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Bigger, better, bolder: stock price consequences on charitable giving after the Deepwater Horizon oil spill

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Abstract

This case study focuses on the explosion of Deepwater Horizon on April 20, 2010 and the effects of stock price reactions around this event on the (types of) donations made to charity by the American oil industry. Charity is divided into two categories: donations made by corporations and the number of charity types a firm supports, which are independent of each other. Using data from WRDS, regressions are made for each of the two charity measures on high absolute CAR (cumulative abnormal return) – a proxy for stock returns – combined with a dummy that represents the period after the Deepwater Horizon oil spill. The results show that relative stock price reactions around the Deepwater Horizon oil spill are negative. Also, a significant positive difference in the means of CAR was found in the favour of firms that do not donate in comparison with firms that do donate. Furthermore, the difference in donation before and after the oil spill is significantly negative for charity donation but significantly positive for types of charity. Finally, the results show a significant negative effect of absolute stock price reactions on types of charity yet is trivial for charity donations made by the oil industry.

Keywords: charity donation, CAR, Deepwater Horizon, CSR

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Section I: Introduction

April 20, 2010. An explosion in Macondo prospect, caused by a blow-out, led to a leak of millions of tons into the Gulf of Mexico. Not only was there environmental damage, also eleven people died, and seventeen people were found wounded directly after the explosion. The Gulf Coast States (Alabama, Florida, Louisiana and Mississippi) proclaimed a state of emergency: after the explosion, 600,000 litres to 9.5 million litres of oil leaked into the ocean each day (Deepwater Horizon: Oil Spill Prevention and Response Measures, and National Resource Impacts, 2010). This kept going until two months after the incident, caused by a not functioning BOP (blowout preventer) (Pallardy, 2018). At this point, former president Barack Obama called this a national disaster. The oil impaired the ecosystem of the Gulf of Mexico and people were afraid that land would be affected too. Also, because of fire hazard, the production of two other platforms was shut down and it was not until February 2011 that new drilling allowances were issued again. Finally, the total damage BP had to pay was estimated at 53.8 billion dollars, of which 18.7 billion was assigned to settlements (Wade & Hays, 2015), which is a new record of these kinds of payments.

According to Smith Jr., Smith and Ashcroft (2011), three reasons why this incident could have happened in such a way are a) mistakes made by humans and equipment deficiency at the drilling platform, b) deterioration of the United States government to help the restriction of the spilled oil and failure of assistance for the resources used for it, and c) the wrongful distribution of information on the size and location of the oil spill by the media. Today's world is a world where we must have everything bigger, better and bolder, emerging in colossal investments and phenomenal attempts to match demand and supply within the oil industry. It goes without saying the oil industry faces challenges, not only construction-wise, but also ethically, financially and intelligently. Once an oil drilling process is perceived as successful, it may gain large compensation but is traded off with at least an equal large exposure. 'High risk yields high return' does not always occur, especially in the oil industry.

It is common knowledge that the oil industry is not known for its care for the environment. Though the environment is a popular discussion these days, concerning climate change resulting in the meltdown of glaciers, global warming and ozone depletion, the oil industry does not seem to implement significant changes related to this topic. The upswing of CSR (corporate social responsibility) might change this view. More and more companies brag to handle their affairs CSR-wise to help both the company and society and are thereby perceived to thrive by using CSR, or: are doing well by doing good (Basil, Runte, Easwaramoorthy and Barr, 2009; Falck and Heblich, 2007). As for reasons stated above, the Deepwater Horizon oil spill may be called a disaster, resulting in brand damage of the concerned companies and the obligation of facing the reality to make up for this catastrophe. The least the companies in the oil industry can do is making sure that their future strategy becomes more focused on sustaining the

environment and guaranteeing the safety of their employees. The Deepwater Horizon oil spill is only one of the recent business scandals that heightened the interest in businesses' ethics, their standards and CSR in combination with their general activities as well as the outing of their marketing strategy. Corporate marketing is proposedly one of the solutions to help rebuilding the damaged brand. This type of marketing focuses on an ethical aspect containing CSR, as the major components are value creation (maximize profit is one but not the only target), co-ordinated organizational activities (stakeholder's wants, needs and behaviours must be supported) and, last but certainly not least, today's and future stakeholder and societal needs (joint of current needs with the organizational inheritance) (Balmer, 2001). Doing well by doing good can be achieved by CSR and one of these CSR activities in particular: charitable giving. In the remainder of this paper, we dive into charitable giving and how this can help the oil industry after the Deepwater Horizon oil spill. For example, erratic companies can perceive a better brand image after publicly donating to charity (Dean, 2004), making the decision of charity donation logical for the oil industry after being involved in such a disaster. Furthermore, donating to charity is recognized as one of the factors that increases a firm's intrinsic value (Peloza and Shang, 2011) and can be seen as a type of investment (Zhang, Rezaee and Zhu, 2010).

