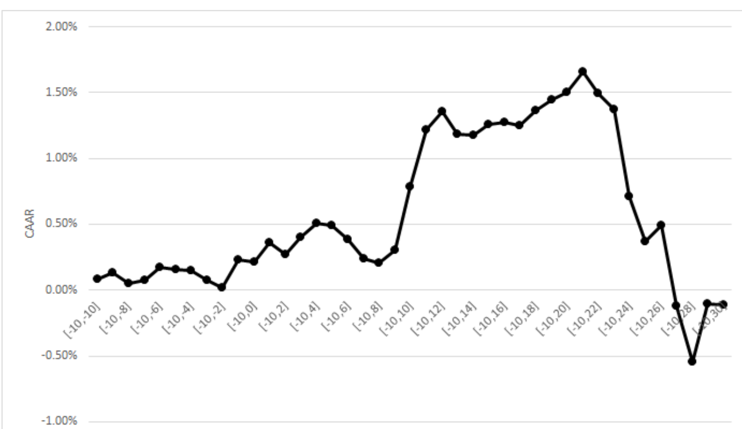

Figure 5: Visual representation of CAR[-10,30] for period 2016-2020

The visual representation of the CAR's suggests that the CAR's are different from zero. T-tests are used to test this suggestion. The results of the t-tests are stated in Table 5. For the full period of 2016-2020 the CAR's are strongly statistically significantly different from zero for [-1,1] and [-5,5]. In addition to the full period, the CAAR's of each year individually are reported with an indication whether they are statistically, significantly different from zero or not. The CAAR's in 2017 are not significantly different from zero and in 2016 they are strongly significant for each event window duration. Although each year individually differs strongly form each other, the CAAR[-1,1] and CAAR[-5,5] of the full period indicate a positive CAAR and therefore a possible causal link between the release of the Corporate Knights sustainability score and the market reaction.

Table 5: Testing abnormal performances: CAAR

Variable	Event window	2016	2017	2018	2019	2020	2016-2020
Constant	[-1,1]	1.12%***	0.22%	-0.29%**	0.03%	0.73%***	0.35%***
		(0.17%)	(0.17%)	(0.15%)	(0.18%)	(0.18%)	(0.08%)
	[-5,5]	1.55%***	0.17%	-0.34%**	0.04%	0.18%	0.32%***
		(0.18%)	(0.17%)	(0.15%)	(0.18%)	(0.18%)	(0.08%)
	[-10,30]	3.18%***	-0.13%	0.14%	1.09%***	-4.52%***	-0.11%
		(0.19%)	(0.18%)	(0.16%)	(0.19%)	(0.19%)	(0.08%)

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

4.3. Cross-sectional analysis

The regressions used in the cross-sectional analysis examine the effect of the sustainability score and additional variables on the dependable variable, cumulative abnormal returns. This is done in four steps where the model gets expanded with additional variables each step. The first model that is tested is the basic bivariate model with only the sustainability score as an independent variable. The four different models are tested on each event window duration for the period 2016-2020. The results for CAR[-1,1] are stated in Table 6, CAR[-5,5] is stated in Table 7 and CAR[-10,30] is stated in Table 8.

By looking at Table 6 it is clear that the sustainability score does not have a significant effect on the CAR[-1,1]. This applies to the bivariate model (model 1) and to the multivariate models (model 2, 3, 4, 5, 6 and 7). The only variables that have a significant effect on the dependent variable are size and the year dummies for 2017, 2018 and 2019. Since size is negatively related to CAR[-1,1] it suggests that small firms are better at implementing CSR than large firms. This relationship is in line with the study of Yadav et al. (2016). The negative relationship of the year dummies of 2017, 2018 and 2019 imply that the CAR[-1,1] for these years are significantly lower than the CAR[-1,1] of the omitted year dummy, 2016. Therefore, looking at an event window of 3 days ([-1,1]), results indicate that the sustainability score has no statistically significant effect on firm value.

Table 6: CAR[-1,1] Regression period 2016-2020

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.30%	2.71%***	0.45%	1.31%**	0.38%	3.85%***	5.05%***
	(0.53%)	(1.21%)	(0.54%)	(0.60%)	(0.56%)	(1.29%)	(1.38%)
Sustainability score	0.07%	0.05%	0.05%	-0.33%	-0.07%	0.10%	-0.41%
	(0.83%)	(0.83%)	(0.83%)	(0.92%)	(0.86%)	(0.85%)	(0.98%)
Size		-0.13%**				-0.15%**	-0.16%**
		(0.06%)				(0.06%)	(0.06%)
Capital structure		0.04%				-0.01%	-0.36%
		(0.46%)				(0.46%)	(0.49%)
Return on Assets		-1.37%				0.03%	-1.70%
		(1.60%)				(1.51%)	(1.58%)
Europe			-0.16%			-0.29%	-0.24%
			(0.18%)			(0.19%)	(0.21%)
Asia			-0.27%			-0.25%	-0.15%
			(0.24%)			(0.25%)	(0.27%)
Year17				-0.90%***			-0.90%***
				(0.24%)			(0.26%)
Year18				-1.39%***			-1.36%***
				(0.23%)			(0.24%)
Year19				-1.06%***			-1.10%***
				(0.24%)			(0.25%)
Year20				-0.30%			-0.35%
				(0.23%)			(0.25%)
Trading volume					-0.01%		-0.06%
					(0.06%)		(0.06%)
Industry fixed effects	No	No	No	No	No	Yes	Yes
Adjusted R^2	-0.0007	0.0056	-0.0007	0.0440	-0.0015	0.0165	0.0617
N of observations	1,386	1,386	1,386	1,368	1,306	1,386	1,288

