# AN EVENT ANALYSIS OF CORPORATE SOCIAL RESPONSIBILITY RATINGS ON STOCK PRICES

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

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May 2017

AN EVENT ANALYSIS OF CORPORATE SOCIAL RESPONSIBILITY RATINGS ON STOCK PRICES

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May 2017

Mathematical Economics

**Abstract**

Corporate social responsibility (CSR) and its effects on firms who choose to practice it is a growing topic of contention in the economics field. However, much of the studies previously done on the CSR and financial performance (CFP) relationship have been inconclusive. In this research, I used Thomas Reuter's ESG ratings of CSR to do an event analysis of 100 different firms' stock prices spanning a time period of ten years, 2007 to 2015. By looking at the percent change in CSR ratings and the percent change in stock prices on the day of ratings announcement, we can account for other factors that affect stock performance and isolate the influence of corporate social responsibility on stock prices. Results of multiple different regression models and robustness checks supported my hypothesis for a positive corporate social performance (CSP) and CFP relationship, in accordance with Stakeholder theory. Specifically, the environmental, social, and ESG ratings had a significant positive impact on stock price. Although the results show a positive relationship between corporate social responsibility and stock performance, the model was not the best fit for the data and therefore further research is necessary. With a more thorough understanding of the CSR-CFP relationship, firms can act accordingly and more efficiently, while ultimately improving their communities' quality of life.

KEYWORDS: (CSR, Corporate Finance, Event Analysis)
JEL CODES: (A13, G3, G14)

**Acknowledgements**

Without the help of several people at this institution as well as at my home, this thesis would not have been possible.

First and foremost, I am hugely indebted to my advisor, Professor **Kevin Rask**, for always finding time in his schedule to meet with me and or answer my barrage of emails and questions. I am also very thankful for his endless guidance and insight into how to improve my analysis and thesis. It is without doubt that my Econometrics class with him inspired me to write this thesis.

I am also very grateful to my previous advisor, the late Professor **Rich Fullerton**, whose expertise, encouragement, and guidance also made it possible for me to pursue and develop this topic of Corporate Social Responsibility. Thank you for the unwavering support and constant kindness.

I would similarly like to acknowledge **my family** for everything they have done for me, emotionally and financially. Without the love and support of my family, I would not be able to attend Colorado College and write this thesis. I especially want to express my gratitude to my mother, **Peggy Ward**, who has always done her best in everything that she does and is an endless inspiration for me to be a better person and student every day.

Finally, I would like to thank **my friends** for always being there for me, including times when I struggled with my thesis and more. Specifically, thank you **David Trevithick** for always encouraging me when I am feeling defeated. Finally, thank you **Jesica Ast**, **Miriam Sanchez**, **Chaline Lobti**, **Joshua Zambrano, Tierre Allen, Freda Kreier,** and **Emma Kepes** for all the moral support.

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED
UNAUTHORIZED AID ON THIS THESIS

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Signature

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## I. Introduction

With the increasing threat of climate change and the growing negative externalities of globalization, many people are calling for corporations to take more responsibility for their business practices and effect on communities' quality of life. However, are there incentives for businesses to perform such costly services on top of their economic and legal obligations? In the past few years, there has been growing discussion of the role of business in society. On one side are those who support the shareholder view of management and believe that the focus should always be on the interest of the firm's owners and stockholders. Essentially, management decisions should be solely motivated by a firm's market value maximization to further grow the wealth of the company's owners. However, on the other side, the stakeholder theory shifts that managerial focus from the firm's stockholders to a wider group of people, deemed stakeholders. This group includes customers, employees, and the general community. Thus, business must not only satisfy the owners' wants of profit maximization, but it must also satisfy the demands of the larger community the firm serves (Bird et al., 2007; McGuire et al., 1988).

Although concerns for social issues have always been a part of business, formal research on corporate social responsibility has only prominently arisen in the past fifty years or so (Carroll, 1999). Increasingly hyperactive media has contributed to heightening society's sensitivity to issues of environmental abuses, mistreatment of employees, and health concerns to the public. In developed nations in particular, people are more aware and interested in the ethics surrounding business practices, especially when it comes to shopping at the companies with which they support (Harrison, 1999).

Consequently, corporate social responsibility is now a growing topic of contention in the field of economics. There has been a multitude of research conducted on the effect of corporate social performance on financial performance as a result. However, there is still no consensus on whether corporate social performance has a positive or negative relationship with corporate financial performance (Margolis et al., 2009; Perrini et al., 2011; Orlitzky et al., 2003). Subsequently, there is a demand for more research to better analyze the effects of corporate social responsibility on financial performance.

Researchers have approached this problem in many different ways in order to analyze the CSR-CFP relationship. However, there are fundamental difficulties in this type of research that arise depending on how you measure and define a firm's social responsibility and financial performance. Thus, for the purposes of this study, I will define CSR as a multidimensional term for "social consciousness" that incorporates philanthropy, good environmental policies, ethical labor practices, and anything that "represents a concern with the needs and goals of society which goes beyond the merely economic" (Carroll, 1999).

Numerous studies have utilized the *Fortune* survey to measure CSR in companies. The survey is conducted on "senior executives, outside directors, and financial analysts" who are tasked with rating the ten largest companies in their industry on eight attributes of CSR (*Fortune*, 1994: 58). However, a high correlation between the overall reputation of the companies and their corporate social responsibility reputation suggests that perhaps the overall image of the firm, rather than its responsible practices, was the determining factor of its CSR reputation (Griffin and Mahon, 1997). This makes the fortune survey an unreliable classification system for the study of CSR.

Another popular corporate social performance measurement is the Kinder, Lydenberg, Domini & Co. Index, also known as the KLD index. The index includes eight measures of CSR, much like the *Fortune* survey, that include employee and community relations, treatment towards women and minorities, corporate governance, and the environment. Since the ranking in the KLD index is done by third party independent analysts, it is more reliable than the *Fortune* corporate social performance ratings. Still, the KLD index lacks a method to weigh the different dimensions of CSR included and thus does not give a very accurate picture of the effects of CSR (Waddock and Graves, 1994).

On the other hand, there are also many ways of calculating corporate financial performance. Some studies measure returns on investments or return of assets, while others calculate return of equity or stock market prices. McGuire, Sundgren, and Schneeweis argue that accounting-based measure can only represent historical firm performance and can be easily manipulated by firms. Additionally, they must be adjusted for industry specific effects and risk. Meanwhile stock-based measures have been inconclusive in their results and may not be a proper valuation for a firm as it is formed by investors. Conclusively, CSR can affect financial performance in various ways and therefore, if a study selects an inappropriate variable to define financial performance, the results may be inaccurate (McGuire et. al, 1988).

Consequently, in this research, I will be using Thomas Reuter's CSR ratings and indices as it is very current and reliable. With over 4,600 companies evaluated and more than 226 key performance indicators, Thomas Reuters Corporate Responsibility Ratings is a leading provider of CSR ratings. The ratings encompass three categories;

environmental performance, social performance, and corporate governance performance. All three categories are then factored in to form an overall environmental-social-governance performance rating (ESG). For my financial performance indicator, I will be using a firm's stock prices. I believe stock market prices can not only work well as a financial performance indicator, but can also give us a unique perspective on the financial market's response to socially responsible behaviors from firms. In addition, because accounting-based measures can be altered by managerial manipulation and therefore be a biased indicator, stock prices can also be more reliable in terms of gauging financial performance. (Izzo and Donato, 2012).