In this research, an event study is performed regarding the Deepwater Horizon disaster, the oil rig on the Macondo prospect that exploded on April 20, 2010. The purpose of this research is to examine the consequences of economic damage of the Deepwater Horizon oil spill in two ways: first, the cumulative abnormal returns around the event and second, the change in charitable giving after the disaster. Where previous research solely investigates the influence of firm financials such as profitability and ROA (return on assets) on charitable giving (Seifert, Morris and Bartkus, 2003; Amato and Amato, 2007; Zhang, Rezaee and Zhu, 2010), none of those papers use stock price reaction as an independent variable. In those papers, the main finding is the positive influence of firm financials on charitable giving. Furthermore, the factors that influence charitable giving are determined in general, not after a specific event. Though when the papers contain a specific event, such as a natural disaster or the 9/11 terrorist attack (see Crampton and Patten, 2007; Muller and Whiteman, 2009; Tilcsik and Marquis, 2013; Zhang, Rezaee and Zhu, 2010), still no use of stock price reaction is made. A different view on charitable giving proposes the increase of donations when reputation of the firm is damaged (Dean, 2004; Basil, Runte, Easwaramoorthy and Barr, 2009; Peloza and Shang, 2011). This means there is a good (firm financials) and bad (reputational damage) influence in the determination of donations made to charity. In that case, absolute stock price reactions justify both the positive and negative responses. Including the absolute stock price reaction in linear regression models to estimate the impact on charity donation after the Deepwater Horizon oil spill is the way this research is conducted. This research thus adds to existing literature in combining both the event, the Deepwater Horizon oil spill of April 20, 2010, and stock price reaction around this event to estimate the impact on charitable giving after this event. The remainder of this paper is consequently established around the following research question:

To what extent do stock price reactions around the Deepwater Horizon oil spill have an impact on the donations made to charity by the American oil industry after this event?

The results show that stock price reactions around the Deepwater Horizon oil spill are significantly negative when using a timeframe one day before up until to one day after the event. Moreover, the results show a significant negative difference in charity donation and a positive significant difference in charity types before and after 2010. Also, a significant difference in the means of CAR between does donate and does not donate in the favour of does not donate was found. Furthermore, the absolute stock price reactions which are high around the Deepwater Horizon oil spill have a significant negative impact on charitable giving after this event, measured by charity types. Charitable giving then has a higher chance to decrease with high stock price reactions around the Deepwater Horizon oil spill. Though this event probably is not the only determinant of charitable giving, it might have played a role in the past and may play a role in future decisions concerning donation.

The remainder of this paper is constructed as follows. In Section II, an overview of the Deepwater Horizon oil spill is given, presenting the history and cause, followed by the impact of the disaster on the environment, economy and stakeholders, and continued with more information on CSR and charitable giving. Section III and IV show the data and methodology used to conduct this research, whereas the results of it are discussed in Section V. The conclusion of this research and suggestions for further analysis are provided in the last section, Section VI.

Section II: Theoretical framework

2.1 History and Cause

How could this disaster have happened? Let us start at the very beginning: the foundation of Deepwater Horizon. In the interest of researching the geologic formations related to hydrocarbon reservoirs and finding hydrocarbon production possibilities, the Macondo well was created. For the creation of a well, a drilling platform was necessary, which led to the production of Deepwater Horizon. The lease used to build the drilling rig was valid for ten years and started in 2008. Ownership of the drilling platform is with Transocean and is leased to three companies of which British Petroleum (BP) is the largest, owning 65%. The other two companies, Anadarko Petroleum and MOEX Offshore, own 25% and 10% respectively (Wassel, 2012). Since BP functions as the management company, it is their responsibility to complete operations.

These operations include the drilling of oil out of the offshore well, while facing different complications. The first complication Wassel (2012) points out is the assurance of the employees' safety. Second, so called kicks must be captivated, or an explosion of the well is likely. The drilling causes pressure onto the geological systems, resulting in a flow of hydrocarbons or saline water into the pore area of rocks (pore pressure), where a counterpressure must be exerted by drilling mud into the wellbore. In the case of a difference in pressure, where the pore pressure is higher than the counterpressure, a 'kick' may appear. A kick is the occurrence of fluids flowing into the wellbore, too low counterweight will then cause the flow of hydrocarbon into the well which will then be followed by an explosion (kick, n.d.). The deeper the drilling, the higher the pore pressure will be, and a higher mud weight is necessary to prevent the platform from blowing out, or the chance of a kick is getting higher (Zoback, 2010). Now, a system called a BOP (blowout preventer) exists, used to check the accidental flow of hydrocarbons on areas behind the primary barriers. The BOP should warn personnel when hydrocarbons are flowing into areas they should not, preventing a kick and thereby a blowout.

When a high pressure difference on the Macondo prospect was found, another way to perform counterpressure was operated, as the mud on its own was not enough. Using two kinds of cement, foamed and unfoamed, it was tried to decrease the pressure difference. However, since these cements were so different from each other, it did not have the intended effect and instead left a tail of slurry with foamed cement instead of unfoamed cement (National Academy of Engineering and National Research Council, 2012). Furthermore, when the Deepwater Horizon personnel was testing the effect of the cement, they interpreted the results of the operation being effective, and they continued the drilling process. This then caused the flow of hydrocarbons into the well, which was not observed until it was too late: only ten minutes later the Deepwater Horizon exploded and left a giant fire that lasted for two

days. At the time of the blowout, the BOP was not functioning properly and could not warn personnel on the platform (Wassel 2012).

2.2 Impact

Of course, there is a reason this event is called a disaster. In the following section, a closer look is taken at the consequences of the Deepwater Horizon oil spill. First, the environmental impact is discussed, followed by economic and reputational impact and finished with stakeholder impact.

