THE IMPACT OF CORPORATE SUSTAINABILITY PERFORMANCE ON CORPORATE FINANCIAL PERFORMANCE

Evidence from the Corporate Knights Global 100 Sustainability Index

MSc Finance
Thesis

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Abstract

This research investigates the effects of corporate sustainability performance on financial performance for worldwide public firms. The event study methodology with a primary event window of [-1, +1] is used to examine the effect of the announcement of the Corporate Knights Global 100 Sustainability Index on stock values of the firms ranked in 2013, 2014, 2015, or 2016. This study finds significant positive cumulative abnormal returns around the announcement date, which proves that a positive relationship between the announcement of the ranking and a firm's value exists. This is in line with the expectations. To explicate this relationship, different subsamples are made and compared with each other: firms ranked in the top quartile versus firms ranked in the bottom quartiles; firms that increased their ranking by at least 50 places versus firms that did not achieve this increase; firms that newly entered the ranking in the top 50 versus firms that already had a place in the ranking; and firms in 'clean' industries versus firms in 'dirty' industries. For these subsamples, no difference in cumulative abnormal returns is found except for firms in 'clean' industries versus firms in 'dirty' industries. More specifically, firms in 'dirty' industries experience higher average cumulative abnormal returns, which is contrary to the expectations. Additionally, a cross-sectional analysis is conducted to investigate the relationship between CARs and complementary rank. It followed that in 2014 and 2015 the complementary rank is positively related to the CARs, but in 2015 it is only significant at the 10% level and this positive effect is not found for 2013 and 2016, which means that a specific relationship cannot be concluded.

Table of contents

List of Tables

List of Figures

1. Introduction

This chapter introduces the thesis topic and describes why this topic is nontrivial. Additionally, the main research question, sub-questions and the thesis structure are described.

The sensitivity toward sustainability is growing in all aspects today. Businesses and managers are adapting their business models based on a balance between economic, ecological, social, and cultural value creation (Porter & Derry, 2012). Therefore, it is interesting to investigate whether companies, acting in the value of their shareholders, should engage in sustainable and socially responsible investments (SRI), which combines an investor's financial objectives with their concerns about social, environmental and ethical (SEE) issues (Van de Velde, Vermeir, & Corten, 2005). This means that there is more pressure for firms to improve their Corporate Sustainability Performance (CSP) and integrate environmental, social and governance (ESG) factors into their business practices (Humphrey, Lee, & Shen, 2012). CSP is a measure of sustainability, which is reflected in for example sustainability rankings. Traditional finance theory state that the main focus of a firm has to be to maximize shareholder value, also known as the shareholder theory. An opposite theory is the stakeholder theory, which states that not only shareholders but also every other stakeholder must be considered in the firm's objective. The question is whether investing in sustainability will increase shareholder value. Previous research is divergent about the relationship between sustainability and shareholder or firm value.

This study investigates the impact of CSP on Corporate Financial Performance (CFP), by analysing changes in stock prices in response to the announcement of the Corporate Knights Global 100 Sustainability Index. Corporate Knights is a company with a research division that produces rankings and ratings based on CSP (Corporate Knights, n.d.). Every year in January Corporate Knights publishes the Global 100 Sustainability Index, which is an index of the 100 most sustainable companies in the world based on publicly disclosed data. The announcement of this ranking may influence an investor's reaction. This research will investigate whether the announcement of the Corporate Knight Global 100 Sustainability Index has an impact on a firm's value and if so, which direction the impact has. The Corporate Knight Global 100 Sustainable Index is not used before for this kind of research, but there are comparable researches, that used other sustainability rankings. The rankings that are used in the past, contain only (large) US companies. Therefore, it is useful to conduct a comparable study for firms worldwide.

The methodology used in this study is the event study methodology, this is a statistical test to determine the impact of an event on the value of a firm using stock returns. This study investigates whether firms

ranked in the Corporate Knight Global 100 Sustainable Index experience abnormal stock returns. The benchmark model used for calculating the abnormal returns is the MSCI ACWI Market Index per GICS sector since this is an index for firms worldwide. The firms are categorized in industry sectors based on the Global Industry Classification Standard (GICS). After determining whether the firms experience abnormal returns, the results will be explained.

As mentioned before, there are no researches in the past that used the Corporate Knights Global 100 Sustainability Index for this kind of research. This thesis uses the rankings of 2013, 2014, 2015, and 2016 since the methodology is the same for these years. It is chosen to use the most years with the same methodology so that there is more data to compare. This makes it possible to compare the abnormal returns over the years, which gives a better overview of the results.

Investigating the relationship between the announcement of the Corporate Knights Global 100 Sustainability Index and the value of a firm provides more insights in the relationship between CSP and CFP. This leads to the main question of this research:

What is the effect of the announcement of the Corporate Knight Global 100 Sustainability Index on a firm's value?

In order to answer the main question, six sub-questions are formulated:

1. *Does the announcement of the Corporate Knights Global 100 Sustainability Index, on average, imply a positive significant cumulative abnormal return?*
2. *Does the announcement of the Corporate Knights Global 100 Sustainability Index imply a higher average cumulative abnormal return for firms ranked in the top quartile than for firms ranked in the bottom quartile?*
3. *Does the announcement of the Corporate Knights Global 100 Sustainability Index imply a higher average cumulative abnormal return for firms that increased their ranking by at least 50 places relative to the previous year than for firms that did not achieve this increase?*
4. *Does the announcement of the Corporate Knights Global 100 Sustainability Index imply a higher average cumulative abnormal return for firms that newly entered the ranking in the top 50 compared to the previous year than for firms that already had a place in the ranking?*
5. *Are the cumulative abnormal returns around the announcement date of the Corporate Knights Global 100 Sustainability Index positively related to a firm's complementary rank?*

6. *Does the announcement of the Corporate Knights Global 100 Sustainability Index imply a higher average cumulative abnormal return for firms in clean industries than for firms in dirty industries?*

The rest of this thesis is structured as follows: in Chapter 2 the current literature about CSP and the linkage with financial performance is reviewed. Chapter 3 embeds the thesis topic in the review of Chapter 2 by developing hypotheses. The fourth chapter describes the research methodology, regression model, and data sources, whose results are described in Chapter 5. Finally, Chapter 6 will summarize and conclude the earlier chapters and discusses the limitations and topics for future research.

2. Literature review

This chapter is the theoretical foundation of this research. It summarizes and compares previous studies about sustainability and the impact of sustainability on financial performance. First, the relationship between Corporate Sustainability Performance and Financial Performance in general is described. Second, the previous researches about sustainability rankings and their impact on a firm's value are summarized.

2.1 The relationship between Corporate Sustainability Performance and Financial Performance

Many of the existing literature investigates the importance of Corporate Sustainability Performance (CSP). According to Epstein and Roy (2003), the definition of sustainability is an economic improvement that takes the needs of the present generation into account but does not ignore the ability of future generations to meet their own needs. The impacts of CSP elements are hard to measure and evaluate (Epstein & Roy, 2003). However, many studies have tried to research the effect of CSP on Corporate Financial Performance (CFP). Previous research is divergent since researchers have several views on the relationship between CSP and CFP. It shows theoretical and empirical justification for a positive, negative or no relationship between sustainability and financial performance.

One view is that there is a positive relationship between CSP and CFP. This positive relationship arises from two points of view. The first point of view is that the costs of sustainability can be minimal, which means that firms will benefit from sustainability actions in terms of increased employee and customer goodwill (McGuire, Sundgren, & Schneeweis, 1988). For example, firms that are socially responsible and sustainable may face fewer employment issues and customers may be more likely to buy products of such a firm. Additionally, socially responsible and sustainable initiatives may improve the relationship with banks, investors, and the government. Therefore, it may lead to better access to sources of capital (McGuire et al., 1988). Second, the costs of being socially responsible and sustainability can be significant but are offset by an increase in revenues and a reduction in other firm costs (McGuire et al., 1988). For example, simplifying packaging, recycling, energy-efficient lightning or solar panels lead to sustainable cost savings. Ambec and Lanoie (2008) identified the optimal circumstances for increasing revenues and reducing costs. They mention three different mechanisms which may lead to an increase in revenues: higher accessibility to certain markets, distinguishing their products from others, and selling technologies that reduce or eliminate pollution. Hussain, Rigoni and Cavezzali (2018) studied whether the benefits exceed the costs of being sustainable and conclude that there is a positive relationship, but engaging in CSP is costly and it will only pay off if there are sustainable development goals and the firm is devoted to achieve these goals (Hussain et al., 2018). This is in line with stakeholder

theory, which argues that not only shareholders but also all other stakeholders must be considered in the firm's objective (Berk & DeMarzo, 2017), such as customers, employees, and suppliers (Humphrey et al., 2012). Additionally, Statman and Glushkov (2009) argue that firms with high CSP ratings have higher returns than firms with low CSP ratings. However, they argue that investors who invest in socially responsible stocks also shun stocks of companies associated with for example tobacco, alcohol, and gambling, which reduces the investor's net return (Statman & Glushkov, 2009). Another study that shows a positive relationship between sustainability and financial performance is done by Klassen and McLaughlin (1996), who conclude that a firm's financial performance will be affected by both market gains and cost savings. The study conducted by Ameer and Othman (2012) agrees with this positive relationship.