In many other CSR-CFP research papers, economists create regression models and try to isolate the relationship through control variables. However, because so many factors influence stock performance, I believe an event analysis will give a clearer picture of the effects of CSR ratings on stock performance. In this research, I will use Thomas Reuter's ESG ratings of CSR to analyze 100 different firms' stock prices spanning a time period of ten years, 2007 to 2016. By performing an event analysis, I will be able to isolate the CSR-CFP relationship by analyzing the change in stock prices due to a change in CSR ratings.

My hypothesis aligns with the stakeholder theory and ultimately, I believe the CSR-CFP relationship will be positive. In my model, this means that an announcement of a good CSR rating will be a significant factor in creating positive change in a firm's stock prices. By participating in socially responsible behaviors, I believe firms will benefit in the long run through increased employee morale and, in turn, worker productivity. With responsible environmental practices, firms could also decrease risks and gain an

increased consumer base as shifts in society favor sustainability. Furthermore, good corporate social responsibility practices can be indicative of good management and encourage more investment by constituents, improving access of capital. In other words, I argue that corporate social responsibility will ultimately have a positive effect on a company's financial performance in the stock market as sustainability and socially responsible practices become more sought after by developed countries.

The remainder of this paper is organized into chapters as follows: Section II. Literature Review and Theory, summarizes the current literature while also shedding light on the ways corporate social responsibility could affect financial performance. Section III. Data and Methodology, explains the data collected, how they are processed, and what models they are used in. Section IV. Results, discusses the outcomes of processing the data in my model. Section V. Conclusion, concludes the paper and explores the implications of the results for the event analysis. Section VI. Appendices, contains supplementary information for reference.

## II. Literature Review and Theory

### II a. Theory

There are various theories about the effects of corporate social responsibility on corporate financial performance. The proponents that argue that CSR negatively effects performance believe that when a firm uses resources on socially responsible actions, it is incurring additional costs and could lose out to less socially responsible firms in the same industry (Bragdon et al., 1972; Vance, 1975; McGuire et al., 1988). For example, as the socially conscious firm contributed to charitable work, a competitive firm could use its

resources on cutting costs and increasing efficiency instead and gain an advantage. Furthermore, not only would socially responsible actions disadvantage the company, the firm could also be restricted in its future strategic opportunities, such as being unable to relocate a manufacturing plant in a location with questionable labor laws even if it provides tax incentives (Callan and Thomas, 2009). These views are in line with the shareholder theory of management, where the objective of the firm should always be in line with the interest of the firm's owners. According to this theory, CSR does not directly contribute to profit maximization and may even harm financial performance, therefore there is no place for it in a company's mission.

The advocates for the opposing view that CSR is beneficial to CFP, the Stakeholder theory, believe that rather than disadvantaging the firm, it would help build a larger and more loyal customer base, reduce labor issues within the company, increase worker productivity, and lessen the risk of bad publicity (Soloman et al., 1985; Alexander et al., 1978). For example, the community may choose the firm's product over a competitor's product because he or she may be supportive of the company's work in charity or green practices. In addition, participating in socially responsible practices, especially in terms of having environmentally friendly policies, i.e. not dumping waste inappropriately, could also decrease the risk of the company from being fined or penalized by the government in law suits and contribute to a better relationship with the community (McGuire et al., 1988). To conclude, CSR can act as an insurance against bad reputation as well as open opportunities for financial capital from more trusting investors (Cheng et al., 2013).

A third view of the CSR-CFP relationship is that there is no effect. Some economists believe the relationship is neutral or nonexistent and neither benefits performance nor harms it. Advocates argue that if there is a demand for CSR, then socially responsible policies will help increase a firm's market value and firms will fulfill that demand (Mackey et al., 2007). However, if there is no demand, it will be at best insignificant and at most harmful to a firm's profitability. Ultimately, they believe there is no simple direct relationship between the two variables (Simpson and Kohers, 2002).

**II b. Existing Literature**

According to Margolis, Elfenbein, and Walsh, who conducted a meta-analysis of corporate social responsibility on financial performance studies in 2009, "59% (of the studies in the meta-analysis) reveal a non-significant relationship, 28% a positive relationship, and 2% a negative relationship between CSP (Corporate Social Performance, CSR) and CFP" (Margolis et al., 2009). Their research ultimately points to a slightly significant positive relationship across all industries between CSR and CFP, however the effect itself is small and accounts for only 2.23% of financial performance variance. In Orlitzky, Schmidt, and Rynes' meta-analysis of the CSR-CFP link, they similarly find a weak positive association between the two variables but had rather large unexplained variances across the studies (Orlitzky et al., 2003). Due to the ambiguity of CSR and CFP calculation, it is not surprising that many research studies yield such inconclusive results and large variances. Numerous studies use very different methods and variables to determine the relationship, which makes it very difficult to conduct a meta-analysis of the studies.

Of the studies discovering positive results between corporate social performance and financial performance, Galema et al. found evidence of a positive impact from CSR investment on stock returns, suggesting that stockholders value diversity and environmental sustainability of their firms. While Saeidi et al.'s research on the mediating role of competitive advantage on CSR and CFP resulted in support for CSR contributing to increased firm value, other studies, investigating the effects of CSR on shareholder value, show signs of CSP creating insurance-like protection for firms against stock price crash risk and increasing shareholder value during negative events (Galema et al., 2008; Saeidi et al., 2015). These studies give weight to the theory that CSR may help firms, governments, and communities develop better relationships and thus open more financial opportunities for the firms (Godfrey et al., 2009; Kim et al., 2014).

Meanwhile, Lopez, Garcia, and Rodriguez discovered significant evidence of a negative link between CSR and performance indicators in their study of the effect of sustainable development on corporate performance. Although they concluded that a company's switch to socially responsible practices may put them at a disadvantage with other less responsible competitors, they also acknowledged that the effects diminish over time and the results make no assumptions about a long-term negative effect on performance (Lopez et al., 2007). Many studies conducted have also found a negative CSR-CFP link in specialized industries. For example, Yang et al.'s regression results showed a negative connection between CSR and return on equity in the financial industry while Inoue et al.'s study saw CSR affect CFP negatively in the sports sector (Yang et al., 2010; Inoue et al., 2011). Finally, Lioui and Zenu's research on indirect and direct effects

of environmental CSR on financial performance resulted in a statistically significant direct negative relationship between the two.

Lastly, in Aupperle, Carrol, and Hatfield's investigation, they failed to find any significant evidence that a CSR-CFP relationship exists (Aupperle et al., 1985). Their results exhibited no difference in profitability between firms who were more socially responsible than other firms. Although, in González-Benito et al.'s empirical study of environmental proactivity on business performance, they concluded that the CSR-CFP relationship was too complex and had to be explored further as their results exhibited both positive and negative conclusions. Based on the specific type of environmental CSR activity, business performance could be positively and/or negatively affected. Although this corporate social responsibility and financial performance connection has been a rather popular topic of research for the past several years, the results to the analysis of the relationship is still inconclusive.

Below is a brief table summary of literature review for this thesis. The + means positive and significant results, the +/- means inconclusive or insignificant results, and the – means negative and significant results.