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

Table 7: CAR[-5,5] Regression period 2016-2020

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	1.59%***	2.81%***	1.43%***	2.76%***	1.33%**	4.25%***	5.39%***
	(0.54%)	(1.23%)	(0.55%)	(0.61%)	(0.57%)	(1.31%)	(1.40%)
Sustainability score	-1.98%**	-1.93%***	-1.59%*	-1.98%**	-2.03%**	-1.97%**	-2.07%**
	(0.84%)	(0.84%)	(0.85%)	(0.94%)	(0.87%)	(0.86%)	(0.99%)
Size		-0.09%***				-0.16%**	-0.21%***
		(0.06%)				(0.06%)	(0.07%)
Capital structure		-0.10%				-0.08%	0.17%
		(0.47%)				(0.47%)	(0.50%)
Return on Assets		5.85%				6.64%***	6.17%***
		(1.63%)				(1.54%)	(1.61%)
Europe			-0.20%			-0.19%	-0.33%
			(0.18%)			(0.19%)	(0.22%)
Asia			0.21%			0.43%**	0.44%
			(0.24%)			(0.25%)	(0.28%)
Year17				-1.41%***			-1.56%***
				(0.24%)			(0.26%)
Year18				-1.76%***			-1.96%***
				(0.23%)			(0.24%)
Year19				-1.37%***			-1.52%***
				(0.24%)			(0.26%)
Year20				-1.17%***			-1.30%***
				(0.24%)			(0.26%)
Trading volume					-0.17%***		-0.31%***
					(0.06%)		(0.06%)
Industry fixed effects	No	No	No	No	No	Yes	Yes
Adjusted R^2	0.0010	0.0092	0.0016	0.0165	0.0043	0.0260	0.0517
N of observations	5,082	5,082	5,082	5,016	4,918	5,082	4,855

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

The regressions of CAR[-5,5] gives a slightly different interpretation about the relationships between the dependent variable and the independent variables. The main difference is that the regressions of CAR[-5,5] suggest a statistically significant negative relationship between the sustainability score and the cumulative abnormal returns over the event window [-5,5]. This significant relationship is implied by the bivariate model and the six multivariable models. This means that a lower sustainability level for firms results in a higher CAR for the event window [-5,5]. In line with the regressions of CAR[-1,1], size has a statistically significant negative relationship with the dependent variable. In addition to size, also ROA has a significant relationship with CAR[-5,5]. ROA has a positive relationship which indicates that firms with a higher profitability will have a higher CAR[-5,5]. This relationship is in contrast with the study of Yadav et al. (2016) who found a negative relationship between ROA and the cumulative abnormal returns. Same as for CAR[-1,1] the year dummies for 2017, 2018 and 2019 have a statistically significant negative relationship with the dependent variable. However, for CAR[-5,5] the year dummy for 2020 also has a statistically significant negative relationship with CAR[-5,5]. The variable trading volume has a strong statistically significantly negative relationship with the CAR[-5,5]. This means that a firm with a lower trading volume will have a higher cumulative abnormal return for the event window [-5,5]. This is in contrast to the literature that states that there is a positive correlation between trading volume and stock price changes (Epps & Epps, 1976; Harris, 1986; Morgan, 1976; Rogalski, 1978; Smirlock & Starks, 1985). The regressions for CAR[-5,5] imply a statistically significant negative relationship between market value and sustainability performance. This empirical result is in line with the discussed literature (Anderson-Weir, 2010; Krueger, 2015; Meric et al., 2012).

The last regressions are done for CAR[-10,30] and are stated in Table 8. In line with CAR[-5,5], the bivariate and multivariable models show a statistically significant negative relationship between the sustainability score and the CAR. By analyzing the seventh model which includes the firm specific control variables, the industry fixed effects, the geographical dummies, the year dummies and trading volume, it is visible that only ROA and the Europe dummy do not have a significant relationship with the dependent variable. Size, the four year-dummies and trading volume have a negative relationship and capital structure and the Asia dummy have a positive relationship. This means that firms with a more aggressive capital structure gain a higher CAR[-10,30]. The significant positive Asia dummy indicates that North American and European firms underperform in contrast to their Asian counterparts. These results are in contrast with the discussed literature, since the literature states that Asia is trailing both Europe and North America and that Europe is the leading region in rewarding sustainability (Cellier & Chollet, 2011; Hill et al., 2007; Ho et al., 2012; Maignan & Ferrell, 2003; Nuzula & Kato, 2011). The negative relationship between sustainability score and CAR[-10,30] is in line with the results of the regressions for CAR[-5,5]. This gives a stronger claim to the statement that there is a negative relationship between sustainable firms and market value.

Table 8: CAR[-10,30] Regression period 2016-2020

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	1.07%*	11.53%***	1.09%*	3.37%***	0.87%	11.87%***	15.00%***
	(0.57%)	(1.30%)	(0.58%)	(0.65%)	(0.60%)	(1.38%)	(1.48%)
Sustainability score	-1.85%**	-1.96%***	-2.18%**	-0.76%	-1.77%*	-3.41%***	-1.84%*
	(0.89%)	(0.86%)	(0.90%)	(0.99%)	(0.92%)	(0.91%)	(1.05%)
Size		-0.62%***				-0.72%***	-0.79%***
		(0.07%)				(0.07%)	(0.07%)
Capital structure		1.25%***				2.42%***	3.13%***
		(0.49%)				(0.50%)	(0.55%)
Return on Assets		0.19%				2.39%	1.00%
		(1.72%)				(1.62%)	(1.70%)
Europe			0.32%*			0.51%**	0.17%
			(0.19%)			(0.21%)	(0.23%)
Asia			0.04%			0.01%	0.52%*
			(0.25%)			(0.27%)	(0.29%)
Year17				-3.05%***			-3.31%***
				(0.26%)			(0.28%)
Year18				-2.71%***			-2.93%***
				(0.24%)			(0.26%)
Year19				-1.32%***			-1.77%***
				(0.26%)			(0.27%)
Year20				-7.30%***			-7.74%***
				(0.25%)			(0.27%)
Trading volume					-0.08%		-0.17%***
					(0.06%)		(0.07%)
Industry fixed effects	No	No	No	No	No	Yes	Yes
Adjusted R^2	0.002	0.0097	0.0003	0.0556	0.0003	0.0153	0.0741
N of observations	19,404	19,404	19,404	19,152	18,363	19,404	18,121