Traditional finance theory follows the view of Friedman (1970), who states that the main focus of a firm has to be to maximize shareholder value (Friedman, 1970; Griffin & Mahon, 1997), also known as the shareholder theory. Friedman considers CSR and sustainability as an agency loss; it is not in the shareholders' benefits (Barnett, 2007). This implies a negative relationship between sustainability and financial performance. A negative view as described by McGuire et al. (1988) is that firms face a trade-off between sustainability and financial performance since investing in socially responsible and sustainable initiatives puts firms at an economic competitive disadvantage compared to other less sustainable firms (McGuire et al., 1988; Barnett, 2007; Alexander & Buchholz, 1978). They state that it entails high additional costs, such as contributing to charities and promoting sustainability plans for the community. Additionally, being sustainable may reduce a firm's strategic opportunities. McGuire et al. (1988) also find that environmental crises lead to significant negative returns and Barnett (2007) states that firms should invest in improving the efficiency of the firm or return money to shareholders instead of investing in sustainable and socially responsible initiatives, which is in line with the shareholder theory. Investing in sustainability reallocates wealth from shareholders to other stakeholders who have no rightful claims (Humphrey et al., 2012). However, Barnett (2007) also states that some sustainable or socially responsible investments may be profit-maximizing and thus in shareholder's benefits; but the management has to be careful with these investments since it differs per firm (Barnett, 2007). Managers must know the consequences of their decisions and actions they can take to increase both sustainability and long-term financial performance (Epstein & Roy, 2003).

The last view is that sustainability has no impact on financial performance. Several studies have proposed arguments for a causal relationship between sustainability and financial performance but did not find clear answers. This may be explained by factors such as stakeholder mismatching, neglecting contingency factors, and measurement errors (Orlitzky, Schmidt, & Rynes, 2003). Alexander and

Buchholz (1978) conclude that sustainability has no effect on financial performance and assume that stock markets are efficient, which means that the stock price is immediately adjusted based on any effect related to sustainability. Humphrey et al. (2012) made the same conclusion.

Several researchers tried to summarize these different views and studies on the relationship between sustainability and financial performance. Griffin and Mahon (1997) and Margolis and Walsh (2001) conducted a meta-analysis of several studies about the relationship between sustainability and financial performance. The method used in both studies is the so-called 'vote-counting' method. According to Orlitzky et al. (2003), who also conducted a meta-analysis, this method is shown to be invalid. Orlitzky et al. (2003) used a psychometric meta-analysis, which corrects for statistical artefacts, such as measurement error and sampling error. The methods and conclusions of these three study reviews are shown in Table 1.

Table 1 Summary of multiple study reviews

Authors	Studies reviewed	Method	Conclusions
Griffin and Mahon (1997)	51	Vote-counting: they count how many studies conclude a positive, negative or no relationship between CSP and CFP.	• Twenty-five years of research has not produced a solution. • Many studies focus on different industries. They think it is better to conduct single-industry studies. • The best measures for CFP are size (via log of total assets), return on assets, return on equity, asset age, and 5-year return on sales.
Margolis and Walsh (2001)	95	Vote-counting: they count how many studies conclude a positive, negative or no relationship between CSP and CFP, considering both variables as both dependent and independent variables.	• There is a positive relationship between CSP and CFP. • There are concerns about the validity of the measures used for CSP and the diversity of the measures used for CFP.
Orlitzky, Schmidt and Rynes (2003)	52	Aggregating results of the individual studies and correcting for sampling error and measurement error to estimate the true correlation between CSP and CFP.	• There is a positive relationship between CSP and CFP across industries. • Reputation appears to be an important factor in this relationship.

2.2 Previous research about sustainability rankings

In the past, multiple rankings are used to research which effect the publication of the ranking has on a firm's value. However, The Corporate Knights Global 100 Sustainability Index is not used for such research before, but several studies used the Newsweek Green Ranking. They conducted an event study, with the publication of the Newsweek Green Ranking as the event date. Amato and Amato (2012) found a positive impact on market performance for firms ranked in the top quartile of the ranking while it has no impact on the firms in the lowest quartile. They state that the explanation for these positive results is the perceptibility of Newsweek and the impact of validations done by unbiased observers on consumer and investor attitudes (Amato & Amato, 2012). Lyon and Shimshack (2015) and Yadav, Han and Rho (2016) also found that the rankings had a positive impact on shareholder value. Lyon and Shimshack (2015) found that firms in the top quartile had abnormal returns that were 0.6%-1.0% higher than firms in the lower quartiles. They provide several implications for a positive impact. First, they think that at least some stakeholders continue to believe the importance of environmental performance. Second, investors seem to believe that traditional media sources remain important. Finally, they state that it remains uncertain which firms are good environmental performers and which firms are poor environmental performers, which means that markets also remain uncertain (Lyon & Shimshack, 2015). This means that there always will be information asymmetry. Additionally, Yadav et al. (2016) state that investors are willing to pay a premium price for environmental performance. Investors worry the most about environmental damage; firms need to address this by improving their environmental performance (Yadav et al., 2016). According to Yadav et al. (2016) the positive relationship becomes stronger when firms improve their environmental performance. On the contrary, Meric, Watson and Meric (2012) found a negative relationship between Newsweek's green ranking and firm value. They conclude that the costs of being green affect a firm's profitability, which shows that investors are willing to pay a lower price for a green firm's stock compared to a non-green firm's stock. Another ranking that is used is the Morningstar sustainability rating. Hartzmark and Sussman (2019) concluded a positive effect of the ranking on firm value. They find that investors value sustainability since investors think that higher ratings predict positive future returns. They also find that investors value sustainability for nonpecuniary motives, such as moral ideas (Hartzmark & Sussman, 2019).

3. Hypotheses development

In this chapter, the hypotheses of the research will be developed based on the theoretical foundation described in the previous chapter. These hypotheses are needed to determine the impact of the announcement of the Corporate Knights Global 100 Sustainability Index on firm value. First, general information about Corporate Knights and their Global 100 Sustainability Index is described. Second, the hypotheses are developed and explained.

3.1 Corporate Knights Global 100 Sustainability Index

As mentioned in the literature review, there are no previous researches about the relationship between the announcement of the ranking of Corporate Knights and firm value. The Corporate Knights Global 100 Sustainability Index is published every year in January by Corporate Knights. Corporate Knights is a company with a research division that produces rankings and ratings based on a firm's Corporate Sustainability Performance (Corporate Knights, n.d.). The Global 100 Sustainability Index is an index of the 100 most sustainable companies in the world based on publicly disclosed data. The difference with the rankings mentioned in the literature review is that this ranking consists of worldwide firms, which was a limitation of the other rankings and researches. In this research, the ranking of the years 2013 till 2016 will be used since the rankings of these years are formed based on the same methodology, which allows comparison over the years. It is chosen to use the most years with the same methodology so that there is more data to compare. All worldwide public companies with a market capitalization of at least $2 billion based on the prior year are screened on different criteria. Corporate Knights uses 12 priority KPIs, on which the screened firms will be scored if it is a priority KPI for their industry group, based on the Global Industry Classification Standard (GICS): energy productivity, carbon productivity, water productivity, waste productivity, percentage tax paid, leadership diversity, clean capitalism pay link, CEO-to-average worker pay link, safety performance, innovation capacity, employee turnover, and pension fund status (Corporate Knights, 2013). These KPIs are equally weighted and make altogether the sustainability score. The 100 companies with the highest scores, subject to each industry group's capitalization, will be published in the Global 100 Sustainability Index. Each GICS sector will be assigned a fixed number of places in the ranking, based on each sector's contribution weighted on market capitalization to the MSCI ACWI of the prior year.