*Table 1. A Brief Summary of Literature Review*

| Author | Title | Results | + | +/- | - |
|---|---|---|---|---|---|
| Gordon et al. (1978) | Corporate Social Responsibility and Stock Market Performance | There is no significant link between stock performance and CSR. | | X | |
| Aupperle et al. (1985) | An Empirical Examination of the Relationship between Corporate Social Responsibility and Profitability | No relationship between CSR and profitability. | | X | |

| | | | | | |
|---|---|---|---|---|---|
| Waddock & Graves (1997) | The Corporate Social Performance-Financial Performance Link | CSR leads to better CFP, which in turn also increases CSR. | X | | |
| González-Benito et al. (2005) | Environmental Proactivity and Business Performance: An Empirical Analysis | No evidence of CSR contributing to higher profitability. | | X | |
| Lopez et al. (2007) | Sustainable Development and Corporate Performance: A Study Based on the Dow Jones Sustainability Index | CSR creates a short-term negative influence on the performance of share price. | | | X |
| Callan et al. (2009) | Corporate Financial Performance and Corporate Social Performance: An Update and Reinvestigation | The CSR-CFP relationship is positive. | X | | |
| Godfrey et al. (2009) | The Relationship Between Corporate Social Responsibility and Shareholder Value: An Empirical Test of the Risk Management Hypothesis | CSR protects and creates value for shareholders when experiencing a negative event. | X | | |
| Margolis et al. (2009) | Does It Pay to Be Good? A Meta-Analysis and Redirection of Research on the Relationship Between Corporate Social and Financial Performance | A meta-analysis of the CSR-CFP relationship, showing a slight positive effect. | X | | |
| Yang et al. (2010) | The Linkage Between Corporate Social Performance and Corporate Financial Performance | CSP has a negative effect on return on equity in the financial industry and an insignificant effect in the electronic industry. | | | X |
| Inoue et al. (2011) | CSR and the Bottom Line: Analyzing the Link Between CSR and Financial Performance for Professional Teams | CSR negatively effects CFP in the sport industry. | | | X |

| | | | | | |
|---|---|---|---|---|---|
| Lioui and Zenu (2012) | Environmental Corporate Social Responsibility and Financial Performance: Disentangling Direct and Indirect Effects | There is a negative relationship between environmental CSR and return on assets. | | | X |
| Lee et al. (2013) | The Corporate Social Responsibility–Financial Performance Link in the U.S. Restaurant Industry: Do Economic Conditions Matter? | The CSR-CFP link is not significant in the U.S. restaurant industry. | | X | |
| Flammer (2015) | Does Corporate Social Responsibility Lead to Superior Financial Performance? A Regression Discontinuity Approach | CSR shareholder proposals are value enhancing for the firm. | X | | |
| Saeidi et al. (2015) | How Does Corporate Social Responsibility Contribute to Firm Financial Performance? The Mediating Role of Competitive Advantage, Reputation, and Customer Satisfaction | CSR enhances reputation and competitive advantage which indirectly increases firm performance. | X | | |

## III. Data and Methodology

### III a. Data

In this study, I investigated 100 firms in various industries from 2007 through 2016. However, because I utilize Thomas Reuters' Corporate Social Responsibility Index, my set of firms chosen were based on the inclusion in the index. The firms included were then further narrowed down according to whether they were publicly traded in order for me to collect stock performance data.

Although there are many ways to measure corporate financial performance, I selected stock market prices from *Google Finance* as my financial performance proxy over the other alternatives. I believe stock price is both a good representation of financial performance as well as the best representation of the direct response of stakeholders' interests. In addition to the stock prices from the day of announcement of CSR ratings, I also collected stock prices a week prior to the announcement to use as a control variable for the event analysis. Thus, for each company and each year, there are two days associated with it; the day of announcement and the control day. One day to capture the effect of the CSR ratings may not be enough as stockholders might be slow to the new information. To account for this, I have two models; the One Day model and the Multiple Day model. The One Day model's stock price difference is calculated over a single day period and the Multiple Day model is calculated over the span of a few days divided by the number of spanned days. Therefore, for each day (control and experiment), there are four associated data points; the stock price at the beginning of the day and at the end of the day, and the stock price a day before and a day after. Since the stock market is not open every day, the Multiple Day model's stock prices will be collected with different amounts of days spanning them. For example, if the before stock price is collected on a Friday, then the after stock price could only be collected on Monday. This poses an inconsistency problem to my longer period model and thus I also created a variable to keep the number of days passed accountable, called "days". For future convenience, the indicator variable CSREvent was also created to differentiate between the control group (CSREvent = 0) and the announcement group (CSREvent = 1). Finally, I calculated the percent change in stock prices for both models. However, to keep the Multiple Day

model's percent change in stock price to be per day like in the One Day model, I divide the change in stock price by the number of spanned days.

For every firm included in the study, I collected their environmental, social, corporate governance, and ESG ratings from Thomas Reuter's Corporate Responsibility Indices from 2007 to 2016. Thomas Reuter's ESG ratings are derived from their own business resource, ASSET4. ASSET4 utilizes over 100 analysts to calculate objective, relevant, and systematic corporate responsibility information based on over 250 performance indicators and more than 750 individual data points from their original data sources. The environmental rating "consists of three category groupings; emission reduction, product innovation, and resource reduction" (Thomas Reuters). The social rating is the most complex of all the categories and is made up of seven groupings; "community, diversity, employment quality, health-and-safety, human rights, product responsibility, and training-and-development" (Thomas Reuters). Finally, the governance rating includes five category groupings including "board functions, board structure, compensation policy, shareholders' policy, and vision-and-strategy" (Thomas Reuters). Through these 15 groupings, Thomas Reuters can then calculate an all-encompassing ESG rating that ranges from 0 to 100 for different firms. To track the effect of CSR announcement accurately, I calculated the percent change in CSR each year on the day of announcement.

Due to the ESG rating being an all-encompassing score of the other ratings, it cannot be included with the other ratings. Therefore, I will first do an isolated regression with ΔESGRate and CSREvent, followed by another regression model including the specific areas of CSR. This way, I will be able to analyze the effect of CSR ratings as a

whole on stock performance as well as the affect of specific CSR areas on stock performance. Overall, the two regression equations for the two models are as follows:

*One Day Model*

$$\Delta S_1 = f(\Delta R_{esg}, Ev) \quad (1.1)$$

$$\Delta S_1 = f(\ \Delta R_{env}, \Delta R_{so}, \Delta R_{cg}, Ev) \quad (1.2)$$

*Multiple Day Model*

$$\Delta S_m = f(\Delta R_{esg}, Ev) \quad (2.1)$$

$$\Delta S_m = f(\Delta R_{env}, \Delta R_{so}, \Delta R_{cg}, Ev) \quad (2.2)$$

$\Delta S_1$ = The change in stock prices during one day, from opening to closing price

$\Delta S_m$ = The average per day change in stock prices spanning multiple days

$Ev$ = The indicator variable for distinguishing between a control or an experimental, also named CSREvent

$\Delta R_{env}$ = The change in the environmental CSR rating

$\Delta R_{so}$ = The change in the social CSR rating

$\Delta R_{cg}$ = The change in the corporate governance CSR rating

$\Delta R_{esg}$ = The change in the overall ESG CSR rating

Below is a table of variables for the model, including their description and sources.

*Table 2. Variable Description and Sources*

| Variable | Name | Definition | Source |
|---|---|---|---|
| EnvRate | Environmental Rating | The Environmental CSR rating is based on three categories: emission reduction, product innovation, and resource reduction | Thomas Reuters Corporate Responsibility Index |

| | | | |
|---|---|---|---|
| ΔEnvRate | Change in EnvRate | The percent change in EnvRate from the previous year | Author's Calculations |
| SORate | Social Rating | The Social CSR rating is based on seven categories: community, diversity, employment quality, health-and-safety, human rights, product responsibility, and training-and-development | Thomas Reuters Corporate Responsibility Index |
| ΔSORate | Change in SORate | The percent change in SORate from the previous year | Author's Calculations |
| CGRate | Corporate Governance Rating | The Corporate Governance CSR rating is based on 5 categories: board functions, board structure, compensation policy, shareholders' policy, and vision-and-strategy | Thomas Reuters Corporate Responsibility Index |
| ΔCGRate | Change in CGRate | The percent change in CGRate from the previous year | Author's Calculations |
| ESGRate | Environmental Social Governance Rating | The ESG rating is a composite rating based on EnvRate, SORate, and CGRate | Thomas Reuters Corporate Responsibility Index |
| ΔESGRate | Change in ESG Rating | The percent change in ESGRate from the previous year | Author's Calculations |
| Days | Days | The number of days between the collected stock price and when the CSR ratings were announced | Author's Calculations |
| SpDays | Stock Price with multiple days | The percent change in stock prices during multiple days divided by the variable days | Author's Calculations based on *Google Finance* stock prices |

| | | | |
|---|---|---|---|
| SpOne | Stock Price with one day | The percent change in stock prices during one day, from opening to closing price | As above |
| CSR Event | CSR Event | The indicator variable for distinguishing between a control day or an announcement day | Author's Calculations |

Below is a table of descriptive statistics for all my variables.