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

The results of the regressions stated in Table 6, 7 and 8 suggest that the CAAR's are different across the years. To further test this with the use of the null hypothesis that is stated in equation (10), F-tests for each event window period are performed and the results are stated in Table 9. The F-tests show that for each event window there is a significant difference between the years, since the P-values are all smaller than 0.01.

Table 9: F-test for year dummies	
Event window	P-value
[-1,1]	0.0000
[-5,5]	0.0000
[-10,30]	0.0000

By first looking at the visual display of the CAAR's across years in Figure 6, it is possible to see that the CAAR is the highest in 2016 for [-1,1], [-5,5] and [-10,30]. In addition, Figure 6 also shows that the CAAR[-10,30] in 2020 is vastly lower than the CAAR[-10,30] of previous years. This decline is also not in line with the relationship between the CAAR[-1,1] and CAAR[-5,5] in 2020 and the CAAR[-1,1] and CAAR[-5,5] of the previous years. The lower CAAR[-10,30] of 2020 can be the reason that the CAAR[-10,30] takes a sharp decline that was shown in Figure 5. Figure 6 also suggests that for each event window there is not a positive trend across all years, however it indicates that for [-1,1] and [-5,5] it is possible that there is a positive trend starting. However, in order to say something meaningful about the differences between years and the trend additional tests are required.

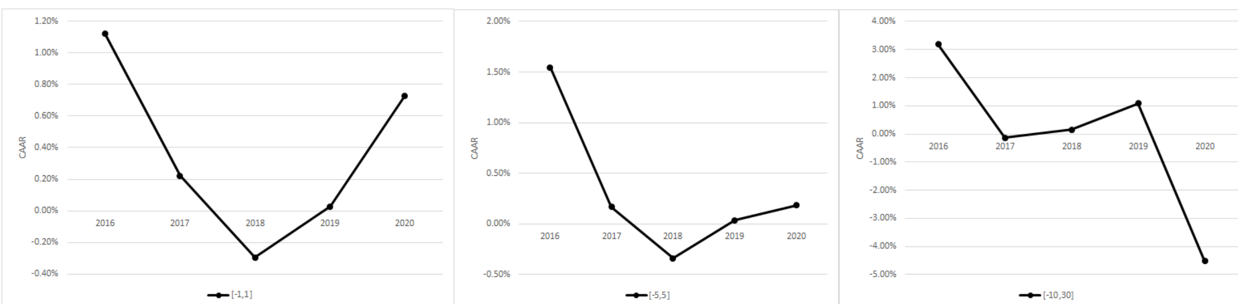

Figure 6: Visual representation of the development of the CAAR across the years for the three event window

Since the F-tests indicate that the year dummies are significantly different from each other, additional two-sample z-tests (see equation (12)) are conducted to further investigate the differences in CAAR[t_1,t_2] between the years. The results of these two-sample z-tests are stated in Table 10. The results show that there are indeed significant differences across the years for each event window. The two-sample z-tests for CAAR[-1,1], CAAR[-5,5] and CAAR[-10,30] all show that the CAAR's are the highest in 2016. Table 10 also shows that the trend is indeed not a positive trend across all years. However, the results show that the CAAR[-1,1] in 2020 is higher than 2017, 2018 and 2019 and for CAAR[-5,5] it is higher than 2018 and 2019. These results indicate that there is a starting positive trend for CAAR's during the event windows [-1,1] and [-5,5]. For the event window [-10,30] the results show that the CAAR of 2019 is higher than in 2017 and 2018. However, the CAAR in 2020 is significantly lower than in 2019 and therefore it is not possible to speak of a starting positive trend for the event window [-10,30].

Table 10: Multiple two-sample z-test: CAAR

	[-1,1]	[-5,5]	[-10,30]
2016 vs 2017	0.90%***	1.38%***	3.32%***
	(0.16%)	(0.08%)	(0.04%)
2016 vs 2018	1.41%***	1.89%***	3.04%***
	(0.15%)	(0.08%)	(0.04%)
2016 vs 2019	1.09%***	1.51%***	2.09%***
	(0.16%)	(0.08%)	(0.04%)
2016 vs 2020	0.39%**	1.36%***	7.70%***
	(0.16%)	(0.08%)	(0.04%)
2017 vs 2018	0.52%***	0.51%***	-0.28%***
	(0.15%)	(0.08%)	(0.04%)
2017 vs 2019	0.19%	0.13%	-1.22%***
	(0.16%)	(0.08%)	(0.04%)
2017 vs 2020	-0.51%***	-0.02%	4.38%***
	(0.16%)	(0.08%)	(0.04%)
2018 vs 2019	-0.32%**	-0.38%***	-0.95%***
	(0.15%)	(0.08%)	(0.04%)
2018 vs 2020	-1.02%***	-0.52%***	4.66%***
	(0.15%)	(0.08%)	(0.04%)
2019 vs 2020	-0.70%***	-0.15%*	5.61%***
	(0.16%)	(0.08%)	(0.04%)

*Note: Standard errors are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

To improve the study of the development of the relationship between sustainable firms and financial performances this paper first looks at the visual representation of the development of the sustainability score estimates across the years for each event window that are shown in Figure 7. Figure 7 suggests that there is an overall positive trend for the sustainability score estimate in the event window of [-1,1] and a negative trend across all years for the event window [-10,30]. The visual representation of event window [-5,5] suggests that there is no trend since the estimate jumps up and down each year.