3.2 Hypotheses

This thesis will research the impact of the announcement of the Corporate Knights Global 100 Sustainability Index on a firm's value. In order to determine and quantify this impact, six hypotheses are formulated. The impact on a firm's value will be measured by the cumulative abnormal return (CAR).

This a 'surprise' return on the day of publication, which shows the increase or decrease of the return on a firm's stock due to the publication of the ranking. This methodology is called event study methodology and will be further explained in Chapter 4. The six hypotheses are described below.

In Chapter 2 previous studies are discussed. Although these previous researches are divergent about the effect of sustainability on financial performance, the existence of a positive relationship between sustainability and financial performance is predominant in these studies. For example, Margolis and Walsh (2001) and Orlitzky et al. (2003) summarized respectively 95 and 52 studies about the relationship between sustainability and financial performance and concluded that this relationship is positive. Additionally, Klassen and McLaughlin (1996) researched the stock reaction on environmental events and concluded that positive environmental events lead to significant positive abnormal returns. Moreover, Yadav et al. (2016) and Hartzmark and Sussman (2019) studied the market reaction on the announcement of respectively the Newsweek's green ranking and the Morningstar sustainability ranking. Both studies showed positive abnormal returns for ranked firms. Based on these findings the first hypothesis is formulated:

Hypothesis 1: *The announcement of the Corporate Knights Global 100 Sustainability Index does, on average, imply a positive significant cumulative abnormal return.*

The Corporate Knights Global 100 Sustainability Index contains 100 firms. Shareholders may react on which first catches their attention, for example stocks that are positively mentioned in the news or appear high in a sustainability ranking. This is confirmed by Amato and Amato (2012), who found a positive impact on market performance for firms ranked in the top quartile of the ranking while it has no impact on the firms in the lowest quartile. Lyon and Shimshack (2015) also found that the abnormal returns of firms in the top quartile were 0.6%-1.0% higher than firms in the lower quartiles. These findings lead to the second hypothesis:

Hypothesis 2: *The announcement of the Corporate Knights Global 100 Sustainability Index does imply a higher average cumulative abnormal return for firms ranked in the top quartile than for firms ranked in the bottom quartiles.*

Besides the difference between top-ranked firms and bottom-ranked firms, the difference between firms that increased their ranking and firms that did not increase their ranking is also interesting to research. Yadav et al. (2016) did that for the Newsweek's green ranking and concluded that the positive relationship between sustainability and financial performance becomes stronger when firms increased

their environmental performance. Therefore, it is expected that the effect will be the same for the Corporate Knights Global 100 Sustainability Index. Not only the increase in ranking is interesting, but also whether firms that newly entered the ranking in the top 50 experience higher returns than firms that already were in the ranking. In line with the findings mentioned before, it is also expected that the positive relationship between sustainability and financial performance becomes stronger when firms newly enter the ranking. Based on these findings hypotheses 3 and 4 are formulated:

Hypothesis 3: *The announcement of the Corporate Knights Global 100 Sustainability Index does imply a higher average cumulative abnormal return for firms that increased their ranking by at least 50 places relative to the previous year than firms that did not increase their ranking by at least 50 places.*

Hypothesis 4: *The announcement of the Corporate Knights Global 100 Sustainability Index does imply a higher average cumulative abnormal return for firms that newly entered the ranking in the top 50 compared to the previous year than firms that already had a place in the ranking.*

To further investigate the relationship between the announcement of the ranking and the financial performance of the firms, a cross-sectional analysis will be conducted after controlling for firm-specific characteristics and industry-fixed effects. Lyon and Shimshack (2015) did a similar research for the Newsweek's Green Ranking and regressed a firm's place in the ranking on the CARs of the firms. They found that a positive relationship between these variables exists. This is in line with the results of Yadav et al. (2016). Based on these results, a positive relationship is expected between the place in the ranking and the CARs. To test this hypothesis, a complementary rank is used (Cordeiro & Tewari, 2013), so that the first place in the ranking is the 'worst' and de 100th place in the ranking is the 'best'. This will be further explained in Chapter 4. The reason is that it makes the results better interpretable. Therefore, the following hypothesis is formulated:

Hypothesis 5: *Cumulative abnormal returns around the announcement date of the Corporate Knights Global 100 Sustainability Index are positively and significantly related to a firm's complementary rank.*

Griffin and Mahon (1997) concluded after reviewing 51 studies that the effect of sustainability on financial performance differs per industry. It is reasonable that financial markets react differently to 'cleaner', less polluting or 'dirtier', more polluting industries (Klassen & McLaughlin, 1996). Klassen and McLaughlin (1996) showed that strong environmental performance has a stronger positive impact on financial performance for clean industries than for dirty industries. Additionally, Statman and Glushkov

(2009) conclude that sustainable investors are less likely to invest in companies in 'dirty' industries. Therefore, the following hypothesis is formulated:

Hypothesis 6: *The announcement of the Corporate Knights Global 100 Sustainability Index does imply a higher average cumulative abnormal return for firms in clean industries than for firms in dirty industries.*

4. Methodology and data sample

This chapter will describe the methodological background and the data sample of this research. First, the event study methodology is described. Next, the cross-sectional analysis will be discussed and finally, the data sample is explained in detail.

4.1 Event study methodology

The methodology used in this study is the event study methodology, this is a statistical test to determine the impact of an event on the value of a firm using stock returns (De Goeij & De Jong, 2011). The event study methodology was first introduced by Fama, Fisher, Jensen and Roll (1969), who concluded that stock prices adjust to new information and therefore the stock market is efficient. The disclosure of new information is called the event. When stock markets are efficient, the impact of the event can be measured by the changes in stock returns around the event. The event study methodology is widely used in finance and has become the standard method of measuring the market reaction to the announcement of an event (Binder, 1998). Examples of such events are earnings announcements, the announcement of a merger or a change in accounting rules. In this study, the event is the announcement and publication of the Corporate Knights Global 100 Sustainability Index.

Bowman (1983) discussed five steps to conduct an event study. However, these steps are summarized in three steps by De Goeij and De Jong (2011). First, the event and the timing of the event must be identified. Second, a "benchmark" model must be specified for the normal stock returns. Finally, the abnormal returns around the event date must be calculated and analysed. Below, these three steps will be discussed in detail (De Goeij & De Jong, 2011).

The first step is to identify the event and the timing of the event. The event in this study is the announcement and publication of the Corporate Knights Global 100 Sustainability Index. This study uses the publications of 2013 till 2016. Therefore, there are four event dates, which are trivial since the rankings were publicly announced. These event dates are summarized in Table 2 (Corporate Knights, 2020).

Table 2 Event days and times

Event	Event day and time
Publication of the CKG100 Ranking 2013	Monday, January 21, 2013, 6:00 A.M. CET
Publication of the CKG100 Ranking 2014	Wednesday, January 22, 2014, 6:00 A.M. CET
Publication of the CKG100 Ranking 2015	Wednesday, January 21, 2015, 6:00 A.M. CET
Publication of the CKG100 Ranking 2016	Wednesday, January 20, 2016, 6:00 A.M. CET

The time of the publication is important since it indicates if investors had enough time to use the new information and reflect it in the stock price. This is essential for determining the event day; if the opening of the stock market is after the publication of the ranking, the event day is the day of the publication. However, if the opening of the stock market is before the publication of the ranking, the new information won't be immediately reflected in the stock price. The event day is, in that case, the day after the publication, which is the first day that investors can use the new information. Since the firms in the Corporate Knights Global 100 Sustainability Index are worldwide, they operate in different stock markets which all have different opening times. There are 25 different stock markets incorporated; five of them have opened after the publication time. So, for firms operating in these five stock markets, the event day is the day after publication; for the other firms, the event day is the day of publication (Namgyoo, 2004). These days are the event dates, which are all indicated by t=0 and where "t" refers to the number of days from the event (De Goeij & De Jong, 2011).