2.2.1 Environmental impact

After the explosion, the leaking oil is estimated at rates of 600,000 litres to 9.5 million litres *each day* (Deepwater Horizon: Oil Spill Prevention and Response Measures, and National Resource Impacts, 2010). While BP tried to control the leak, efforts in capturing the oil with an enormous containment dome have failed, so have multiple attempts with an injection of dispersants, a smaller containment dome and a junk shot (waste material used to block the BOP). A solution that could work is the drilling of a relief well, which may take up to three months to be drilled (BP, 2010). In the meantime, the oil kept flowing through the ocean and to the shores, damaging the wildlife living in and on the shores of the Gulf of Mexico. This led to eight National Parks and four Wildlife Refuges being at immediate risk (U.S. Department of the Interior, n.d.). Also, U.S. Fish and Wildlife Service (2010) reported oiled waste had to be removed from valuable areas of the Gulf Coast states, adding up to almost 500,000 kilograms of oiled waste. On the contrary, Hu et al. (2011) find that the ocean is actually cleaner in a north-east area containing 11,000 km^2 of the Gulf of Mexico during August 2010, (nearly a month after the leak was blocked), compared to any year since 2002 at the same time of year.

2.2.2 Economic and reputational impact for the oil industry

The economic impact has different factors: settlements and stock prices, but also local economy including fishing industry and tourism. While the first two are discussed in this section - reputational impact - the latter two are presented in Section 2.2.3, as the local economy is a stakeholder instead of a part of the oil industry. This section thus focuses on the economic and reputational impact for the oil industry on its own.

It is expensive and hard to remove spilled oil from ecosystems, therefore estimating the impact of the disaster is relevant, trying to prevent this from happening again. The total damage BP was accountable for has been estimated at 53.8 billion dollars, of which 18.7 billion was assigned to settlements (Wade & Hays, 2015). This is a new record for these kinds of payments. Furthermore, stakeholders need to be noticed about casualties facing both BP and BP's external parties, since BP is a publicly traded company.

As stock prices are known to face a negative drift after bad news (Chan, 2003; Frazzini, 2006; Kothari, Shu and Wysocki, 2009; Ng, Tuna and Verdi, 2013), it is useful to see the impact of the Deepwater Horizon oil spill on the stock prices of the oil industry. Followed by the event, the stock price of BP decreased drastically over the following two months, starting around $60 per share at mid-April 2010, decreasing to just $30 in the third week of June (British Petroleum, 2018). Needless to say, BP's brand has been hugely damaged by this event. Not only BP was influenced by this shock, the whole oil and gas industry faced a decrease in stock prices[1] followed by new regulations of the American government: no additional drilling platforms are allowed to be built in the next two years. The spill may have been 'caused' primarily by BP, this does not mean the other companies in the oil industry did not suffer from it, which will be tested in the first hypothesis.

Hypothesis 1: *The stock price reaction of the whole American oil industry is significantly negative around April 20, 2010.*

2.2.3 Economic and stakeholder impact

Of course, BP is not the only party that suffers economically from the oil spill. Local economies, including the fishing industry and tourism operators are victims as well. The Gulf of Mexico provides production of oysters, shrimp and other fish. The sales from the commercial fishing industry dropped by around 40%, or $4.36 billion, in 2010 compared to 2008 (Smith Jr., Smith and Ashcroft, 2010). This is a lot if one bears in mind that these waters account for 59% of United States' nationally harvested oysters and even 73% of its shrimp, as reported by National Marine Fisheries Service (Schmit, 2010). Furthermore, tourism in Florida usually generates a revenue of $65 billion (CNN Wire Staff, 2010), however the oil spill stopped people from going to the coast for sport fishing and resulted in the cancellation of holidays. As the president of the Mississippi Gulf Coast Tourism Commission proclaims in CNN, the appointments for future bookings have dropped to 20% of its usual size (loss of $3.80 billion, Smith Jr. et al.). As an alleviation, BP promised $15 million to Alabama, Louisiana and Mississippi, and $25 million to Florida to help the Gulf Coast States attract tourists again. Part of the decrease in tourism is fed by false information in the media: it is declared beaches are full of oil and therefore closed, yet the truth is all beaches are open for the public (CNN Wire Staff, 2010). Apart from the low crowd of tourists, purchase prices of fish increased by over 40% compared to last year, a large amount for the restaurants settled at the coastal area (CNN Wire Staff, 2010). Furthermore, real estate prices dropped (loss of $4.32 billion, Smith Jr. et al.), which may also be owed to the maldistribution of information.

[1] S&P Global Oil index of 1982.91 on April 16, 2010 compared to 1611.98 on June 30. Source: https://us.spindices.com/indices/equity/sp-global-oil-index.

2.3 Corporate marketing

The Deepwater Horizon oil spill is solely one of the recent business scandals that heightened the interest in businesses' ethics, their standards and CSR (corporate social responsibility) in combination with their general activities as well as the outing of their marketing strategy. Now, to rebuild the reputational damage on the company's brand, corporate marketing is proposedly one of the solutions. This type of marketing focuses on an ethical aspect containing CSR, as the major components are value creation (maximize profit is one but not the only target), co-ordinated organizational activities (stakeholder's wants, needs and behaviours must be supported) and, last but not certainly not least, today's and future stakeholder and societal needs (joint of current needs with the organizational inheritance) (Balmer, 2001). In Section 2.2 we have seen the impact of the oil spill on both the company itself and the stakeholders around it. Combine this impact with the corporate marketing strategy, the stakeholder and societal future needs, and see a possibility to carry out the impression one would want stakeholder and society to see: doing well by doing good, where a company is showing off its CSR activities that will help both the company and society (Falck and Heblich, 2007). In this paper, attention is paid to one of these CSR activities in particular: charitable giving.