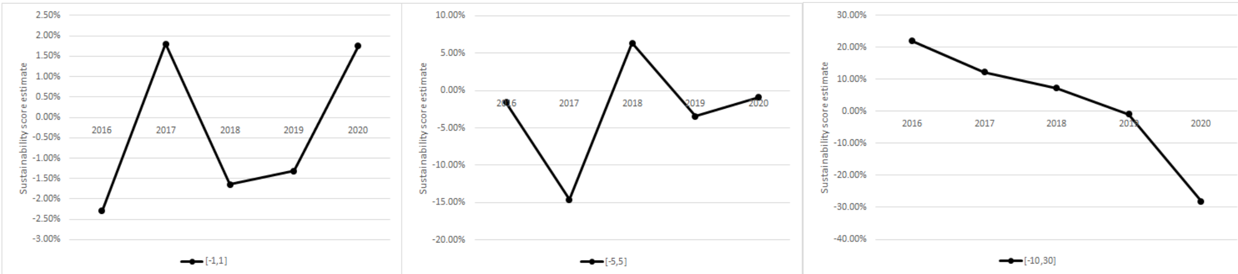

Figure 7: Visual representation of the development of the sustainability score estimate across the years for CAAR[t_1,t_2]

To better understand the yearly differences of the sustainability score estimate, two-sample z-tests are conducted and their results are reported in Table 11. The sustainability score estimates of each year are computed with the variables that are used in model (7) of the regression. The results are very different for each event window. Table 11 shows that there is indeed a statistically significant negative trend over the whole period for event window [-10,30]. It also shows that for the event window [-1,1] the sustainability score estimate in 2020 is statistically significantly higher than in 2016, 2018 and 2019. This suggests indeed a positive trend for the event window [-1,1]. For event window [-5,5] the results clarify that there is indeed not a clear trend since the estimate gets significantly lower from 2016 to 2017 and significantly higher from 2017 to 2018 and then it repeats this cycle for the following two years.

Table 11: Multiple two-sample z-test: Sustainability score

	[-1,1]	[-5,5]	[-10,30]
2016 vs 2017	-4.10%***	12.98%***	9.71%***
	(1.51%)	(0.79%)	(0.42%)
2016 vs 2018	-0.65%	-7.95%***	14.74%***
	(1.48%)	(0.79%)	(0.42%)
2016 vs 2019	-0.99%	1.87%**	22.82%***
	(1.39%)	(0.73%)	(0.39%)
2016 vs 2020	-4.04%***	-0.66%	50.01%***
	(1.36%)	(0.71%)	(0.38%)
2017 vs 2018	3.45%**	-20.94%***	5.03%***
	(1.46%)	(0.76%)	(0.40%)
2017 vs 2019	3.12%**	-11.11%***	13.11%***
	(1.36%)	(0.69%)	(0.37%)
2017 vs 2020	0.06%	-13.64%***	40.30%***
	(1.33%)	(0.68%)	(0.36%)
2018 vs 2019	-0.33%	9.82%***	8.08%***
	(1.33%)	(0.69%)	(0.37%)
2018 vs 2020	-3.39%***	7.29%***	35.27%***
	(1.29%)	(0.68%)	(0.36%)
2019 vs 2020	-3.06%***	-2.53%***	27.19%***
	(1.19%)	(0.61%)	(0.32%)

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

4.4. The Influence of COVID-19

Figure 6 and Table 10 show that the CAAR[-10,30] in 2020 was significantly lower than all four previous years. This phenomenon is in contrast to the results for CAAR[-1,1] and CAAR[-5,5]. He et al. (2020) show in their paper that the COVID-19 virus has a significant negative impact on the stock market. They identify an 'pre-event window' where the effects of COVID-19 are just starting to emerge and a 'long event window' where the effects of the virus are far greater. Since the event window [-10,30] starts at 07-01-2020 and ends at 03-03-2020, it falls in the 'pre-event period' and the 'long event window' of China and in the 'pre-event window' of the other countries consisting of North American, European and Asian firms. Therefore, a possible explanation of the sharp decrease in CAAR for the event window [-10,30] in 2020 can be the influence of COVID-

19 on the stock markets worldwide. Since the event windows [-1,1] and [-5,5] are shorter they are potentially way less contaminated by the virus than the event window [-10,30].

Due to the possible contamination of the data in 2020 due to COVID-19, this paper will study if removing 2020 from the dataset will significantly change the results. Table 12 shows the results of the t-tests that are conducted to test if the CAAR's are significantly different from zero for the period 2016-2019. The results show that for all three event windows the CAAR is strongly significantly different from zero and that the CAAR increases when the event window increases. This is in contrast to the CAAR's for the period 2016-2020, see Table 3.