Other essential parts of identifying the timing of the event are the estimation window and the event window (De Goeij & De Jong, 2011). The estimation window is the period before the event. Based on this period the normal returns can be estimated, which indicates what the stock returns would be if the event did not happen. According to Peterson (1989) typical lengths of estimation windows differ from 100 to 300 trading days for daily data. This is in line with Thompson (1995), who is more detailed and states that a period of 250 trading days is a typical estimation window for daily data, which is about one year. However, it is essential not to choose a too long estimation window, so that the effects of the year before will not be reflected in this year's estimation window. For this reason, the estimation period begins 200 trading days before the event. Usually, 10 to 30 trading days prior to the event are excluded from the estimation window due to possible data contamination by "insider trading" (Klassen & McLaughlin, 1996; Aktas, De Bodt, & Cousin, 2007). Therefore, it is chosen to exclude 25 trading days prior to the event. Altogether, the chosen estimation window contains 175 trading days, which is indicated by [-200, -26]. Subsequently, the event window must be identified. This is the period after the event in which the effects of the new information will be visible in the stock price. It is essential to choose an event window that is not too long since a too long event window can cause event clustering (Thompson, 1995), which means that the return can also be caused by another event than the publication of the ranking. This is also stated by Klassen and McLaughlin (1996) and MacKinlay (1997). In line with their findings, a short event window of 3 days is chosen, which is indicated by [-1, +1]. The day before the event is used to capture any effects of an advanced notice and the following days capture the effects of the market reaction on the publication of the ranking (Klassen & McLaughlin, 1996). The timing of the event is summarized in Figure 1, which is based on the methodology as described by De Goeij and De Jong (2011).

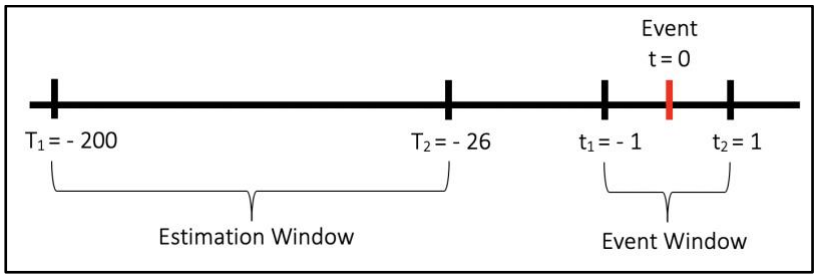

Figure 1 Timeline around the event

The second step is specifying a "benchmark" model for the normal returns. The normal return (NR) is the return that the firm would have if there was no announcement and publication of the ranking. According to De Goeij and De Jong (2011) there are many models available, but they summarized four: mean-adjusted model, market-adjusted model, market model and Capital Asset Pricing Model (CAPM). In this study, the normal returns will be calculated according to the market model since this is the most commonly used methodology in similar studies and it is the best-supported methodology according to Armitage (1995). The market model estimates the expected returns by the relationship between a share's returns and market returns, which is estimated by the OLS regression equation:

$$NR_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt},$$

where NR_{it} is the daily normal return of a firm's stock, R_{mt} is the daily return of the market and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the OLS estimates of the regression coefficients.

The third step is calculating and analysing the abnormal returns. The abnormal return (AR) can be calculated as the difference between the actual return and the normal return:

$$AR_{it} = R_{it} - NR_{it}$$

Next, the Cumulative Abnormal Return (CAR) and Cumulative Average Abnormal Return (CAAR) can be calculated over the event window:

$$CAR_i = \sum_{t=t_1}^{t_2} AR_{it}$$

$$CAAR_i = \frac{1}{N} \sum_{t=t_1}^{t_2} CAR_i$$

An issue that might occur is called event-clustering. This means that the publication of the Corporate Knights Global 100 Sustainability Index is on the exact same date for all firms in the ranking, which can lead to cross-sectional correlation among the abnormal returns. This may cause an increase in the

variance of the abnormal returns, which leads to misspecification of the statistical significance. There are several ways to solve this problem. First, the use of standardized cumulative abnormal returns (SCARs) can be used to control for cross-sectional correlation bias (Yadav et al., 2016). However, SCARs are only relevant to use for determining the statistical significance, but the SCARs do not reflect the real economic effects anymore, so they are not useful for further analysis, such as explaining cross-sectional effects (Boehmer, Masumeci, & Poulsen, 1991). For that reason, it is chosen not to use SCARs. However, accounting for cross-sectional correlation is still needed. Based on the findings of Cordeiro and Tewari (2013), it is assumed that investors compare the performance of the firms in the ranking with their peers based on their GICS sector, rather than the performance of all the firms in the ranking. This means that the cross-sectional correlation is mainly due to the differences in industries. Then, the problem is solved under the assumption that that the sector dependence drives the possible cross-sectional correlation, which rules the bias out. Therefore, the cross-sectional correlation among the abnormal returns can be solved by adjusting the normal returns based on the GICS sector. This can be done by dividing and clustering the firms in the 11 GICS sectors and estimate their normal return by the following OLS equation:

$$NR_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{sector},$$

where NR_{it} is the actual return of a firm, R_{sector} is the return of firms in the same sector and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the OLS estimates of the regression coefficients. The MSCI All Country World (ACWI) Index by GICS sector will be used as a benchmark for the sector returns. This index is chosen since it is worldwide and therefore representative for the firms in the sample of this research and the index is also available by GICS sector. The index will be further explained in paragraph 4.3.

Finally, the abnormal performance must be tested. Therefore, a statistical test must be conducted. The goal of this statistical test is to find out whether the calculated ARs are significantly different from zero at a certain significance level (De Goeij & De Jong, 2011). The significance level used in this study is 5% and the null-hypothesis to be tested is:

$$H_0 : E(CAR_i) = 0$$

Then, the statistical test that has to be conducted is:

$$TS = \sqrt{N}\frac{CAAR}{s} \approx N(0,1)$$

where s is the standard deviation:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2}$$

The event study as described above will be used to research hypothesis 1, 2, 3, 4 and 6. There will be empirical evidence for hypothesis 1 if the calculated CAAR appears to be positive. To investigate hypothesis 2 the sample will be split into two groups: the top quartile and the bottom quartiles of the ranking. If the calculated CAAR for the top quartile group appears to be higher than the calculated CAAR for the bottom quartiles, there is evidence for the hypothesis. The same method will be applied to test hypothesis 3 and 4. For hypothesis 3, the sample will be split into two groups: firms that increased their ranking by at least 50 places relative to the previous year and firms that did not increase their ranking by 50 places. For hypothesis 4, the sample will also be split into two groups: firms that newly entered the ranking in the top 50 compared to the previous year and firms that already had a place in the ranking. If the calculated CAAR of the first-mentioned group is higher than the calculated CAAR of the other group, evidence is found for hypotheses 3 and. To investigate hypothesis 6, the analysis will be conducted for three groups: 'dirty', 'clean' and 'neutral' industries based on their GICS sector. If the calculated CAAR for firms in the 'clean' industries is higher than the calculated CAAR for firms in the 'dirty' industries, the hypothesis is true. Assigning 'clean', 'dirty' or 'neutral' to GICS sectors is done based on researches of Klassen & McLaughlin (1996), Etzion (2007), and Cordeiro & Tewari (2015). The sectors energy and materials are assigned as 'dirty', the sector financials is assigned as 'clean' and the other sectors are assigned 'neutral'.

4.2 Cross-sectional analysis

To further analyse the relationship between sustainability and financial performance, the CARs as mentioned in Chapter 4.1 will be used in a cross-sectional analysis. The CAR will be regressed on the complementary rank of a firm. The complementary rank is chosen instead of the (complementary) score since the score was not published in 2013 and 2014 yet. Therefore, it is not possible to regress the CAR on the (complementary) score of a firm for every year in the sample. Determining the complementary rank will be done based on the research of Cordeiro and Tewari (2013), by subtracting the initial rank of 101. This means that the first firm in the ranking will be the worst and the 100^{th} firm will be the best. Through this, results are better interpretable. Additionally, CAR will be regressed on firm characteristics that can explain the CAR. According to Yadav et al. (2016), essential firm characteristics are profitability, size and leverage of the firm. These are indicated by respectively ROA, log of revenues and the total debt ratio. Since the sample contains firms from different industries, it is necessary to control for industry effects. Determining the industry is done based on the 11 GICS sectors. To avoid perfect collinearity, only 10 of the 11 sectors are included as a dummy in the model. The same applies to the different international markets. However, controlling for cultural effects by adding continent dummies leads to subsamples with only a few observations. For that reason, it is chosen not to control for cultural or country effects.