*Table 3. Aggregate Descriptive Statistics*

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| envrate | 2,000 | 29.44481 | 32.58471 | 0 | 96.58 |
| ΔEnvRate | 2,000 | .9255908 | 7.326836 | -39.54226 | 98.20359 |
| sorate | 1,999 | 27.64667 | 30.19533 | 0 | 94 |
| ΔSORate | 2,000 | .6368256 | 8.76001 | -53.19317 | 93.13725 |
| cgrate | 2,000 | 31.28654 | 32.826 | 0 | 94.4 |
| ΔCGRate | 2,000 | .5104183 | 6.255237 | -38.49576 | 102.7586 |
| esgrate | 2,000 | 29.457 | 31.43131 | 0 | 93.27 |
| ΔESGRate | 2,000 | .4967992 | 4.16378 | -26.06095 | 41.33739 |
| spone | 1,619 | .117202 | 2.036195 | -10.01 | 25.53 |
| spdays | 1,912 | .3350994 | 2.154373 | -32.22 | 29.32 |

As shown by table 3, the original rate variables all have very high standard deviations, while the change in rate variables all have lower standard deviations. Thus, when graphed on to a histogram, the difference in rate variables are all normally distributed and centered around zero, apart from some outliers. However, there are also a large amount of zero values in the rate changes that may drive the data to be non-normal. Below is a correlation table with all the variables in the model.

*Table 4. Correlation Coefficients of CSR ratings*

| | envrate | sorate | cgrate | esgrate | ΔEnvRate | ΔSORate | ΔCGRate | ΔESGRate | csrevent | spone | spdays |
|---|---|---|---|---|---|---|---|---|---|---|---|
| envrate | 1.0000 | | | | | | | | | | |
| sorate | 0.9593 | 1.0000 | | | | | | | | | |
| cgrate | 0.9553 | 0.9529 | 1.0000 | | | | | | | | |
| esgrate | 0.9864 | 0.9844 | 0.9840 | 1.0000 | | | | | | | |
| ΔEnvRate | 0.1422 | 0.1161 | 0.1184 | 0.1272 | 1.0000 | | | | | | |
| ΔSORate | 0.0580 | 0.1126 | 0.0843 | 0.0860 | 0.0221 | 1.0000 | | | | | |
| ΔCGRate | 0.0499 | 0.0588 | 0.1081 | 0.0715 | 0.0496 | 0.0419 | 1.0000 | | | | |
| ΔESGRate | 0.1221 | 0.1421 | 0.1393 | 0.1404 | 0.5393 | 0.5951 | 0.5371 | 1.0000 | | | |
| csrevent | 0.9029 | 0.9146 | 0.9569 | 0.9387 | 0.1276 | 0.0928 | 0.0703 | 0.1264 | 1.0000 | | |
| spone | -0.0072 | 0.0037 | -0.0105 | -0.0049 | 0.0544 | 0.0338 | -0.0293 | 0.0437 | 0.0233 | 1.0000 | |
| spdays | -0.0359 | -0.0252 | -0.0397 | -0.0342 | 0.0343 | 0.0678 | -0.0095 | 0.0534 | -0.0162 | 0.6137 | 1.0000 |

As seen in the correlation coefficient table, the original rates were very correlated with high values of .96 and .98. However, when transformed into percentage change, their correlation with each other drops to less than .10. The only exception is ΔESGRate, where the correlation coefficient is still mildly high at .54 with ΔEnvRate and ΔCGRate, and .60 with ΔSORate. This is expected as the three rates, ΔEnvRate, ΔSORate, and ΔCGRate, ultimately all factor into the calculation of the ΔESGRate. However, there will be no multicollinearity problem between the ESG rating and the other CSR ratings as the regression models will not include both the overall ESG and the specific CSR ratings together. Overall, these low correlation coefficient values will help prevent multicollinearity problems within the regression model.

**III b. Methodology**

To fully analyze the role of corporate social responsibility on stock performance, I will be conducting three different regression models: ordinary least squares, fixed-effects, and random-effects. The fixed-effects model assumes that there is an unobservable constant characteristic across the firms while the random-effects model assumes there is unobservable random variation across the firms. These assumptions could mean that perhaps there is a constant or random characteristic inherent in some of the firms that effect the stock performance that we have omitted in the model. Thus, both the fixed effects and random effects models then try to fix for this unobserved heterogeneity that

would affect coefficient estimates. The OLS however, does not account for these individual-specific variations, and so we must make sure we conduct regression analysis on all three models to find the best fit with the most accurate results.

To determine which model will be best suited for the data, I will conduct a Hausman test and a Breusch-Pagan Lagrange Multiplier test (BPLM) on each regression. The Hausman test is designed to help decide whether the fixed-effects or random-effects model is better suited for the data, depending on if the unique errors is correlated to the regressors. The null hypothesis is indicative that the data is better suited with the RE model, while the alternative hypothesis means the data is better suited with the FE model. On the other hand, the Breusch-Pagan Lagrange Multiplier test (BPLM) is a test that helps determine whether the data is better suited with a random-effects model or a simple ordinary least squares model by examining the variances of the errors. Through these two tests, I can then select the most accurate and best fit model to base my analysis on.

## IV. Results

To determine the relationship between corporate social responsibility and financial performance, my research set out to examine new CSR rating announcements and its influence on stock prices through an event analysis. Since my position aligned with the stakeholder theory, I expect the coefficients for any of the CSR ratings to be positive. This would mean that a one percent increase in any of the CSR factors, ESG, corporate governance, social, or environmental, would contribute to a positive percent change in stock prices. I also expect the CSREvent variable to be significant. The CSREvent is a dummy variable for announcement of CSR ratings and since I expect

ratings to have a statistically significant effect on stock performance, I also expect announcement days to have an overall significant effect on stock prices. However, because it is an event variable for ratings announcement, based on each individual firm's rating of CSR, it could be either positive or negative in its effect on stocks.

Below is a table of the one day model and the multiple day model's regression results. Specific regression results and test results can be found in the appendices at the end of the paper. An "x" indicates the variable was very insignificant and left out of the regression model.