Table 12: Testing abnormal performances: CAAR period 2016-2019

Variable	[-1,1]	[-5,5]	[-10,30]
Constant	0.27%***	0.35%***	1.09%***
	(0.08%)	(0.08%)	(0.09%)

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

To test if excluding 2020 from the database significantly changes the CAAR's this paper uses a two-sample z-test for each event window. These results are reported in Table 13. As already expected, Table 13 shows that only for the event window [-10,30] the CAAR of period 2016-2019 is significantly different from the period 2016-2020. It also indicates that the CAAR is significantly higher for the period 2016-2019. This is in line with the results of He et al. (2020) who show that COVID-19 has a negative impact on the stock performances.

Table 13: Multiple two-sample z-test: CAAR

	[-1,1]	[-5,5]	[-10,30]
2016-2020 vs 2016-2019	0.08%	-0.03%	-1.20%***
	(0.11%)	(0.06%)	(0.03%)

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

Since the CAAR of period 2016-2019 for the event window [-10,30] is significantly higher than the CAAR of period 2016-2020, this paper will run regressions on the event window [-10,30] for period 2016-2019 to study if excluding the year 2020 of the database affects the relationship. The same variables as the previous regressions, see Table 6, 7 and 8, will be used. The results of the regressions are stated in Table 14. Table 14 shows that the relationship between the sustainability score and CAR[-10,30] is still significant, except now it is a positive relationship for all five models. The variables size and capital structure both remain significant and their sign also remains unchanged. ROA and the year dummies for 2017, 2018 and 2019 remain unchanged. The geographical dummies for Europe and Asia are now both significant but they have a negative relationship with the CAR[-10,30] instead of a positive relationship. This means that North American firms now outperform European and Asian firms instead of the other way around. Trading volume remains significantly negative. However, the effect of trading volume on the cumulative abnormal returns for the event window [-10,30] increases from -0.17% to -0.80%.

Table 14: CAR[-10,30] Regression period 2016-2019

Variables	(1)	(2)	(3)	(4)	(5)
Constant	-3.07%***	6.64%***	7.22%***	8.60%***	9.89%***
	(0.75%)	(1.61%)	(1.64%)	(1.66%)	(1.72%)
Sustainability score	6.51%***	7.23%***	7.58%***	8.41%***	8.04%***
	(1.17%)	(1.19%)	(1.21%)	(1.32%)	(1.37%)
Size		-0.52%***	-0.53%***	-0.56%***	-0.64%***
		(.08%)	(0.08%)	(0.08%)	(0.08%)
Capital structure		2.02%***	1.66%***	1.94%***	1.55%***
		(0.55%)	(0.55%)	(0.56%)	(0.58%)
Return on Assets		0.83%	0.88%	0.37%	-2.37%
		(1.82%)	(1.81%)	(1.82%)	(1.89%)
Europe			-0.64%***	-0.50%**	-1.29%***
			(0.24%)	(0.24%)	(0.26%)
Asia			-0.78%***	-0.72%**	-1.07%***
			(0.31%)	(0.31%)	(0.34%)
Year17				-3.04%***	-3.25%***
				(0.26%)	(0.28%)
Year18				-3.49%***	-3.59%***
				(0.26%)	(0.27%)
Year19				-2.38%***	-2.72%***
				(0.27%)	(0.29%)
Trading volume					-0.80%***
					(0.08%)
Industry fixed effects	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.0027	0.0425	0.0433	0.0634	0.0811
N of observations	14,842	14,842	14,842	14,842	14,380

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

To study the differences in the relationship between sustainability firms and financial performances across the geographical regions this paper will use the period 2016-2019 to prevent that our data is contaminated by COVID-19. Figure 8 shows the visual representation of the sustainability score estimate across the geographical regions for all three event windows. The sustainability score estimate is calculated by regressing sustainability score, size, CS, ROA, industry dummies and year dummies on the dependable variable, CAR. Figure 8 suggests that the sustainability score estimate is the highest in North America for the event window [-1,1] , [-5,5] and [-10,30].

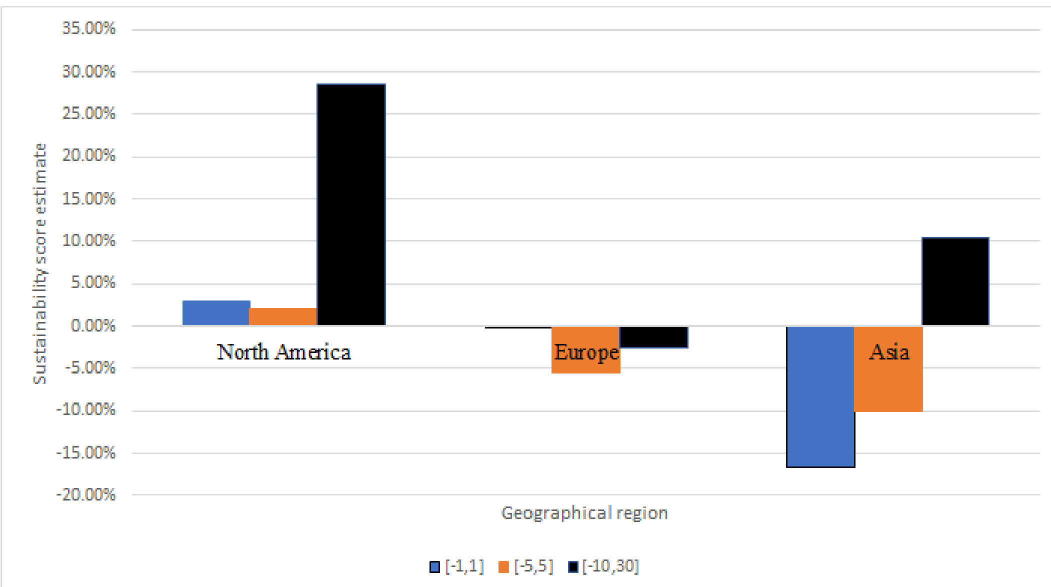

Figure 8: The visual representation of the sustainability score estimate across the geographical regions