Altogether, the following multivariate regression model for firm *i* in industry *j* and continent *k* will be used to conduct the cross-sectional analysis on CARs:

$$CAR_{ijk} = \alpha_0 + \alpha_1 comprank_{ijk} + \alpha_2 ROA_{ijk} + \alpha_3 lnrevenues_{ijk} + \alpha_4 debtratio_{ijk} + \theta_j + \varepsilon_{ijk},$$

where CAR_{ijk} is the cumulative average abnormal return for firm *i* in industry *j* and continent *k* over the event window, $comprank_{ijk}$ is the complementary rank, ROA_{ijk} is net income divided by total assets, $lnrevenues_{ijk}$ is the log of the revenues, $debtratio_{ijk}$is debt divided by assets, and θ_j is a vector that includes 10 industry sector dummies. α_0, α_1, α_2, α_3, and α_4 are regression coefficients and ε_{ijk} is the error term.

Using this cross-sectional analysis, hypothesis 5 can be tested. This hypothesis states that abnormal returns around the announcement date of the Corporate Knights Global 100 Sustainability Index are positively related to a firm's complementary rank. If coefficient α_1 of the above-formulated equation is positive and statistically significant, this positive relationship is confirmed.

4.3 Data sample

There are several data sources used to compile the final dataset of this research. First, the datasets published by Corporate Knights for the years 2013, 2014, 2015 and 2016 will be used, since the ranking methodology is the same for these years. It is chosen to use the most years with the same methodology so that there is more data to compare. The sample consists of all the firms that had a place in the ranking in one of those years, which are 177 firms. Of these firms, the firm's name, place in the ranking and country published by Corporate Knights will be used.

Second, firm-specific and industry-fixed information must be obtained. The industry will be obtained based on the GICS sector of the firms. The GICS industry is published by Corporate Knights, but there are many GICS industries and these are very detailed, therefore, the industries are converted to the 11 GICS sectors based on the report published by S&P Global and MSCI (MSCI & S&P Global, 2018), which are: energy, materials, industrials, consumer discretionary, consumer staples, health care, financials, information technology, communication services, utilities, and real estate. The firm-specific characteristics, following the study of Yadav et al. (2016), are profitability (ROA), size (ln of revenues), and leverage (debt ratio) and are obtained from Compustat Fundamentals Annual in Wharton Research Data Services (WRDS). These are obtained separately for the Global firms and the firms in North-America. This information must be collected for the year before the year of publication of the ranking.

So, for example, the firm-characteristics of 2012 will be used for firms published in the ranking of 2013. The used variables are shown in Table 3. To match the firm-specific variables with the firms in the rankings, the data is matched based on the unique code per firm 'gvkey'.

Table 3 Firm-specific variables Compustat

Compustat variable code	Description
REVT	Total revenues
NI/NICON[1]	Net income (consolidated)
AT	Total assets
DLTT	Total long-term debt
DLC	Total current debt

This information is reported by WRDS in the local currency of the firms. Therefore, the information is converted to US Dollars (USD) for all firms, based on the average exchange rates in 2012, 2013, 2014, and 2015 (exchangerates.org.uk, 2020).

Finally, stock information is needed to calculate the abnormal returns. To calculate the actual return R_{it}, historical prices are needed. These are obtained from Compustat Security Daily in WRDS. The variable code of the daily stock price is PRCCD which is the daily closing price. To calculate the adjusted daily stock price, PRCCD is divided by AJEXDI, which is the daily adjustment factor. The adjusted stock price is used since it accounts for stock splits, dividends, etc., which means that it is a more accurate reflection of the true value of the stock. Then, the formula used to calculate the actual return is:

$$R_{it} = ln(\frac{P_t}{P_{t-1}}),$$

where R_{it} is the return in percentage of firm *i* at time *t,* P_t is the stock price of the firm at time *t*, and P_{t-1} is the stock price of the day before *t*. The natural logarithm is used since it is a continuously compounded return, which means that returns can be summed and subtracted from each other.

To calculate the normal return, a benchmark for the market returns is needed. Since the firms in the ranking are operating in different countries, it is important to choose a benchmark that incorporates stocks worldwide. Therefore, based on the study of Lundgren and Olsson (2010) the MSCI All Country World Investable (ACWI) Market Index is chosen. This index is a market capitalization-weighted index in which stocks from 23 developed countries and 24 emerging markets are included. The market index is also available by GICS sector. As mentioned in Chapter 4.1, the market index by GICS sector is used to

[1] There is a difference in WRDS between variables for North-America and Global firms. Net income for North-American firms is indicated by NI in WRDS, but for Global firms it is called NICON.

account for cross-sectional correlation. The MSCI ACWI Market Index per GICS sector is obtained from DataStream.

Finally, several firms are removed from the sample. According to Bowman (1983), occurrence of overlapping events can affect the results of the study. For that reason, firms that announced a stock repurchase, merger or acquisition during the event window are removed from the sample; this is done by searching through the global news monitoring and search engine Factiva of Dow Jones. Besides that, there are over-the-counter (OTC) stocks in the sample. This means that these firms are not listed on a formal public exchange; these stocks are traded through a broker-dealer network. Therefore, these firms are also removed from the sample. Additionally, firms are removed from the sample if the firms do not have enough observations in the event window and estimation window. After removing these firms, there are 128 firms in the final sample.

5. Empirical study

In this chapter, the results of the event study and the cross-sectional analysis will be explained. First, the descriptive statistics are provided. Second, the results of the empirical study will be discussed.

5.1 Descriptive statistics

Table 4 shows the descriptive statistics of the Corporate Knights Global 100 Sustainability Index for the years 2013 till 2016. The sample contains all firms that were published in the ranking of 2013, 2014, 2015 or 2016. So, it can differ per year which firms are in the sample. The ranking consists of 100 firms each year, but firms with overlapping events are excluded from the sample.

Table 4 Descriptive statistics CKG100 ranking

Variable	N	Mean	St. Dev.	Min	Max
Ranking 2013	96	50.43	29.08	1	100
Ranking 2014	97	50.58	29.16	1	100
Ranking 2015	94	50.07	28.89	1	100
Ranking 2016	94	49.78	29.65	1	100

The firms published in the ranking are operating in a variety of industries. An overview of the distribution of the firms in these industries is shown in Table 5. This distribution is based on the GICS industry sectors. Most firms in the sample are operating in the financial sector (27 firms), followed by the information technology sector (20 firms). Utilities (7 firms) and telecommunication services (7 firms) are the least represented sectors in the sample.

Table 5 Number of firms per GICS industry sector

Industry sector	Number of firms
Financials	27
Information Technology	20
Consumer Discretionary	19
Health Care	18
Consumer Staples	16
Industrials	16
Energy	15
Materials	15
Real Estate	8
Telecommunication Services	7
Utilities	7
Total	**168**

Additionally, Table 6 gives an overview of the distribution of the firms by continent. Notably, most firms are located in Europe (85 firms), followed by North-America (47 firms). The least firms in the sample are located in South-America (6 firms) and Africa (1 firm). As mentioned in Chapter 4.1 it is chosen not to control for cultural/country effects, since this leads to subsamples with only a few observations.

Table 6 Number of firms per continent

Continent	Number of firms
Europe	85
North-America	47
Asia	19
Oceania	10
South-America	6
Africa	1
Total	**168**

Table 7 shows the number of firms that increased their ranking by 50 places or more relative to the year before. Remarkably, there are just a few firms (two in 2014, four in 2015, and one in 2016) that increased their ranking from the bottom half to top half in one year.

Table 7 Number of firms that increased their ranking by 50 places or more

	2014	2015	2016
Increase of 50 or more places	2	4	1
No increase of 50 or more places	95	90	93
Total	**97**	**94**	**94**

Table 8 shows the number of firms that newly entered the ranking relative to the year before. In 2014 and 2015, 31 firms newly entered the ranking, and in 2016 24 firms newly entered the ranking.