*Table 5. Summary of Regression Results for the One Day Model*

| **Variable** | **OLS** | | **Fixed-Effects** | | **Random-Effects** | |
|---|---|---|---|---|---|---|
| | *Coefficient* | *P-value* | *Coefficient* | *P-value* | *Coefficient* | *P-value* |
| ΔESGRate | .020 | .097 | .018 | .147 | .020 | .097 |
| CSREvent | .072 | .480 | .073 | .475 | .072 | .480 |
| Constant | .068 | .359 | .068 | .356 | .068 | .359 |
| Observations | 1,619 | | 1,619 | | 1,619 | |
| $R^2$ | .002 | | .002 | | .002 | |

| **Variable** | **OLS** | | **Fixed-Effects** | | **Random-Effects** | |
|---|---|---|---|---|---|---|
| | *Coefficient* | *P-value* | *Coefficient* | *P-value* | *Coefficient* | *P-value* |
| ΔEnvRate | .015 | .026* | .014 | .043* | .015 | .026* |
| ΔSORate | .008 | .172 | .008 | .162 | .008 | .171 |
| ΔCGRate | -.011 | .179 | -.012 | .125 | -.011 | .179 |
| CSREvent | X | X | X | X | X | X |
| Constant | .100 | .051 | .102 | .048 | .100 | .051 |
| Observations | 1,619 | | 1,619 | | 1,619 | |
| $R^2$ | .005 | | .005 | | .005 | |

*Significant at the 95% confidence level

*Table 6. Summary of Regression Results for the Multiple Day Model*

| **Variable** | **OLS** | | **Fixed-Effects** | | **Random-Effects** | |
|---|---|---|---|---|---|---|
| | *Coefficient* | *P-value* | *Coefficient* | *P-value* | *Coefficient* | *P-value* |
| ΔESGRate | .028 | .019* | .027 | .028* | .028 | .019* |
| CSREvent | .089 | .371 | .088 | .377 | .089 | .371 |
| Constant | .276 | .000 | .277 | .000 | .276 | .000 |
| Observations | 1,912 | | 1,912 | | 1,912 | |
| $R^2$ | .004 | | .004 | | .004 | |

*Significant at the 95% confidence level

| **Variable** | **OLS** | | **Fixed-Effects** | | **Random-Effects** | |
|---|---|---|---|---|---|---|
| | *Coefficient* | *P-value* | *Coefficient* | *P-value* | *Coefficient* | *P-value* |
| ΔEnvRate | .010 | .134 | .009 | .181 | .010 | .133 |
| ΔSORate | .015 | .007* | .016 | .005* | .015 | .006* |
| ΔCGRate | .X | X | X | X | X | X |
| CSREvent | .078 | .432 | .077 | .440 | .078 | .432 |
| Constant | .276 | .000 | .277 | .000 | .276 | .000 |
| Observations | 1,912 | | 1,912 | | 1,912 | |
| $R^2$ | .006 | | .006 | | .006 | |

*Significant at the 95% confidence level

**IV a. Regression Analysis**

One Day Model

As you can see on Table 5, the ESG rating and CSREvent both share an insignificant relationship with stock performance in the One Day model. Furthermore, I fail to reject my null hypothesis for the social and corporate governance CSR ratings. Therefore, a change in either of these ratings have no significant impact on a firm's stock performance. In contrast, the ratings for the environmental CSR have a noteworthy

influence on stock prices. This means that a one percent increase in ΔEnvRate leads to a .015 percent increase in stock price.

Comparing the Ordinary Least Squares, Fixed-Effects, and Random-Effects model, one can see that there is no radical difference between most of the three models' results. The biggest change in value is the change in environmental rating, where the p value almost doubled when performing a FE model over an OLS model, however all other values are approximately the same. To determine which model would be best for the data, I conducted a Hausman test and a Breusch-Pagan Lagrange Multiplier test (BPLM). The Hausman test resulted in a p value of .727 for the ΔESGRate regression and a .681 for the specific CSR regression. Thus, we fail to reject the null hypothesis. This means that the Random Effects model is better than the Fixed Effects model for this data. However, after running the Breusch-Pagan Lagrange Multiplier test for both the ESG and other CSR ratings regression, I did not get any significant results. Subsequently, there is no evidence to suggest a significant unobserved difference between the companies that would affect stock performance and the simple OLS model is best suited for this dataset overall.

Multiple Day Model

Per Table 5, ΔESGRate and ΔSORate were both found to be statistically important in positively affecting stock performance, while CSREvent, ΔEnvRate, and ΔCGRate showed no evidence of a relationship with stock prices over the course of multiple days. One could say a one percent increase in ESG or social CSR ratings can increase a firm's stock price by .028 or .015 percent respectively. However, a change in the other CSR ratings, CSREvent, ΔEnvRate, and ΔCGRate, would have no substantial

positive or negative affect. Furthermore, the results of CSREvent also indicate that there is an insignificant difference between stock prices depending on when CSR ratings are announced. Therefore, my hypothesis for the variable CSREvent was not supported by the results and announcement of CSR days have zero effect on stock performance.

Comparing the Ordinary Least Squares, Fixed-Effects, and Random-Effects model, there is no substantial difference between all three models' results, however the ΔEnvRate again is almost doubled from the OLS model to the FE model. I conducted yet another Hausman and Breusch-Pagan Lagrange Multiplier test (BPLM) for both the ESG and specific CSR ratings regression model and found that both resulted in very large nonsignificant values. Consequently, the OLS is also the best model for the Multiple Day Model dataset.

**IV b. Robustness Checks and Analysis**

For the OLS regressions, I conducted various tests to check for misspecification problems, multicollinearity issues, and heteroskedasticity to ensure my results were dependable. I conducted a Ramsey Reset test for misspecification, followed by a variance inflation factor check for multicollinearity, several tests on heteroskedasticity, including the white test and the Breusch-Pagan Cook Weisberg test, as well as an analysis of residuals for non-normality. The Ramsey Reset test is a general misspecification test for linear models that checks to see if the model would benefit from nonlinear combinations of the explanatory variables. Misspecification of the model leads to omitted variable bias that causes endogeneity and biased coefficient estimates. The variance inflation factor (VIF) not only determines the level of multicollinearity in an OLS regression but also tells us how much of a model's variance is increased due to collinearity. To check

heteroskedasticity, I not only conducted a white test on both OLS models but also used the Breusch-Pagan Cook Weisberg test for heteroskedasticity for clearer results. Finally, I predicted the residuals of the models and graphed them on a scatter plot and histogram to determine its normality.

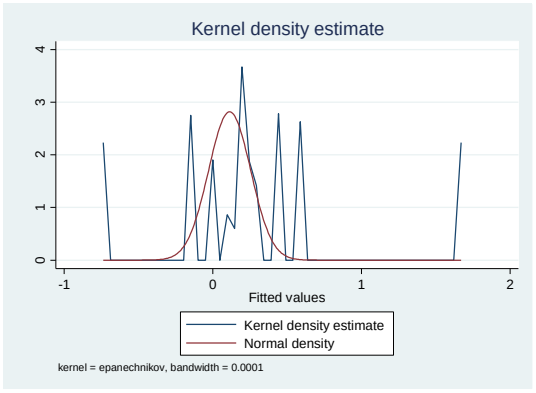
One Day Model

Both the Ramsey Reset test and VIF resulted in inconsequential values. This means that the model did not have substantial omitted variable bias and additionally, there was also no evidence of multicollinearity between the variables. A variance factor greater than or equal to 5 is indicative of imperfect multicollinearity but the One Day Model's highest VIF value was only 1.02 for ΔESGRate. Although the One Day Model's coefficients are already very small values, imperfect multicollinearity can generally lower the t statistics of a model as well as give insignificant coefficients.

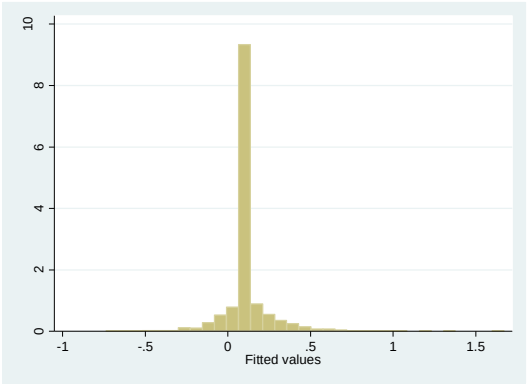
Heteroskedasticity is where the variability of the variances around the regression line is not constant. This breaks a fundamental assumption of OLS regressions and gives inaccurate results such as low standard errors. The low standard errors in turn lead to unreliable confidence intervals and hypotheses tests. Accordingly, it is very important to check for heteroskedasticity and fix it. Fortunately, the outcomes for both the white test and the Breusch-Pagan Cook Weisberg test were insignificant, signifying that our test statistics and confidence intervals are in fact trustworthy.