To study if there are indeed statistically significant differences between the geographical regions for the sustainability score estimate, two-sample z-tests will be performed for the period 2016-2019. The results of these tests are reported in Table 15. The results show that North America has indeed the highest sustainability score in the event window [-1,1], [-5,5] and [-10,30]. Table 15 also indicates that Europe has a higher estimate than Asia for the event window [-1,1] and [-5,5] and that Asia has a higher estimate than Europe for the event window [-10,30]. These results contradict with the discussed literature, since the literature states that Europe is the leading region in CSR (Cellier & Chollet, 2011; Hill et al., 2007; Ho et al., 2012; Maignan & Ferrell, 2003; Nuzula & Kato, 2011). However, the literature also states that Asia is trailing North America and

Europe in the area of CSR and the event windows [-1,1] and [-5,5] show results that are in line with this statement.

Table 15: Multiple two-sample z-test: sustainability score

	[-1,1]	[-5,5]	[-10,30]
North America vs Europe	3.02%***	7.56%***	30.98%***
	(0.26%)	(0.14%)	(0.07%)
North America vs Asia	19.44%***	12.14%***	18.09%***
	(0.46%)	(0.24%)	(0.13%)
Europe vs Asia	16.42%***	4.58%***	-12.89%***
	(0.46%)	(0.22%)	(0.12%)

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

4.5. The attention effect

To study if the CAR's are explained by the attention effect this paper will first look at a graphical representation of the CAR's for the event windows [-5,5] and [-10,30] because the event window [-1,1] is too short to capture a possible attention effect. Since the CAR's of the event window [-10,30] are contaminated by COVID-19 the period 2016-2019 will be used. The graphical representation of event window [-5,5] and [-10,30] are shown in Figure 9 and 10. Both graphs show that the CAAR decreases on $t = 2$, however the decline is for both event windows smaller than the increase on $t = 1$. In addition, the CAAR's do not continue to decline after $t = 2$, on the contrary, they start to increase again. This suggests that the investor's behavior to buy "attention-stocks" do not or weakly explain the abnormal returns around the G100 ranking announcement.

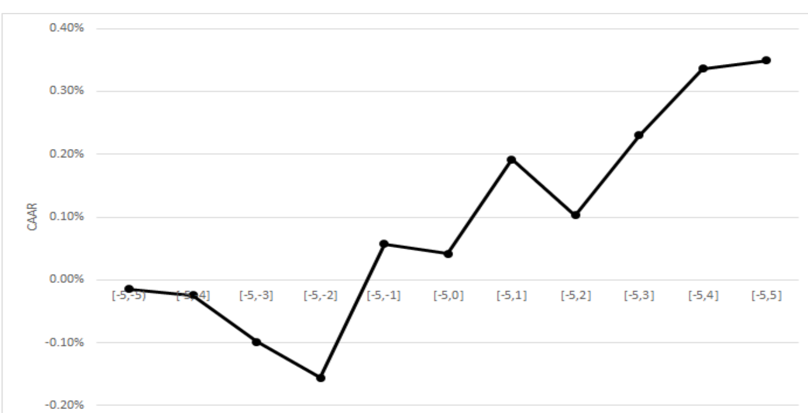

Figure 9: Graphical representation of event window [-5,-5] for period 2016-2019

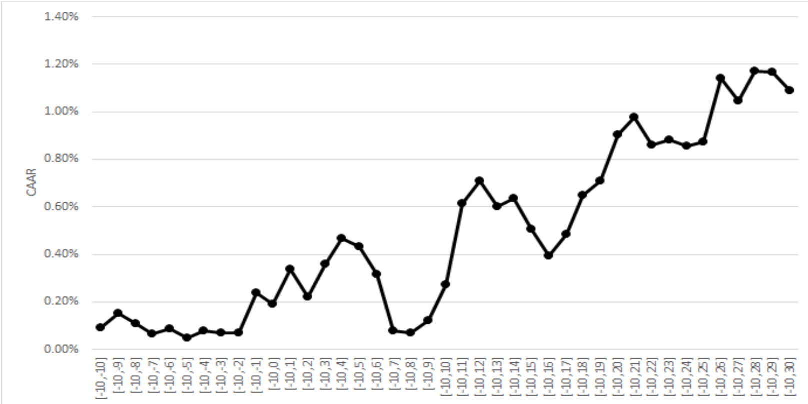

Figure 10: Graphical representation of event window [-10,30] for period 2016-2019

To gain additional information about the possible attention effect, an event study for the cumulative abnormal volumes (CAV's) is executed. Table 16 shows the descriptive statistics of the CAV's over the period 2016-2019. It shows that the mean is -6.29% for the event window [-1,1], -4.55% for [-5,5] and 75.83% for the event window of [-10,30]. Table 16 also indicates that CAV[-1,1] is skewed to the left and CAV[-5,5] and CAV[-10,30] are skewed to the right.

Table 16: Descriptive statistics of the CAV's period 2016-2019

	mean	sd	min	median	max
CAV[-1,1]	-6.29%	118.75%	-856.50%	-6.28%	363.84%
CAV[-5,5]	-4.55%	308.99%	-976.29%	-21.24%	1143.13%
CAV[-10,30]	75.83%	889.81%	-3371.68%	7.63%	3361.30%

Table 17 shows the results of the t-test to test if the CAV's are significantly different from zero. To test the attention effect event window [-1,1] is too short to gain a better understanding. At event windows [-5,5] 2016 is significantly positive and in 2017 it is significantly negative, for 2018, 2019 and the whole period 2016-2019 there is no statistically significant difference from zero. For the event window [-10,30] the CAAV is significantly different from zero for each year and the whole period. Only in 2017 the CAAV was lower than zero.