2.3.1 Charitable giving

Charitable giving, as described by Investopedia (charitable donation, n.d.), is something that is given freely, often cash-based yet not limited to clothing, assets such as real estate, or even appreciated securities, to charities or non-profit companies by an individual or a business. Besides the tax advantages a company may achieve, another benefit from charitable giving is that an image is being created in which environmental and societal issues are evaluated as important for the company (Basil, Runte, Easwaramoorthy and Barr, 2009). Moreover, natural disasters can have a positive influence on corporate donations to charity (Muller and Whiteman, 2009; Tilcsik and Marquis, 2013; Zhang, Rezaee and Zhu, 2010) and so does the 9/11 terrorist attack, though it is only significantly positive in the short term and restrained by economic considerations in the long term (Crampton and Patten, 2007). Furthermore, Dean (2004) found that capricious companies, such as BP in this particular case, perceived a better public image after donations to charity, both conditionally and unconditionally. For this reason, it is a logical and strategic move of the oil industry to start donating or increase the sum donated to charity, to rebuild its damaged brand after the Deepwater Horizon oil spill in 2010. Hence, this will be tested in the second hypothesis:

Hypothesis 2: *Charity donations made by the American oil industry are significantly higher after 2010.*

It is now interesting to look at the way charity donations are made. Are they higher when the absolute return is higher? As previously mentioned, companies with a damaged image are more likely to give to

charity, whereas companies that are doing well are not significantly affected by the amount donated (Dean, 2004). However, firms with a large amount of cash available appear to donate more (Seifert, Morris and Bartkus, 2003). Increasing intrinsic value is another reason for donating to charity (Peloza and Shang, 2011). Companies with a damaged image usually face a low return on their stocks, whereas companies that are doing well may experience an increase in their stock price, and thus a higher return. Taking the absolute value of the stock returns, both up- and downward peaks will be covered by the absolute peak, or absolute high return. To see what happened to charity donations in the past, we look at charity donation before 2010. Following this reasoning we can use the absolute value of returns to estimate the effect of stock price reactions on charitable donations:

Hypothesis 3: *Absolute stock price reactions around the Deepwater Horizon oil spill in the American oil industry show a positive significant difference with firms that donated and did not donate in the past.*

According to Choi and Wang (2007), a firm's financial performance is lifted when the CEO is conscientious and philanthropic, accordingly more prone to increase trust in bonding between firm and stakeholders. This bonding can be expressed in a form of charity donation. Dunn (2004) even found a relationship between the philanthropic CEO and a professional donation programme. Moreover, small and large firms have a higher ratio of donation to total revenue compared with medium companies (Amato and Amato, 2007), which helps this research considering firms in the oil industry are big[2]. On the one hand, with the purpose of advocating continuous performance, Zhang, Rezaee and Zhu (2010) consider charitable giving as an investment: a positive relation exists between profitability, leading to higher expected stock returns, and donation. On the other hand, companies with a damaged brand and therefore lower predicted stock returns, can improve their image by making donations, but only if the motive is clearly genuine (Yoon, Gürhan-Canli and Schwarz, 2006). When consumers doubt the honesty of the activities, it may hurt the brand even more. Also, Brammer and Millington (2004) found a reverse in the determination of charitable giving: where first profits were an important factor in donation, now social reputation and stakeholder domination are determinant aspects. Having discussed both sides of the coin, the last hypothesis is as follows:

Hypothesis 4: *When absolute stock price reactions are high, charitable giving is higher after the Deepwater Horizon Oil spill.*

These four hypotheses are used to provide an answer to the research question. Though the existing literature does not provide a clear answer to charity donations after a corporate disaster, answers for the

[2] Seven out of the 25 largest companies in the world are operating in the oil industry. Source: https://www.forbes.com/pictures/edjl45efeik/the-worlds-top-25-companies/#2d2c8c2a4da2.

same question concerning natural disasters are found positive (Muller and Whiteman, 2009; Tilcsik and Marquis, 2013; Zhang, Rezaee and Zhu, 2010) with respect to the amount donated to charity. This paper adds to existing literature by investigating the influence of a corporate disaster, the Deepwater Horizon oil spill, on the relationship between stock price reaction and charitable giving. Where in recent literature a positive response to donation was found for firms with high profitability, other literature points out the negative response between damaged brand and corporate giving. Using absolute values of stock price reaction to encounter both the positive and negative peak as described before, the above determined hypotheses can be classified as supported or not supported.

Section III: Data

The data obtained refers to an event study: the Deepwater Horizon oil spill at April 20th, 2010. In order to investigate the influence of this event on charity donation, we look at cumulative abnormal returns as independent variable, charitable giving as dependent variable and size, ROA (return on assets) and leverage among others as control variables. For this research, the American oil industry is investigated by using SIC codes 1200-1399 and 2900-2999. In total 94 firms are investigated over the period 2006-2014. This section presents an overview of the main and control variables used for this research.