*Figure 1. Normality Plots for One Day Model*

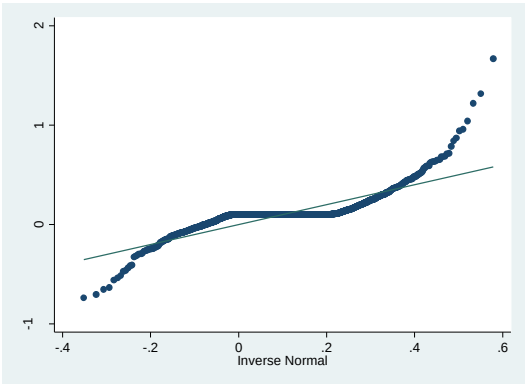
A.



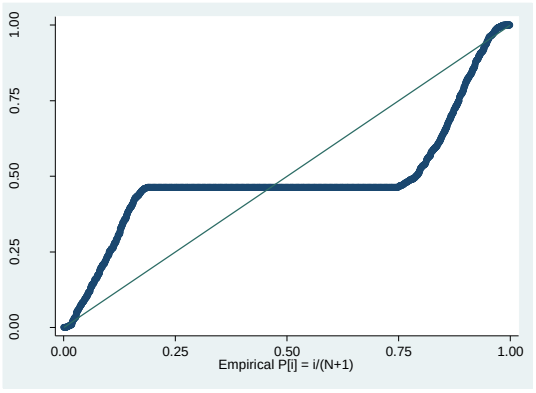

B.




C.




D.




Above are the normality plots for the One Day model derived from the aggregate data's residuals. As one can see, the data for the One Day model is not normal. The kernel density plot (Figure 1A) and histogram (Figure 1B) show that we have very inconsistent occurrences of data as well as a lot of zero values that are skewing the graph upward in the center. On our residuals vs inverse-normal graph (Figure 1C), the tails of the data also diverge from normality even when much of the middle range of our data is relatively following the normal line. In figure 1D, we also see that the multitude of zeroes in the data have caused the middle to be rather flat. Accordingly, when I conduct the Shapiro-Wilk test for normality, I get a significant p-value of .000 that states the data is very obviously not normal. Although the residuals for the One Day Model is not normal, it is no cause for worry and the results of the OLS regression should still be trustworthy.

The data set is very large and with a sample size of a hundred companies over the span of ten years, it is acceptable that the residuals might not be very normal.

Multiple Day Model

Like the One Day model, the Ramsey Reset test and VIF test for the Multiple Day model also resulted in insignificant values, denoting that the model did not have considerable omitted variable bias or imperfect multicollinearity present. Although the white test resulted in insignificant evidence for heteroskedasticity in the ESG regression, the Breusch-Pagan Cook Weisberg test returned positive for heteroskedasticity with a p value of .002. This difference could be caused by the fact that the Breusch-Pagan test checks for a linear form of heteroskedasticity while the white test checks for more types of heteroskedasticity and examines the nonlinear effects on the variances as well. Consequently, to be sure I had the most accurate results, I performed a robust OLS regression on the ESG ratings. The results of the simple and robust OLS regressions are shown together on the table below.

*Table 7. Summary of Regression Results for the Multiple Day ESG Rating Model*

| **Variable** | **OLS** | | | **Robust OLS** | | |
|---|---|---|---|---|---|---|
| | *Coefficient* | *P-value* | *Std. Err.* | *Coefficient* | *P-value* | *Std. Err.* |
| ΔESGRate | .028 | .019* | .012 | .028 | .005* | .010 |
| CSREvent | .089 | .371 | .099 | .089 | .366 | .098 |
| Constant | .276 | .000 | .069 | .276 | .001 | .081 |
| Observations | 1,912 | | | 1,912 | | |
| $R^2$ | .004 | | | .004 | | |

*Significant at the 95% confidence level

The outcome of the robust OLS was an even more significant ΔESGRate p value of .005, with higher standard errors on the constant, and virtually the same results for

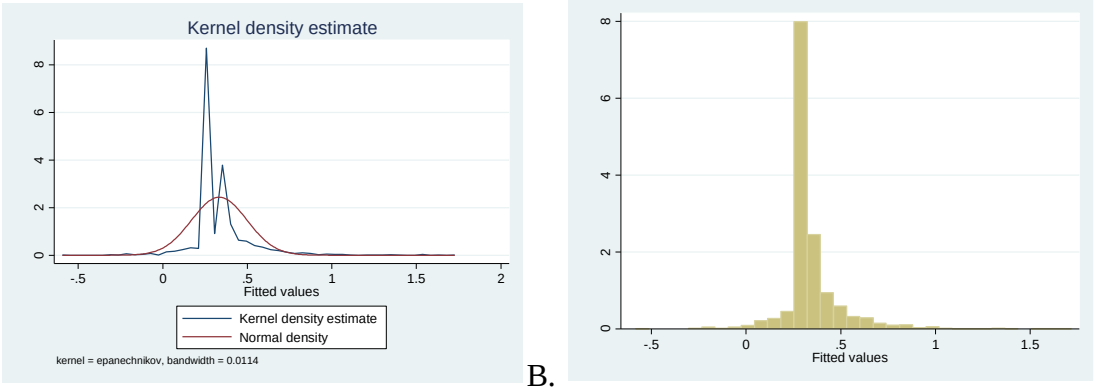
everything else in the model. This does not change our previous interpretation of the effects of ESG ratings on stock performance because the coefficient of ΔESGRate ultimately stayed the same, despite the p value decreasing.

For the regression that includes the more specific CSR ratings, the white test and the Breusch-Pagan Cook Weisberg test both confirmed trivial results in support for homoskedasticity in the system. Therefore, our results for the specific CSR ratings are ultimately trustworthy and there is no need for a robust regression.

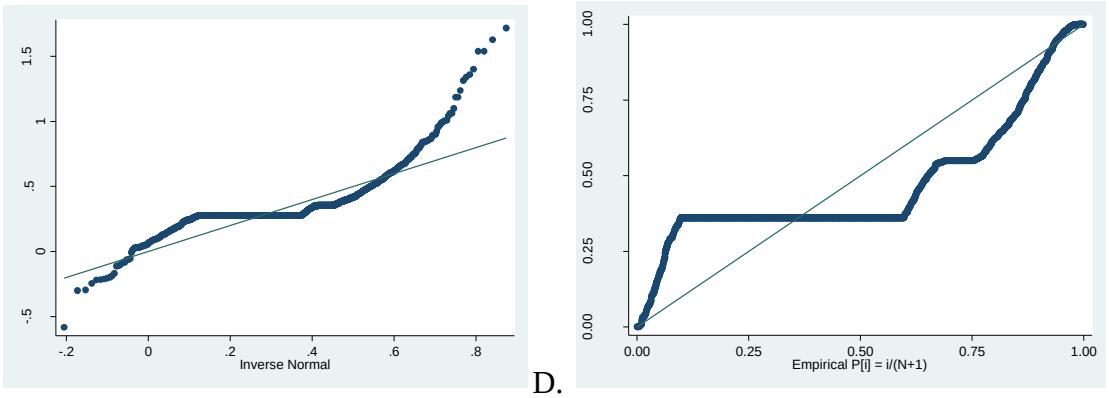
Below are the normality plots for the Multiple Day model. Much like the One Day model normality plots, the data for this model is also not normal.