Variable	Event window	2016	2017	2018	2019	2016-2019
constant	[-1,1]	25.19%***	-25.76%***	9.03%	-32.79%***	-6.29%*
		(-6.00%)	(-5.94%)	(-5.83%)	(-9.89%)	(-3.60%)
	[-5,5]	40.02%***	-42.55%***	-8.52%	-4.55%	-4.55%
		(-9.62%)	(-8.63%)	(-10.14%)	(-10.64%)	(-4.90%)
	[-10,30]	256.86%***	-98.62%***	111.38%***	44.71%***	75.83%***
		(-14.29%)	(-14.29%)	(-13.08%)	(-16.06%)	(-7.30%)

Table 17: Testing abnormal Performances: CAAV

*Note: Standard deviations are reported in parenthesis. The significance levels are denoted by ***, ** and * for 1%, 5% and 10% respectively*

Figure 11 shows that graphical development of the CAAV for [-5,5] and Figure 12 shows the development of the CAAV for event window [-10,30]. Both figures indicate that the abnormal volume increases from $t = 0$. This is in line with the literature about the attention effect (Barber & Odean, 2008; Chemmanur & Yan, 2019; Hou et al., 2009). However, the attention effect theory suggests that the trading volume should drop significantly once the news fades out (Barber & Odean, 2008). Both Figure 11 and 12 do not show a significant decrease in trading volume once the news fades out. This implies that the attention effect does not influence the cumulative abnormal returns, which is in contrast to H_5.

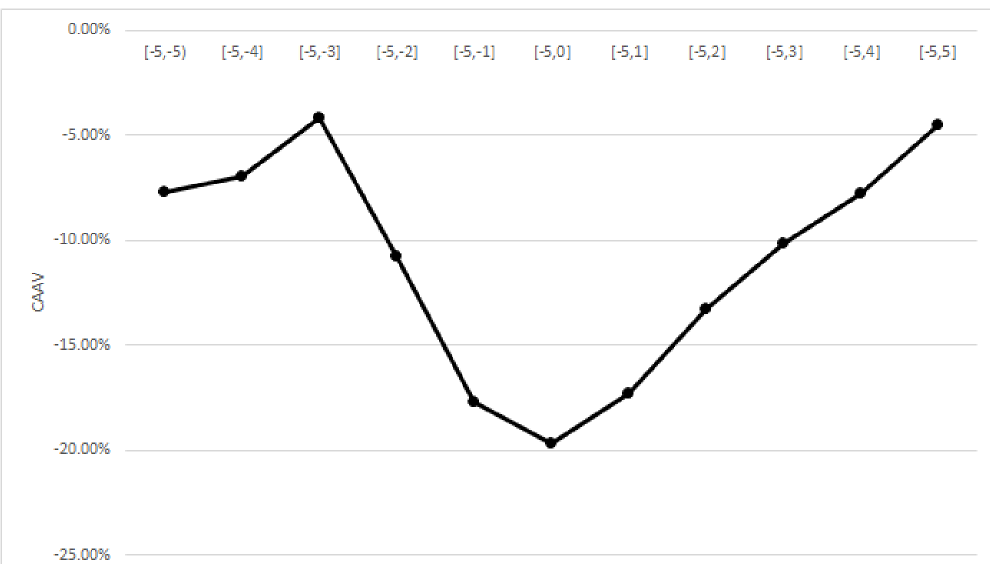

Figure 11: Graphical representation of the development of CAAV[-5,5]

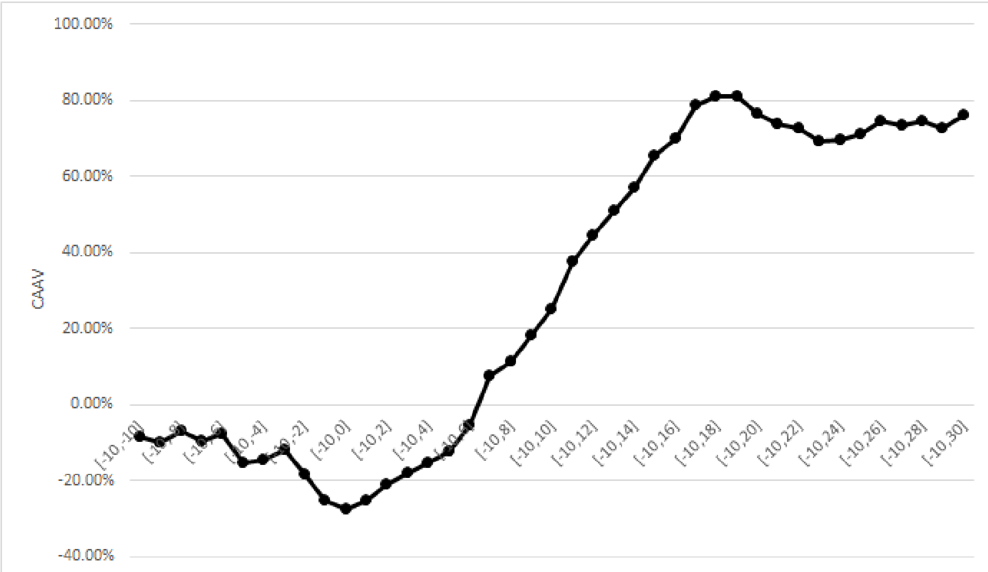

Figure 12: Graphical representation of the development of CAAV[-10,30]

5. Conclusion and Recommendations

5.1. Conclusion

This research used an event study combined with a cross-sectional analysis to study the relationship between sustainable firms and firm value. The results are mixed across the different event windows, years and geographical regions. These mixed findings are consistent with the discussed literature that shows both positive and negative relationships (Anderson-Weir, 2010; Krueger, 2015; Lyon & Shimshack, 2015; Meric et al., 2012; Murguia & Lence, 2015; Yadav et al., 2016). However, the empirical results of this paper clearly shows a relationship between sustainability and financial performances using the Corporate Knights global 100 sustainability ranking announcement.