3.1 CAR

The CAR (cumulative abnormal return) is provided by WRDS (Wharton Research Data Services) and serves as a proxy for stock price reaction. To disclose any kind of relationship between the event and the stock return, analysis of the stock price evolution happens around the event date, in this case April 20, 2010. If we take timeframe (K, L), we combine the abnormal returns AR_t to arrive at the following formula (Van der Sar, 2015):

$$CAR_{KL} = \sum_{t=K}^{L}(\frac{1}{N}\sum_{i=1}^{N} ar_{it}) = \sum_{t=K}^{L} AR_t \qquad (1)$$

Hereby, ar_{it} represents the abnormal return of stock i (i = 1, 2, …, N) over period t. Abnormal return calculates the disparity during period t of the realized return of stock i in comparison with the expected return under regular circumstances[3]. AR_t is then the average of all stocks i over period t, whereas CAR_{KL} sums all AR_t in (K, L) to arrive at a more confident understanding of the cumulative abnormal returns in (K, L) and their systematisms.

In this paper, the CAR data is obtained for April 20th, 2010, with two timeframes. The first being a three-day window [-1, 1], and the second one [-3, 3], a seven-day window, using the regular market model. Ergo, one window observes the CAR from one day prior to the event up until one day after the event, while the second window uses three days in advance up until three days after the event. The market model predicts the expected return by using the market's average return. Two windows are utilized, because in this way the testing of hypotheses can be done more precisely, and the seven-day frame may capture the abnormal return of the event in a different, more specific way than the three-day frame.

[3] Under regular circumstances means in case the event did not happen.

Now we know the CAR of firms in the American oil industry, the absolute CAR is divided into three classifications: high, medium and low. In order to see the influence of CAR on charity donation, the three categories are used to determine how strong the impact is. Descriptive statistics of CAR and CAR classifications of both windows are given in the first two rows of Table 1. Formula 1 thus gives the CAR where (K, L) is either (-1, 1) or (-3, 3) and N equals 94, i.e. the CAR of 94 firms is calculated. This means the three categories show whether the absolute CAR is in the high, medium or low segment, hence each classification contains either 31 or 32 firms.

Chan (2001) argues that after - especially bad - news, the change of stock prices is not directly visible after the event, but it may take up until a couple of months before the returns get back to normal. In other words, underreaction of investors takes place. This can be seen in row one and two of the descriptive statistics, where the difference between maximum is over five times as high for the seven-day window in comparison with the three-day window. On the contrary, Barber and Odean (2008) claim that attention-grabbing stocks are the ones that are actually bought and whether the news is positive or negative does not show a clear difference in buying. Attention-grabbing stocks refer to stocks that show up in the news, or stocks traded in enormous amounts, for example. These stocks stay in the minds of investors which makes them buy these stocks in particular, since it is too hard to make a clear distinction between all available stocks. Again, this is what the data presented in Table 1 show, by a positive value for the mean in the longer timeframe. One can say returns of the oil industry stocks show abnormal return around the Deepwater Horizon disaster, though it still must be investigated whether these values are statistically significant.

3.2 Charity Donation

The next set of variables used for this paper are retrieved from the WRDS MSCI database, using KLD scores. These scores follow the ethical concerns of companies, based on ESG (environmental, social and governance) factors (Turner, 2013). In compliance with Liang and Renneboog (2017), these KLD variables are valid units of measurement, seeing that importance is added to social and environmental concerns and less emphasis is given to corporate governance. Since the independent variable already contains economic issues, corporate governance concerns should not be present in the dependent variable.

The KLD dataset classifies three kinds of variables that are related to charitable giving. The first variables are the score on charitable giving inside the United States and outside the United States. Also, a variable that contains types of charity is used.

Table 1. Descriptive statistics.

Variable	Number of observations	Mean	Standard Deviation	Min	Max
Independent variable					
CAR1	570	-0.00744	0.0427119	-0.19938	0.07531
CAR3	570	0.0167995	0.0703112	-0.17237	0.4135
Dependent variable					
Charity in US	*333*	*0.021021*	*0.1436702*	*0*	*1*
Charity non-US	*275*	*0.0654545*	*0.2477771*	*0*	*1*
Charity donation	570	0.0438596	0.2049626	0	1
Charity types	396	0.0505051	0.2192617	0	1
Control variable					
Net income	570	547.3707	1837.157	-16998	15550
Fair value of assets	332	341.6262	981.4427	0	8393
Market value	567	9201.377	19365.61	23.811	138757.3
Size	570	3.37045	0.797891	1.006124	5.249827
ROA	570	16.25023	357.2606	-2143.85	7885.837
Leverage	570	3.772269	58.98056	-61.34943	1405.769

This table gives the descriptive statistics of the event windows CAR [-1, 1] and CAR [-3, 3] around the Deepwater Horizon oil spill, dependent dummy variables charity donation inside and outside the US, charity types, and control variables net income, fair value of assets, market value, size, ROA and leverage. Charity donation inside and outside the US are pooled together to form 'charity donation', which is the independent variable that will be used in further investigation in this paper. The variables are retrieved from 2006-2014 for firms in the American oil industry. All control variables are measured in thousands of American dollars. (CAR: cumulative abnormal return; charity donation: equals 1 when a company donates to charity; charity types: equals 1 when a company supports x amount of charity types; size: natural logarithm of total assets; ROA: return on assets; leverage: total liabilities divided by shareholder's equity)

The concerning variables are classified according to MSCI ESG Research Inc. (2015). All variables are measured on a binary scale. 'Charity in US' equals one if the respecting firm has given over 1.5% of its net earnings before tax to charity inside the United States, measured over three years. Next, 'non-US charitable giving' is one if a company contributes at least 20% of its giving outside the US. Last, 'charity types' classifies the number of types of charitable giving firms provide, if a certain amount of types is reached[4], this variable equals one. It should be noted that these three variables are independent of each

[4] The exact amount is not provided by MSCI.

other. The data for these variables is obtained from 2006-2014 on a yearly basis, so that a clear distinction can be drawn from before and after the Deepwater Horizon oil spill. Furthermore, charity inside the US and charity outside the US are pooled together, as these are dummy variables and now together can form the variable 'charity donation'. Therefore, there are now two variables that measure charitable giving: charity donation and charity types.