Table 8 Number of firms that newly entered the ranking

	2014	2015	2016
Newly entered firms	31	31	24
Not newly entered firms	66	63	70
Total	**97**	**94**	**94**

Table 9 represents the number of firms by the sort of industry: clean, dirty or neutral. Firms in the sectors energy and materials are indicated as 'dirty' industries, where the sector financials is indicated as 'clean' industry (Klassen & McLaughlin, 1996; Etzion, 2007; Cordeiro & Tewari, 2015). The other sectors are indicated as 'neutral'.

Table 9 Number of firms by clean, dirty or neutral industry

	2013	2014	2015	2016
Firms in 'clean' industry	14	15	17	17
Firms in 'dirty' industry	18	15	14	11
Firms in 'neutral' industry	64	67	63	66
Total	**96**	**97**	**94**	**94**

The descriptive statistics of firm-specific variables by industry sector are presented in Table 10. The averages of revenues, ROA, and debt ratio are shown by industry sector. It can be concluded that the firm-specific variables widely differ per industry sector. The average revenues are $28,405, the average

ROA is 5.45%, and the average debt ratio is 25.18%. The largest firms based on revenues are in the sectors consumer discretionary and energy, while the smallest firms are in the sectors real estate and telecommunication services. Firms in telecommunication services (8.42%) and information technology (8.24%) have the highest ROA, where financial (0.80%) and utility (2.34%) firms have the lowest ROA. Additionally, the industries utilities (36.86%) and real estate (32.36%) represent the industries with the highest debt ratios, while the industries information technology (11.99%) and financials (15.89%) represent the lowest debt ratios.

Table 10 Firm-specific variables per GICS industry sector

Industry sector	Revenues (USD)	ROA	Debt ratio
Consumer Discretionary	57,052	6.96%	28.12%
Consumer Staples	32,274	5.79%	31.68%
Energy	49,103	2.43%	27.48%
Financials	28,214	0.80%	15.89%
Health Care	23,002	7.40%	16.45%
Industrials	25,973	7.12%	22.07%
Information Technology	43,667	8.24%	11.99%
Materials	21,700	6.65%	22.11%
Real Estate	4,523	3.75%	32.26%
Telecommunication Services	15,508	8.42%	32.04%
Utilities	32,921	2.34%	36.86%
Total	**28,405**	**5.45%**	**25.18%**

5.2 Empirical results

This section provides the results of this thesis research. The hypotheses, as described in Chapter 3.2, will be tested according to the corresponding CAR and t-statistic. The CARs are calculated according to the methodology as described in Chapter 4.1. An event window of [-1, +1] is chosen as the primary event window. However, wider event studies are also tested. The standard event window of [-1, +1] and the estimation window of [-200, -26] will be used if not mentioned otherwise. The statistical significance level of the values is shown by one asterisk (*) for 10% significance, two asterisks (**) for 5%, and three asterisks (***) for 1%.

The CARs for event windows [-1, +1], [-2, +2], [-3, +3], [-4, +4], and [-5, +5] are shown in Table 11. The CARs are positive in all event windows, which means that there exists a positive relationship between the announcement of the ranking and a firm's value.

Table 11 Average CARs for different event windows

Variable	Obs	Mean	Std. Dev.	Min	Max
CAR [-1, +1]	882	0.0051***	0.0314	-0.0786	0.2203
CAR [-2, +2]	1,470	0.0101***	0.0345	-0.1501	0.2368
CAR [-3, +3]	2,058	0.0119***	0.0436	-0.1948	0.2774
CAR [-4, +4]	2,645	0.0151***	0.0503	-0.2137	0.3771
CAR [-5, +5]	3,232	0.0159***	0.0526	-0.2067	0.3232

5.2.1 CARs over the total sample

The first hypothesis states that the announcement of the ranking does, on average, imply a positive significant CAR. To test this hypothesis, the CARs of 2013, 2014, 2015, and 2016 for the event windows [-1, +1], [-2, +2], and [-5, +5] are shown in Table 12. For the event window [-1, +1], the CARs for 2013, 2014, 2015, and 2016 are respectively -0.0040%, -0.0018%, 0.0144%, and 0.0123%. For the event window [-2, +2] the CARs are respectively 0.0045%, -0.0044%, 0.022%, and 0.0183%. Additionally, for the event window [-5, +5] the CARs are respectively 0.0146%, 0.0014%, 0.0313%, and 0.0164%. Except for the CARs in 2014 for event windows [-1, +1] and [-5, +5], the CARs are statistically significant at the 1% level or the 5% level in 2013 for event window [-1, +1]. In most years and event windows the CARs are positive, which means that there is a positive relationship between the announcement of the ranking and the firm value. However, there are two negative significant CARs, which indicates a negative relationship for those years and event windows.

Table 12 CARs over the total sample for different event windows

	2013	2014	2015	2016
CAR [-1, +1]	-0.0040**	-0.0018	0.0144***	0.0123***
	(-2.17)	(-1.39)	(6.09)	(4.96)
Obs	*225*	*219*	*216*	*222*
CAR [-2, +2]	0.0045***	-0.0044***	0.0222***	0.0183***
	(2.95)	(-3.83)	(9.57)	(10.80)
Obs	*375*	*365*	*360*	*370*
CAR [-5, +5]	0.0146***	0.0014	0.0313***	0.0164***
	(10.39)	(1.05)	(13.25)	(8.25)
Obs	*825*	*803*	*790*	*814*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Based on the table above, it can be concluded that there exists a positive relationship between the announcement of the ranking and the firm value in the years 2015 and 2016. In 2013 and 2014 the direction of the relationship is not clear. However, most CARs are significantly positive, which means that it can be concluded that the announcement of the ranking does, on average, imply a positive significant CAR. This means that there exists a positive relationship between the announcement of the

ranking and a firm's value. These findings are in line with the study reviews of Margolis and Walsh (2001) and Orlitzky et al. (2003), and the studies of Yadav et al. (2016) and Hartzmark and Sussman (2019), who showed positive abnormal returns for firms ranked in respectively the Newsweek and Morningstar ranking.

5.2.2 CARs for the top quartile versus bottom quartiles of the sample

The second hypothesis states that the announcement of the ranking does imply a higher average CAR for firms in the top quartile than for firms in the bottom quartiles. To test this hypothesis, the CARs of firms in the top quartile are compared to the CARs of firms in the bottom quartiles. These CARs for the event window [-1, +1] are represented in Table 13. The CARs for firms in the top quartile in 2013, 2014, 2015, and 2016 are respectively -0.0092%, 0.0094%, 0.0210%, and 0.0071%, where the CARs for firms in the bottom quartiles are respectively -0.0023%, -0.0050%, 0.0123%, and 0.0137%. In 2014 and 2015, the CARs for firms in the top quartile are higher than the CARs for firms in the bottom quartiles. These CARs are all statistically significant at the 5% level. However, in 2013 and 2016, the CARs for firms in the top quartile are lower than the CARs for firms in the bottom quartiles. Besides, most of these CARs are less significant than the CARs in 2014 and 2015. When looking at the event window [-2, +2] shown in Table 14, the results are similarly to the results from event window [-1, +1].

Table 13 CARs [-1, +1] for the top quartile versus bottom quartiles of the sample

	2013	2014	2015	2016
CAR firms in top quartile	-0.0092*	0.0094***	0.0210***	0.0071*
	(-1.88)	(3.66)	(2.58)	(1.74)
Obs	*54*	*48*	*51*	*48*
CAR firms in bottom quartiles	-0.0023	-0.0050***	0.0123***	0.0137***
	(-1.26)	(-3.47)	(6.92)	(4.65)
Obs	*171*	*171*	*165*	*174*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Table 14 CARs [-2, +2] for the top quartile versus bottom quartiles of the sample

	2013	2014	2015	2016
CAR firms in top quartile	0.0051	0.0044*	0.0272***	0.0123***
	(1.28)	(1.88)	(3.35)	(3.38)
Obs	*90*	*80*	*85*	*80*
CAR firms in bottom quartiles	0.0043***	-0.0069***	0.0206***	0.0200***
	(2.74)	(-5.34)	(12.13)	(10.46)
Obs	*285*	*285*	*275*	*290*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Based on the above mentioned and the tables above, it can be concluded that the announcement of the ranking has a higher effect on firms in the top quartile than firms in the bottom quartiles for the years in 2014 and 2015. However, for the years 2013 and 2016 this cannot be concluded. Therefore, the second hypothesis has to be rejected, which means that the announcement of the ranking implies no difference in average CAR between firms ranked in the top quartile and firms ranked in the bottom quartiles.