The event study shows a statistically significantly positive CAAR for the event windows [-1,1] and [-5,5] and no significant relationship for the event window [-10,30] during the period 2016-2020. However, by taking the effects of COVID-19 into account this study finds a significant positive CAAR for each of the three event windows for the period 2016-2019. These results show that the Corporate Knights global 100 sustainable ranking announcement has a positive effect on the financial performances of firms (H_1).

The positive CAAR's suggest that sustainability increases firm value. However, the cross-sectional analyses are ambiguous about the relationship between the sustainability score and firm value when controlled for firm-specific variables, industry-fixed effects, year dummies, region dummies and trading volume. Table 6 shows no significant relationship, Table 7 implies a negative relationship and Table 14 shows a positive relationship. Therefore, it is not possible to draw a definitive conclusion about H_2 that speaks of a positive relationship between the sustainability score and announcement returns.

The F-tests and in addition the two-sample z-tests indicate that there are indeed differences across the years for the relationship between sustainable firms and financial performances (H_3). For the event window [-1,1] Table 11 indicates a positive trend since the sustainability score estimate of 2020 is significantly higher than in the years 2016, 2018 and 2019. For the event window [-5,5] there is not a clear trend since the sustainability score estimate alternates between a significant increase and decrease. For the event window [-10,30] the data shows a significant negative trend across the whole period. This implies that the data shows clear differences across the years for the relationship between sustainable firms and financial performances; however, it is not possible to say something meaningful about the trend of the relationship due to the conflicting results.

The literature suggests that there are differences across geographical regions for the relationship between sustainable firms and financial performances (H_4) (Cellier & Chollet, 2011; Hill et al., 2007; Ho et al., 2012; Maignan & Ferrell, 2003; Nuzula & Kato, 2011). This hypothesis is supported by the results stated in Table 15. The data shows that North America has the highest sustainability score estimate across the period 2016-2019 for each of the event windows. In addition, the results show that Europe has a significant higher estimate than Asia for the event windows [-1,1] and [-5,5]. This shows that in contrast to the literature, North America is the leading region in sustainability and in line with the literature Asia is indeed trailing Europe and North America in sustainability.

Table 17 and Figures 11 and 12 show that there is no significant decrease of trading volume once the news about the Corporate Knights global 100 sustainability ranking has faded out. Therefore, it is not possible to say that the attention effect, as described by (Barber & Odean, 2008), has a significant impact on the cumulative abnormal returns around the ranking announcement (H_5).

5.2. Limitations and recommendations for future research

Besides the added value that this study provides for the current literature, some limitations should be taken into account. This study uses the event study methodology for 5 different years to gain an insight about the development of the relationship between sustainable firms and financial performances. However, this just gives an insight. To really study the development of the relationship a portfolio research methodology can be used. By composing a portfolio with sustainable firms and a portfolio with comparable firms that are not considered sustainable firms it is possible to study these firms for a long period to fully understand the relationship between sustainability and firm value.

This study looks at the relationship between sustainability and firm value for the regions North America, Europe and Asia. This is already a more comprehensive research than earlier studies that investigated this relationship for a single country of region (Anderson-Weir, 2010; Cellier & Chollet, 2011; Krueger, 2015; Lyon & Shimshack, 2015; Meric et al., 2012; Nuzula & Kato, 2011; Yadav et al., 2016). However, it can still be of great value to incorporate less studied regions, like South America and Africa, to gain a better insight about the relationship in these regions. This can add value to managers in these regions or for investors that invest or are considering to invest in firms established in these regions.

In addition to adding regions it can also be of great value to study the relationship across smaller regions, for example, but not limited to, South Europe, North Europe, East Europe, UK and Scandinavia. This will ensure more detailed and specific results about the relationship between sustainability and financial performances than by looking at broader regions.

This paper shows high CAR values for the year 2016. This can be a result of the method that is used to calculate the normal returns. The normal returns are calculated over the estimation window [-260,-1], therefore the biggest part of the estimation lies in 2015. Since the year 2015 was a bad year for the equity markets, the normal returns that are used for 2016 are very low (Anspach, 2020; Mitchell, 2020; Racanelli, 2015). As a result, the abnormal returns for the year 2016 can be influenced by the low results of the financial markets in 2015. This can be studied in future research by using different estimation windows or different methods to calculate normal returns.

As mentioned earlier, this paper can be used as a starting point for future research about the relationship between sustainability and firm value by using the Corporate Knights global 100 sustainability ranking. Future research can implement different and/or multiple measures for the financial performances of a firm. This paper solely focuses on the stock markets returns as a measurement for financial performances. In addition, other control variables such as the development of the Tobin's Q, return on equity, EBITDA, etc. could be taken into account. Furthermore, the key performance indicators (KPIs) from the CK methodology can be used to study which KPIs are important and which KPIs are a less important influence on the value of the firm. Finally, it can also be of value to look at the relationship between sustainability and financial performances at a country level. Various sustainability rankings for countries can be used to study if firms are more rewarded for sustainability in high sustainability countries than for low sustainability countries.

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