Rows three up until six of Table 1 show the descriptive statistics for charity donation inside and outside the US, charity types and charity donation. All four variables vary from zero to one, which is of course due to the variables being binary. It is surprising that the charitable giving outside the US has the highest average, as one would expect the donations American companies make are usually in the US itself.

3.3 Control Variables

Several papers name different types of control variables, which for this research are all derived from the WRDS database for the period 2006-2014 and include yearly data. The effect of profitability on charity donation has already been discussed previously (Amato and Amato, 2007), consequently net income is used as a proxy for profitability and therefore one of the control variables. Other papers name the cash amount firms have in possession also plays a role (Seifert, Morris and Bartkus, 2003), which in this research will be measured by the total fair value of assets. Then market value is used, which is ought to have a positive relationship with charitable donation (Luo and Bhattacharya, 2006). Firm size also appears to have an impact on charity donation (Dunn, 2004; Amato and Amato, 2007; Sotorrío and Sánchez, 2008; Liang and Renneboog, 2017), which is measured by taking the natural logarithm of the firm's total assets. Furthermore, ROA proxies as a control for company performance concerning the abduction of the show-off effect (Liang and Renneboog, 2017) - or doing good by doing well - as Falck and Heblich (2007) mentioned. The final control variable, as used by Sottorío and Sánchez (2008), is leverage, which is measured as total liabilities divided by shareholder's equity (debt-to-equity ratio). Leverage appears to have a negative influence on participation in CSR and charitable giving (Brammer and Millington, 2005; Zhang, Zhu, Yue and Zhu, 2010).

The descriptive statistics of the control variables can be found in Table 1. This is data for all registered firms in the United States' oil industry in the period 2006-2014, accordingly this section contains panel data. Unfortunately, the fair value of assets was not available for little under half of the observations. The negative value of leverage is due to negative values of shareholder's equity.

Section IV: Methodology

4.1 Significance

Testing the significance of the CAR values is done to test the first hypothesis: check if the CAR is significantly negative around the Deepwater Horizon disaster. This hypothesis is tested with a sign test, to check for the median of CAR being significantly different from zero. For this test, the relative values of CAR are used for the three-day window and the seven-day window. The result of the sign test is expected to be significant for CAR < 0.

Then, a univariate analysis between charity donation before the Deepwater Horizon oil spill and absolute CAR is carried out to check the third hypothesis. This means charity donations from 2006 up until 2009 are used. With this test, one can check whether the means of CAR show a significant difference when a company donates to charity or not. This is checked for both CAR frames combined with charity donation. For charity types, this test cannot be performed, since there is no firm that met the requirements for the amount of charity types before 2009. For the third hypothesis to be true, the test should show a significant difference in the means of CAR between does donate and does not donate in the favour of does donate.

4.2 Linear regressions

To see if charity donations are significantly higher after the Deepwater Horizon oil spill, a simple linear regression is used, while firm fixed effects and year fixed effects are accounted for. As charitable giving can change across time and differ among firms and to prevent cumulative trends from influencing the regression, fixed effects are used to cancel out time-invariant variables that might be omitted. Moreover, robust standard errors are used to get rid of heteroskedasticity. Also, the control variables are standardized to make sure they are on the same scale. To test the second hypothesis – charitable giving is higher after the Deepwater Horizon oil spill – the following models are used:

$$charity\ donation = \beta_0 + \beta_1 Post2010 + i.year + control + \epsilon \quad (2)$$

$$charity\ types = \beta_0 + \beta_1 Post2010 + i.year + control + \epsilon \quad (3)$$

In these models, the two kinds of charitable giving as mentioned in Section 3.3 are used. The two models are thus independent of each other but are used to see if there is an increase in the amount of charity donation or the types of charity a firm supports after the Deepwater Horizon oil spill. Post2010 is a dummy variable that equals one when the year is 2010 or later and for that reason accounts as a proxy for 'after the Deepwater Horizon oil spill'. 2010 is included since the variables concerned with years, in this case the financial control variables and the KLD variables, are measured at the end of the year and will have incorporated any change after the Deepwater Horizon oil spill. *i.year* automatically creates a

dummy variable for each year in the dataset to adjust year fixed effects. The control variables are all variables mentioned in Section 3.3. β_1 is expected to be significantly higher than zero for the second hypothesis to be accepted.