5.2.3 CARs for firms that increased their ranking by at least 50 places versus firms that did not achieve this increase

The third hypothesis states that the announcement of the ranking does imply a higher average CARs for firms that increased their ranking by at least 50 places relative to the previous year than firms that did not increase their ranking by at least 50 places. The same method as hypothesis 2 is used: the CARs of firms that increased their ranking by at least 50 places are compared to the CARs of firms that did not achieve this increase. These results are represented in Table 15. The CARs for the first group in 2014, 2015, and 2016 are respectively -0.0118%, 0.0074%, and 0.0131%, where the CARs for the second group are respectively -0.0017%, 0.0148%, and 0.0123%. The CARs for firms that increased their ranking by at least 50 places are higher than firms that did not achieve this increase in 2014 and 2016. However, these differences are small and the CARs are not significant at any level. For 2015, significant results at the 1% level are found and show that the CARs are higher for firms that increased their ranking by at least 50 places than firms that did not achieve that increase. These results are similar to the results of the event window [-2, +2], which are shown in Table 16. However, the results in 2014 are now significant at the 5% level for firms that increased their ranking by at least 50 places and at the 1% level for firms that did not achieve this increase.

Table 15 CARs [-1, +1] for firms that increased their ranking by at least 50 places versus firms that did not achieve this increase

	2014	2015	2016
CAR firms that increased their	-0.0118	0.0074***	0.0131
ranking by at least 50 places	(-1.07)	(3.54)	(0.49)
Obs	*3*	*12*	*3*
CAR firms that did not achieve	-0.0017	0.0148***	0.0123***
an increase of at least 50 places	(-1.27)	(5.93)	(4.89)
Obs	*216*	*204*	*219*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Table 16 CARs [-2, +2] for firms that increased their ranking by at least 50 places versus firms that did not achieve this increase

	2014	2015	2016
CAR firms that increased their ranking by at least 50 places	-0.0423**	0.0182***	0.0262
	(-2.42)	(6.66)	(1.02)
Obs	*5*	*20*	*5*
CAR firms that did not achieve an increase of at least 50 places	-0.0039***	0.0224***	0.0182***
	(-3.39)	(9.16)	(10.59)
Obs	*360*	*340*	*365*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Based on the above mentioned and the above table, it can be concluded that there is no significant difference in CARs between firms that increased their ranking by at least 50 places and firms that did not achieve this increase. Therefore, the third hypothesis must be rejected, which means that there is no difference in average CARs between firms that increased their ranking by at least 50 places and firms that did not achieve this increase.

5.2.4 CARs for firms that newly entered the ranking in the top 50 versus firms that already had a place in the ranking

Hypothesis 4 states that the announcement of the ranking does imply a higher average CAR for firms that newly entered the ranking in the top 50 compared to the previous year than for firms that already had a place in the ranking. The same method as used for the two hypotheses before is used: the CARs of firms that newly entered the ranking in the top 50 are compared to the CARs of firms that did not newly enter the ranking in the top 50. These results are represented in Table 17. The CARs for firms that newly entered the ranking in the top 50 in 2014, 2015, and 2016 are respectively 0.0024%, 0.0120%, and 0.0083%. The CARs for firms that did not newly enter the ranking in the top 50 are respectively -0.0028%, 0.0148%, and 0.0132%. Only in 2014, the average CAR for firms that newly entered the ranking in the top 50 is higher than firms that did not newly enter the ranking in the top 50. For 2015 and 2016, the opposite is visible. The results are statistically significant for the years 2015 and 2016 at the 1% level. For 2014, the results are not significant. When looking at the event window [-2, +2], which results are shown in Table 18, the results of 2014 are also significant at the 1% or 5% level.

Table 17 CARs [-1, +1] for firms that newly entered the ranking in the top 50 versus firms that already had a place in the ranking

	2014	2015	2016
CAR firms that newly entered	0.0024	0.0120***	0.0083***
the ranking in the top 50	(1.09)	(3.27)	(2.58)
Obs	*42*	*36*	*42*
CAR firms that did not newly enter	-0.0028	0.0148***	0.0132***
the ranking in the top 50	(-1.85)	(5.42)	(4.46)
Obs	*177*	*180*	*180*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Table 18 CARs [-2, +2] for firms that newly entered the ranking in the top 50 versus firms that already had a place in the ranking

	2014	2015	2016
CAR firms that newly entered	-0.0038**	0.0180***	0.0182***
the ranking in the top 50	(-2.08)	(4.25)	(9.42)
Obs	*70*	*60*	*70*
CAR firms that did not newly enter	-0.0046***	0.0230***	0.0184***
the ranking in the top 50	(-3.35)	(8.69)	(8.97)
Obs	*295*	*300*	*300*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

It can be concluded that the differences between the CARs of the two groups are small and there is no clear relationship visible. For this reason, hypothesis 4 must be rejected, which means that the ranking does not imply a difference in average CARs between firms that newly entered the ranking in the top 50 compared to the previous year than firms that already had a place in the ranking.

5.2.5 CARs related to a firm's complementary rank

To further investigate the effect of the CARs on sustainability performance, a cross-sectional analysis is conducted. The relationship between CAR and complementary rank is researched to test the fifth hypothesis. This hypothesis states that the CARs are positively and significantly related to a firm's complementary rank. The cross-sectional analysis is executed for each year: 2013, 2014, 2015, and 2016. The CARs in the event window [-1, +1] are regressed on the complementary rank, the firm characteristics (ROA, ln of revenues, and debt ratio), and industry fixed effects. The output of this cross-sectional analysis is shown in Table 19.

The models are tested for heteroscedasticity using the Breusch-Pagan test. Since the p-values of the tests are below 0.05, it can be concluded that there is heteroscedasticity in the models, which causes biased standard errors. Therefore, robust standard errors are used to obtain unbiased standard errors (Woolridge, 2016). The robust standard errors are shown in parentheses in Table 19.

The coefficients of complementary rank are statistically significant at the 1% level in 2014 and at the 10% level in 2015. These coefficients are positive, which means that the firm value increases when the sustainability performance (measured by complementary rank) increases. The coefficients of 2013 and 2016 are not statistically significant. ROA is only statistically significant in 2013 at the 5% level and in 2016 at the 1% level. In 2013 the coefficient is negative, which means that there is a negative relationship between the CARs and ROA: firms with higher ROA have lower CARs and thus a lower firm value. In 2016 the coefficient of ROA is positive, which indicates a positive relationship, which is the opposite: firms with a higher ROA have higher CARs and thus a higher firm value. Another firm characteristic is the log of revenues, which indicates the size of a firm. The coefficients of ln(revenues) are statistically significant at the 1% level in 2013 and 2016. These coefficients are negative, which indicates a negative relationship between the CARs and ln(revenues), thus size of the firm. So, larger firms based on revenues have lower CARs and thus a lower firm value. The coefficients of debt ratio, which indicates the leverage of a firm, are not statistically significant in any year. This means that there cannot be made a conclusion about the relationship between the CARs and debt ratio.

Table 19 Cross-sectional analysis of CARs on complementary rank in the event window [-1, +1]

Variables	2013	2014	2015	2016
Complementary rank	6.73e-05	0.000159***	0.000159*	-0.000129
	(5.70e-05)	(4.76e-05)	(0.000146)	(7.30e-05)
ROA	0.0717**	-0.00830	-0.0196	-0.236***
	(0.0485)	(0.0274)	(0.0343)	(0.0691)
Ln(revenues)	-0.00613***	-0.00186	0.00142	-0.00777***
	(0.00176)	(0.00116)	(0.00156)	(0.00198)
Debt ratio	0.00672	-0.0216	0.0226	-0.0237
	(0.0142)	(0.0117)	(0.0128)	(0.0160)
Industry FE	YES	YES	YES	YES
	(0.00796)	(0.00665)	(0.0111)	(0.0117)
Constant	0.0589***	0.0146	-0.00939	0.121***
	(0.0186)	(0.0136)	(0.0229)	(0.0230)
Observations	225	216	216	222
R-squared	0.213	0.136	0.231	0.326

Robust standard errors in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Based on the above-mentioned findings, there cannot be concluded a specific relationship since there are only a few coefficients significant. However, it can be concluded that in 2014 and 2015 the complementary rank is positively related to the CARs. This indicates that a higher complementary rank

has a positive effect on a firm's value. Since this result is not found for 2013 and 2016, the hypothesis of a positive relationship between the CARs and complementary rank must be rejected.