*Figure 2. Normality Plots for Multiple Day Model*

A. B.




C. D.




The kernel density plot (Figure 2A) and histogram (Figure 2B) again show that the data has a lot of zero values in the center. Additionally, our residuals vs inverse-

normal graph (Figure 2C) shows that the tails of the data does not follow the normal line and the data is not very linear. As shown by the normal vs empirical graph (Figure 2D), the data is even more divergent from normality in the middle range of the data due to the multitude of zero values. Because the Multiple Day model is less normal than the One Day model and heteroskedastic tests can be sensitive to non-normality, this could be a reason why the results of the Multiple Day model is more conflicting than the One Day model. Finally, as expected, the Shapiro-Wilk test for normality also results in momentous evidence for non-normality of the data.

**IV b. Limitations**

Although the results provided significant evidence for a relationship between certain corporate social responsibility ratings and stock prices, the R-squared of both the One Day and the Multiple Day model was extremely low, from .002 to .006 depending on the regression models. This indicates that the regression models are not a good fit for the data, and thus lessens the significance of our results. If I had more time to conduct the study, it would have been beneficial for me to collect more explanatory variables to include in the models to help potentially increase the R-squared value.

Another limitation of this research is the base assumption of perfect information of stakeholders. In the One Day model, stakeholders are only given a single day to respond to a ratings announcement. Realistically speaking, there could be many stakeholders who do not get the information quickly enough to respond in the allotted amount of time. It could also be the case that Thomas Reuter's CSR ratings is not released everywhere for investors to easily inform themselves about the current state of CSR performance. I attempt to correct for this with the inclusion of the Multiple Day

model so that stockholders will get a longer amount of time to respond, but this still assumes that they have access to the CSR ratings announcement and can respond to it in a timely manner of one to four days. In addition, the more time I provide for stockholders to respond to CSR ratings, the more time other events can influence stock performance. Although I created the variable "days" to account for that difference, dividing the percent difference in stock prices by the "days" variable is still not a perfect solution to the problem. Instead of getting the exact change in stocks due to CSR ratings announcement, the resulting value is instead an approximate average change around the target date.

It is also possible that stock prices may not be the best indicator for financial performance in terms of gauging a reaction to corporate social responsibility. Shareholders who own stocks in the company may be represented and their reactions to CSR ratings can be characterized by the changes in prices. However, stakeholders that are not shareholders, including employees who do not own any stocks, are not represented. This means that although our stock price variable will help represent certain stakeholders, it does not include the sentiments of all stakeholders. Thus, stakeholders who cannot voice their disapproval or approval of CSR performance is not accounted for in our study and this could give us a less significant CSR-CFP link.

To improve on this study, it is imperative that the number of companies included is increased and the time period is lengthened in order to obtain a better picture of the CSR-CFP link. More explanatory variables should also be added into the models, including different CSR ratings that may be more accessible to stakeholders, in order to help increase the fit of our data and the R-squared value. Although our analysis test concluded that there are no unaccounted for firm specific characteristics, it would also be

interesting to include dummy variables to separate firms based on industry. In that way, we would also be able to determine which CSR rating is most valued by which industry. The span of days between the before and after collection of stock prices should also be extended and examined day by day to account for the lack of perfect information. Last but not least, other proxies for financial performance should also be added to gauge the influence of CSR ratings to include the full range of stakeholders.

## V. Conclusion

Between the One Day model and the Multiple Day model, there was significant results for ESG, environmental, and social CSR ratings. In contrast, corporate governance and the announcement of ratings (CSREvent) made no difference to financial performance. As the ESG category is a composite score of environmental, social, and corporate governance, the importance of environmental and social ratings help explain the significance of ESG ratings in the regression models. The insignificance of CSREvent also makes intuitive sense as the mere announcement of CSR ratings would not necessarily increase or decrease a stock price significantly but rather the ratings of CSR themselves would be significant. Overall between the two models, one could conclude that stakeholders hold environmental and social issues, i.e. gas emissions and human rights, as greater concerns in a company than how the company itself functions, i.e. corporate governance policies. The media's choice of vigilant coverage on social and environmental issues could also be an explanation for this result as well as people being increasingly motivated to respond to ethical issues regarding environmental and social abuses over management problems.

Some possible implications of this positive CSR-CFP relationship might be that companies should proceed to concentrate their investments into improving CSR policies and public image to increased stock performance. Evidently, this research shows that stakeholders care about CSR in firms and will invest accordingly. Specifically, firms should aim to improve the environmental and social aspects of their corporate social responsibility policies as it will benefit them the most.

Although the results of this study concluded that certain areas of corporate social responsibility were significant to influencing stock performance positively, the data did not fit the regression model as well as it should have. Therefore, there must be more research done to support the stakeholder theory. In addition, with 59% of studies on the CSR-CFP link revealing a non-significant relationship, there is a lot more opportunities for research to be done in this field of corporate governance (Margolis et al., 2009).

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## Appendices

One Day Model

Appendix A

| Source | SS | df | MS | Number of obs | = | 1,619 |
|---|---|---|---|---|---|---|
| | | | | F(2, 1616) | = | 1.80 |
| Model | 14.9244341 | 2 | 7.46221704 | Prob > F | = | 0.1654 |
| Residual | 6693.4486 | 1,616 | 4.14198552 | R-squared | = | 0.0022 |
| | | | | Adj R-squared | = | 0.0010 |
| Total | 6708.37304 | 1,618 | 4.14608964 | Root MSE | = | 2.0352 |

| spone | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ΔESGRate | .0199577 | .0120322 | 1.66 | 0.097 | -.0036428 | .0435581 |
| csrevent | .0721379 | .1021529 | 0.71 | 0.480 | -.1282281 | .2725039 |
| _cons | .0676903 | .073727 | 0.92 | 0.359 | -.0769204 | .2123009 |

Above is the Ordinary Least Squares regression with the inclusion of the ESG rating for the One Day model.

Appendix B

```
Ramsey RESET test using powers of the fitted values of spone
       Ho:  model has no omitted variables
                 F(3, 1613) =      1.36
                   Prob > F =      0.2539
```

Above is the Ramsey Reset test for the ESG regression for the One Day Model.

Appendix C

| Variable | VIF | 1/VIF |
|---|---|---|
| csrevent | 1.02 | 0.984053 |
| ΔESGRate | 1.02 | 0.984053 |
| Mean VIF | 1.02 | |

Above is the test for multicollinearity for the ESG regression for the One Day Model.

## Appendix D

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(3)      =      0.75
         Prob > chi2  =    0.8610

Cameron & Trivedi's decomposition of IM-test
```

| Source | chi2 | df | p |
|---|---|---|---|
| Heteroskedasticity | 0.75 | 3 | 0.8610 |
| Skewness | 3.43 | 2 | 0.1803 |
| Kurtosis | 1.52 | 1 | 0.2178 |
| Total | 5.70 | 6 | 0.4581 |

Above is the white test for heteroskedasticity for the ESG regression for the One Day Model.

## Appendix E

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of spone

         chi2(1)      =     2.06
         Prob > chi2  =   0.1514
```

Above is the BPCW test for heteroskedasticity for the ESG regression for the One Day Model.

## Appendix F

| Source | SS | df | MS | Number of obs | = | 1,619 |
|---|---|---|---|---|---|---|
| | | | | F(3, 1615) | = | 2.78 |
| Model | 34.4859475 | 3 | 11.4953158 | Prob > F | = | 0.0397 |
| Residual | 6673.88709 | 1,615 | 4.13243783 | R-squared | = | 0.0051 |
| | | | | Adj R-squared | = | 0.0033 |
| Total | 6708.37304 | 1,618 | 4.14608964 | Root MSE | = | 2.0328 |

| spone | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ΔEnvRate | .0147932 | .0066439 | 2.23 | 0.026 | .0017616 | .0278247 |
| ΔSORate | .0077284 | .0056503 | 1.37 | 0.172 | -.0033543 | .018811 |
| ΔCGRate | -.0106572 | .0079235 | -1.35 | 0.179 | -.0261986 | .0048841 |
| _cons | .1002435 | .0513108 | 1.95 | 0.051 | -.0003993 | .2008863 |

Above is the OLS regression of the other CSR ratings for the One Day Model.