The models that are used to answer the research question are regular linear regressions of charity donation and charity types on absolute cumulative abnormal return, for each timeframe of CAR. It is important to know the impact of CAR to be able to answer the research question. Therefore, the absolute CAR classifications high, medium and low are used. Moreover, since the research question focuses on the impact of the oil spill in particular, a dummy variable for post 2010 is used, as was also done in models 2 and 3. The control variables are all variables as noted in Section 3.3: profitability, fair value of assets, market value, firm size, return on assets and indebtedness. Again, in these models is accounted for firm and year fixed effects, heteroskedasticity and standardization of control variables. This results in four models, which are presented as follows:

$$charity\ donation\ =\ \beta_0 + \beta_1 High1\ +\ \beta_2 High1\ x\ Post2010 + i.year + control\ + \epsilon \quad (4)$$

$$charity\ types\ =\ \beta_0 + \beta_1 High1\ +\ \beta_2 High1\ x\ Post2010 + i.year + control\ + \epsilon \quad (5)$$

$$charity\ donation\ =\ \beta_0 + \beta_1 High3\ +\ \beta_2 High3\ x\ Post2010 + i.year + control\ + \epsilon \quad (6)$$

$$charity\ types\ =\ \beta_0 + \beta_1 High3\ +\ \beta_2 High3\ x\ Post2010 + i.year + control + \epsilon \quad (7)$$

Here, High1 and High3 show the stock return classification 'high', as discussed in Section 3.1. The second variable, an interaction effect between high stock returns and years after the oil spill, is indicated by $High3\ x\ Post2010$. In compliance with the fourth hypothesis, β_2 is expected to be higher than zero, since from previous literature follows charitable giving after the oil spill should increase with the negative image of the firm.

Section V: Results

5.1 Significance

The first hypothesis expects the CAR to be significantly negative around the Deepwater Horizon oil spill. A sign test is performed to test this hypothesis. The sign test uses CAR=0 as null hypothesis, and CAR<0 as alternative hypothesis. As the output shows a test statistic of respectively 0.1895 and 1.0000 for CAR1 and CAR3 in a binomial distribution, the null hypothesis is rejected for CAR1 and accepted for CAR3. This means CAR 1 is significantly lower than zero, but CAR3 is not. The first hypothesis of this research is thus accepted for the three-day window but rejected for the seven-day window: CAR is significantly negative when looking one day around the event date, whilst this cannot be said for three days around the event date.

In order to test the third hypothesis, a univariate test of CAR on charity donation is carried out for the period 2006-2009. The results of this test can be found in Table 2. Companies that do not donate to charity find a significant higher CAR around the Deepwater Horizon oil spill, measured by the short timeframe. In other words, donating to charity has a decreasing effect on stock returns. However, the longer timeframe does not show a significant difference in donating or not donating. This is in contrast with previous literature, where charitable giving and CSR in general increased with both the negative and positive image of the firm.

Table 2. Univariate analysis.

	Charity donation = 0	**Charity donation = 1**	**T statistic**
CAR1	0.03	0.01	2.57**
CAR3	0.05	0.03	1.39

Univariate analysis between charity donation before the Deepwater Horizon oil spill and two absolute CAR (cumulative abnormal return) windows. CAR1 represents CAR window [-1, 1] and CAR3 represents CAR window [-3, 3] around the Deepwater Horizon oil spill. Charity donation equals 1 when a company donates to charity and equals 0 when it does not. Hence, the difference in means of CAR1 and CAR3 is tested for firms in the American oil industry that donate or do not donate between 2006 and 2009.

** p<0.10, ** p<0.05, *** p<0.01.*

5.2 Linear regressions

The regressions done to test the second hypothesis, check for a significant change in donation after the Deepwater Horizon disaster, can be found in Table 3. Model 2 shows the regression with charity donation as dependent variable and model 3 shows the regression with charity types as dependent

Table 3. Linear regressions of charitable giving on proxy after the Deepwater Horizon oil spill.

	(2) Charity donation	(3) Charity types
Post2010	-0.400***	0.573***
	(0.0605)	(0.0866)
2008	-0.211**	0.307**
	(0.0957)	(0.124)
2009	-0.227**	0.341***
	(0.0886)	(0.117)
2010	0.0933**	0.0166
	(0.0466)	(0.127)
2011	0.0775*	0.0234
	(0.0455)	(0.123)
2012	0.0299	-0.0567
	(0.0183)	(0.0526)
2013	0.000778	
	(0.0131)	
Net income	0.00610	0.0338
	(0.0128)	(0.0292)
Fair value of assets	-0.0366**	-0.00212
	(0.0167)	(0.0549)
Market value	0.0280	-0.260*
	(0.0680)	(0.139)
Size	0.127*	-0.160*
	(0.0657)	(0.0865)
ROA	0.0111	-0.0604**
	(0.00779)	(0.0267)
Leverage	-0.0431	1.436
	(0.0885)	(1.138)
Constant	0.333***	-0.186
	(0.0782)	(0.160)
Observations	329	203
R-squared	0.140	0.247

This table shows the results of linear regression firm and year fixed effects models 2 and 3, where each time the independent and control variables are the same. The dependent variable is charity donation in model 2 and charity

types in model 3. Both dependent variables are dummies. Charity donation equals 1 when a company donates to charity and charity types equals 1 when a company supports x amount of charity types. The independent variable, Post2010, is a dummy variable that equals one when the year is 2010 or later. Years 2008-2013 and net income, fair value of assets, market value, size, ROA and leverage are control variables.
*Robust standard errors are given in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*

variable. The years 2010 and later show to have a significant negative effect on charity donation, yet a positive significant effect on charity types. Both coefficients are significant on the one percent level, meaning charity donation decreased after 2010, whereas charity types increased after 2010. Therefore, hypothesis 2 is rejected for charity donation but accepted for charity types.