5.2.6 CARs for firms in 'clean' industries versus firms in 'dirty' industries

The last hypothesis states that the announcement of the ranking does not imply a difference in average CARs between firms in 'clean' industries and firms in 'dirty' industries. The same method as the method used to test hypotheses 2, 3, and 4 is used to test the sixth hypothesis: the CARs of firms in 'clean' industries are compared to the CARs of firms in 'dirty' industries. These results are represented in Table 20. The CARs from firms in 'clean' industries in 2013, 2014, 2015, and 2016 are respectively -0.0002%, -0.0049%, 0.0117%, and 0.0083%, where the CARs from firms in 'dirty' industries are respectively 0.0034%, -0.0054%, 0.0181%, and 0.0352%. In the years 2013, 2015 and 2016, the CARs of firms in 'dirty' industries are higher than the CARs of firms in 'clean' industries. Also, the CARs in 2015 and 2016 are the only significant results where the CARs for firms in 'dirty' industries are significant at the 1% level and the CARs for firms in 'clean' industries are significant at the 5% level in 2015 and at the 10% level in 2016. When looking at the results for the event window [-2, +2], there are more significant results.

Table 20 CARs [-1, +1] for firms in clean industries versus firms in dirty industries

	2013	2014	2015	2016
CAR firms in 'clean' industries	-0.0002	-0.0049	0.0117**	0.0083*
	(-0.04)	(-1.32)	(2.48)	(1.93)
Obs	*33*	*33*	*36*	*39*
CAR firms in 'dirty' industries	0.0034	-0.0054	0.0181***	0.0352***
	(0.72)	(-1.58)	(3.28)	(3.32)
Obs	*48*	*39*	*36*	*30*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Table 21 CARs [-2, +2] for firms in clean industries versus firms in dirty industries

	2013	2014	2015	2016
CAR firms in 'clean' industries	0.0115***	-0.0032	0.0123*	0.0280***
	(3.17)	(-1.03)	(1.89)	(9.67)
Obs	*55*	*55*	*60*	*65*
CAR firms in 'dirty' industries	0.0083*	-0.0053**	0.0240***	0.0392***
	(1.87)	(-2.10)	(5.15)	(5.61)
Obs	*80*	*65*	*60*	*50*

T-statistics in parentheses | *** p<0.01, ** p<0.05, * p<0.1

Based on these results, it can be concluded that the CARs for firms in 'dirty' industries are higher than the CARs for firms in 'clean' industries. This is not in line with the expected relationship based on the studies of Klassen and McLauglin (1996) and Statman and Glushkov (2009), which means that the sixth hypothesis must be rejected.

Overall, it can be concluded that there is a positive relationship between the announcement of the ranking and a firm's value, which was expected and is in line with previous researches (Margolis & Walsh, 2001; Orlitzky et al., 2003; Yadav et al., 2016; Hartzmark & Sussman, 2019). The results of the hypotheses 2, 3, 4, 5, and 6 are all contrary to the expectations as mentioned in Chapter 3. There is no difference between the CARs of the different researched subsamples as tested through hypothesis 2, 3, and 4. Also, it can be concluded that the CARs are not related to a firm's complementary rank. Additionally, a difference in CARs between firms in 'clean' industries and firms in 'dirty' industries is found. More specifically, the CARs for firms in 'dirty' industries are higher than the CARs for firms in 'clean' industries. This is remarkably since studies have shown the opposite results (Klassen & McLaughlin, 1996; Statman & Glushkov, 2009).

6. Conclusion

This chapter concludes and summarizes the results of this research as described in the previous chapters. Furthermore, the limitations of the research will be described.

This research investigates the relationship between Corporate Social Responsibility and financial performance. More specifically, the main research question is: '*What is the effect of the announcement of the Corporate Knight Global 100 Sustainability Index on a firm's value?'.* The question is answered by analysing changes in stock prices in response to the announcement of the ranking, which is called the event study methodology. It is investigated whether firms that are in the ranking experience abnormal stock returns. The rankings of 2013, 2014, 2015, and 2016 are used since the methodology in these years is the same, which makes it possible to compare the abnormal returns over the years and this might give a better overview of the results. Six hypotheses are tested in order to answer the main research question. To test these hypotheses, different methodologies are used. First, hypothesis 1 gives an overall view of the relationship between the announcement of the ranking and the firm value. For this, the CARs for different event windows and years are calculated. Second, the sample is divided into two subsamples, after which the average CARs of these subsamples are compared with each other. It differs per hypothesis which firms are included in the two subsamples. For example, to test hypothesis 2, one subsample contains firms that are ranked in the top quartile and the other subsample contains firms that are in the bottom quartiles. This methodology is used for hypothesis 2, 3, 4, and 6. Finally, a cross-sectional analysis is conducted to further investigate the effect of the CARs on sustainability performance, which is tested by hypothesis 5. Therefore, the CARs are regressed on the complementary rank, the firm characteristics (ROA, ln of revenues, and debt ratio), and industry fixed effects. The regression is conducted for every year of the sample. Also, the models are tested for heteroscedasticity using the Breusch-Pagan test, after which it turned out that there is heteroscedasticity. For that reason, robust standard errors are used to obtain unbiased standard errors.

Overall, this study finds evidence for higher cumulative abnormal returns for firms ranked in the Corporate Knights Global 100 Sustainability Index, which means that there exists a positive relationship between sustainability performance and financial performance. This is in line with multiple studies. For example, Margolis and Walsh (2001) and Orlitzky et al. (2003) reviewed multiple studies about the relationship between sustainability and financial performance and concluded that there exists a positive relationship. Furthermore, similar studies as this research are done by Yadav et al. (2016) and Hartzmark and Sussman (2019) but for different rankings. Both studies showed positive abnormal returns for ranked firms. To explicate this relationship, different subsamples are made. As mentioned before, CARs

of firms that are in the top quartile of the ranking are compared to the CARs of firms in the bottom quartiles. It shows that in 2014 and 2015 the ranking has a higher effect on firms in the top quartile than firms in the bottom quartiles. Unfortunately, this cannot be concluded for the years 2013 and 2016. Hence, a difference in average CARs of firms in the top quartile and firms in the bottom quartile is overall not found. Additionally, CARs of firms that increased their ranking by at least 50 places are compared to the CARs of firms that did not achieve this increase. It followed that there is no significant difference in these average CARs. Moreover, also the CARs of firms that newly entered the ranking in the top 50 are compared to the CARs of firms that already had a place in the ranking. The differences between the CARs of these two groups are small and there is no clear relationship visible. To give a clearer view of the impact of a specific industry on the CARs, CARs of firms in 'clean' industries are compared to CARs of firms in 'dirty' industries. It followed that the CARs of firms in 'dirty' industries are higher than the CARs in 'clean' industries. This is surprising since the opposite (higher CARs for firms in 'clean' industries than for firms in 'dirty' industries) was expected based on studies of Klassen and McLaughlin (1996) and Statman and Glushkov (2009).

Finally, a cross-sectional analysis is conducted. The CARs in the event window [-1, +1] are regressed on the complementary rank, ROA, ln of revenues, debt ratio, and industry fixed effects. The results differ per year. It can be concluded that in 2014 and 2015 the complementary rank is positively related to the CARs. This indicates that a higher complementary rank has a positive effect on a firm's value. However, for 2015 it is only significant at the 10% level and this positive effect is not found for 2013 and 2016, which means that a specific relationship cannot be concluded.

Although this study carefully investigated the main research question, it is still subject to certain limitations. These limitations can be considered in further research of the relationship between sustainability performance and financial performance. In this study it is chosen to use the years 2013 till 2016 since the methodology for these years is the same. Using more years might give a more one-sided result. Besides that, the years used in this study are not the most recent. The methodology is changed a few times after 2016, which implies that Corporate Knights finds this an improved and better methodology. When more years of data of the new methodology are available, it might be interesting to do this research again, which might lead to more significant or different results. Furthermore, this paper only investigates the short-term effect of the announcement of the ranking. Research can also be done to investigate the long-term effect of firms being sustainable. An addition to future research of this topic might be to investigate which the main drivers of the relationship are, this gives a more detailed view of the most important sustainability key performance indicators.

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