Appendix G

```
Ramsey RESET test using powers of the fitted values of spone
       Ho:  model has no omitted variables
                 F(3, 1612) =      0.42
                   Prob > F =      0.7396
```

Above is the Reset test for the specific CSR ratings regression for the One Day Model.

Appendix H

| Variable | VIF | 1/VIF |
|---|---|---|
| ΔCGRate | 1.00 | 0.995871 |
| ΔEnvRate | 1.00 | 0.997141 |
| ΔSORate | 1.00 | 0.997840 |
| Mean VIF | 1.00 | |

Above is the VIF test for the specific CSR ratings regression for the One Day Model.

Appendix I

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(9)      =      4.64
         Prob > chi2  =    0.8645

Cameron & Trivedi's decomposition of IM-test
```

| Source | chi2 | df | p |
|---|---|---|---|
| Heteroskedasticity | 4.64 | 9 | 0.8645 |
| Skewness | 1.32 | 3 | 0.7239 |
| Kurtosis | 1.50 | 1 | 0.2205 |
| Total | 7.46 | 13 | 0.8767 |

Above is the white test for the specific CSR ratings regression for the One Day Model.

Appendix J

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of spone

         chi2(1)      =     3.43
         Prob > chi2  =   0.0641
```

Above is the BPCW test for the specific CSR ratings regression for the One Day Model.

Appendix K

Shapiro-Wilk W test for normal data

| Variable | Obs | W | V | z | Prob>z |
|---|---|---|---|---|---|
| r | 2,000 | 0.74162 | 306.442 | 14.563 | 0.00000 |

Above is the Shapiro-Wilk normality test for the specific CSR ratings regression for the One Day Model.

Multiple Day Model

Appendix L

| Source | SS | df | MS | Number of obs | = | 1,912 |
|---|---|---|---|---|---|---|
| | | | | F(2, 1909) | = | 3.46 |
| Model | 32.0223513 | 2 | 16.0111756 | Prob > F | = | 0.0317 |
| Residual | 8837.54766 | 1,909 | 4.62941208 | R-squared | = | 0.0036 |
| | | | | Adj R-squared | = | 0.0026 |
| Total | 8869.57001 | 1,911 | 4.64132392 | Root MSE | = | 2.1516 |

| spdays | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ΔESGRate | .0281583 | .0120329 | 2.34 | 0.019 | .0045593 | .0517574 |
| csrevent | .0887389 | .0992109 | 0.89 | 0.371 | -.1058343 | .2833121 |
| _cons | .2759686 | .0696244 | 3.96 | 0.000 | .1394208 | .4125164 |

Above is the OLS regression with ESG ratings included for the Multiple Day Model.

Appendix M

```
Ramsey RESET test using powers of the fitted values of spdays
       Ho:  model has no omitted variables
                 F(3, 1906) =      1.07
                   Prob > F =      0.3620
```

Above is the Ramsey Reset test with ESG for the Multiple Day Model.

Appendix N

| Variable | VIF | 1/VIF |
|---|---|---|
| csrevent | 1.02 | 0.983965 |
| ΔESGRate | 1.02 | 0.983965 |
| Mean VIF | 1.02 | |

Above is the multicollinearity test with ESG for the Multiple Day Model.

Appendix O

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(3)      =      4.50
         Prob > chi2  =    0.2124

Cameron & Trivedi's decomposition of IM-test
```

| Source | chi2 | df | p |
|---|---|---|---|
| Heteroskedasticity | 4.50 | 3 | 0.2124 |
| Skewness | 3.39 | 2 | 0.1834 |
| Kurtosis | 2.50 | 1 | 0.1137 |
| Total | 10.39 | 6 | 0.1091 |

Above is the white test with ESG for the Multiple Day Model.

## Appendix P

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of spdays

         chi2(1)      =     9.18
         Prob > chi2  =   0.0024
```

Above is the BPCW test with ESG for the Multiple Day Model.

## Appendix R

```
Linear regression                               Number of obs     =      1,912
                                                F(2, 1909)        =       4.40
                                                Prob > F          =     0.0123
                                                R-squared         =     0.0036
                                                Root MSE          =     2.1516
```

| spdays | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ΔESGRate | .0281583 | .0100558 | 2.80 | 0.005 | .0084368 | .0478799 |
| csrevent | .0887389 | .0981848 | 0.90 | 0.366 | -.1038218 | .2812996 |
| _cons | .2759686 | .0806812 | 3.42 | 0.001 | .117736 | .4342011 |

Above is the Robust OLS regression with ESG for the Multiple Day Model.

Appendix S

| Source | SS | df | MS | Number of obs | = | 1,912 |
|---|---|---|---|---|---|---|
| | | | | F(3, 1908) | = | 3.69 |
| Model | 51.1461316 | 3 | 17.0487105 | Prob > F | = | 0.0115 |
| Residual | 8818.42388 | 1,908 | 4.62181545 | R-squared | = | 0.0058 |
| | | | | Adj R-squared | = | 0.0042 |
| Total | 8869.57001 | 1,911 | 4.64132392 | Root MSE | = | 2.1498 |

| spdays | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ΔEnvRate | .0100173 | .0066742 | 1.50 | 0.134 | -.0030721 | .0231067 |
| ΔSORate | .0153352 | .005634 | 2.72 | 0.007 | .0042858 | .0263846 |
| csrevent | .0781969 | .0994628 | 0.79 | 0.432 | -.1168704 | .2732642 |
| _cons | .2759686 | .0695672 | 3.97 | 0.000 | .1395328 | .4124044 |

Above is the OLS regressions with specific CSR ratings included for the Multiple Day Model.

Appendix T

```
Ramsey RESET test using powers of the fitted values of spdays
       Ho:  model has no omitted variables
                 F(3, 1905) =      0.90
                   Prob > F =      0.4412
```

Above is the Ramsey Reset test with specific CSR ratings for the Multiple Day Model.

Appendix U

| Variable | VIF | 1/VIF |
|---|---|---|
| csrevent | 1.02 | 0.977380 |
| ΔEnvRate | 1.02 | 0.983166 |
| ΔSORate | 1.01 | 0.994065 |
| Mean VIF | 1.02 | |

Above is the VIF test with specific CSR ratings for the Multiple Day Model.

## Appendix V

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(6)      =      5.34
         Prob > chi2  =    0.5015

Cameron & Trivedi's decomposition of IM-test
```

| Source | chi2 | df | p |
|---|---|---|---|
| Heteroskedasticity | 5.34 | 6 | 0.5015 |
| Skewness | 3.37 | 3 | 0.3380 |
| Kurtosis | 2.50 | 1 | 0.1142 |
| Total | 11.20 | 10 | 0.3420 |

Above is the white test with specific CSR ratings for the Multiple Day Model.

## Appendix W

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of spdays

         chi2(1)      =     0.02
         Prob > chi2  =   0.8790
```

Above is the BPCW test with specific CSR ratings for the Multiple Day Model.

## Appendix X

Shapiro-Wilk W test for normal data

| Variable | Obs | W | V | z | Prob>z |
|---|---|---|---|---|---|
| r | 2,000 | 0.77167 | 270.799 | 14.249 | 0.00000 |

Above is the Shapiro Wilk normality test with specific CSR ratings for the Multiple Day Model.