Now let us have a look at the impact of stock price reaction after the oil spill, as presented in Section 4.2 by models 4 up until and including 7. The results of these models are presented in Table 4. The first two columns show the models with the short CAR window, whereas the latter two columns show the long CAR window. It is striking and should be noted that the variable high returns is omitted for all models because of collinearity. As this is not one of the main variables, the regression can be continued. Looking at model 4, the interaction effect between high absolute stock return and post 2010 is positive but not significant, whereas in model 5 it is negative and significant on the one percent level. The short CAR window shows a significant negative effect of stock price reactions on charity types after the Deepwater Horizon oil spill. For model 6, the interaction variable is again positive but not significant. However, in model 7 the interaction effect is again negative and significant on the one percent level. Knowing that the interaction effect between high returns and post 2010 is significantly negative on charity types, one can say that the chance of corporate giving to different types of charity decreases when the stock return is high after the Deepwater Horizon oil spill. As opposed to previous literature, the effects of high stock returns combined with a disaster on charitable giving are negative where a positive impact was expected.

Table 4. Linear regressions on charitable giving using high stock returns.

	(4) Charity donation	(5) Charity types	(6) Charity donation	(7) Charity types
High1 x Post2010	0.0553	-0.266***		
	(0.0845)	(0.100)		
High3 x Post2010			0.0397	-0.247***
			(0.0872)	(0.0864)
2008	-0.191*	0.275**	-0.198*	0.254*
	(0.102)	(0.133)	(0.101)	(0.128)
2009	-0.209**	0.307**	-0.216**	0.292**
	(0.0952)	(0.125)	(0.0932)	(0.121)
2010	-0.308***	0.587***	-0.307***	0.582***
	(0.0835)	(0.0768)	(0.0837)	(0.0726)
2011	-0.323***	0.603***	-0.321***	0.589***
	(0.0890)	(0.0825)	(0.0893)	(0.0773)
2012	-0.368***	0.513***	-0.368***	0.509***
	(0.0677)	(0.0898)	(0.0678)	(0.0869)
2013	-0.398***	0.576***	-0.398***	0.576***
	(0.0535)	(0.0876)	(0.0536)	(0.0859)
2014	-0.397***		-0.399***	
	(0.0581)		(0.0590)	
Net income	0.00752	0.0305	0.00686	0.0311
	(0.0131)	(0.0285)	(0.0131)	(0.0274)
Fair value of assets	-0.0357**	-0.00359	-0.0362**	-0.00293
	(0.0157)	(0.0536)	(0.0160)	(0.0506)
Market value	0.0365	-0.279*	0.0360	-0.304**
	(0.0654)	(0.141)	(0.0658)	(0.141)
Size	0.127*	-0.179*	0.123*	-0.125
	(0.0639)	(0.0909)	(0.0643)	(0.0948)
ROA	0.0114	-0.0564**	0.0104	-0.0539**
	(0.00781)	(0.0247)	(0.00773)	(0.0263)
Leverage	-0.0379	0.180	-0.0448	1.869*
	(0.0930)	(0.761)	(0.0898)	(1.072)
Constant	0.317***	-0.199	0.322***	-0.124
	(0.0804)	(0.151)	(0.0805)	(0.166)

Table 4 – *continued.*

Observations	329	203	329	203
R-squared	0.144	0.263	0.142	0.274

This table shows the results of firm and year fixed effects regression models 4, 5, 6 and 7, where the dependent variable differs to check for a different effect in charity donation (the dependent variable in models 4 and 6) and charity types (the dependent variable in models 5 and 7). Both dependent variables are dummies. Charity donation equals 1 when a company donates to charity and charity types equals 1 when a company supports x amount of charity types. High1 (High 3) represents the dummy variable that equals one when absolute CAR1 (CAR3) is in the high segment, High1 x Post2010 (High3 x Post2010) represents the interaction effect between High1 (High3) and a dummy variable that equals one when the year is 2010 or later. CAR1 and CAR3 represent the timeframes [-1, 1] and [-3, 3] respectively around the Deepwater Horizon oil spill of April 20, 2010. The effect of high stock price reactions around the Deepwater Horizon oil spill on charitable giving after this event is tested.
*Robust standard errors are given in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*

Section VI: Conclusion

This research examines the effect of stock price reaction on charitable giving after the Deepwater Horizon oil spill on April 20, 2010. Stock price reactions reveal to what extent consumers are concerned with the brand and the firm's handling of situations, such as the explosion of the drilling rig. Previous literature has found a positive effect of spending on charity after a natural disaster and after the 9/11 terrorist attack. It is therefore a logical implication of the Deepwater Horizon oil spill that firms in the oil industry increase the amount donated or types of donating to charity in a positive way. Furthermore, existing literature finds on the one hand that firms donate more to charity when their brand is damaged, and on the other hand that firms donate more to charity when the profitability increases. The first will cause a decrease and the latter will lead to an increase in stock prices. Therefore, the absolute stock price reaction will then account for both the positive and negative responses. In combination with the Deepwater Horizon disaster, the absolute stock returns after 2010 should show a positive impact on donations made to charity. Consequently, the main question of this research is to what extent the stock prices around the Deepwater Horizon oil spill have an impact on the donations made to charity by the American oil industry after this event.

To investigate this, two timeframes for measuring stock price reaction are used. The first timeframe contains the cumulative abnormal return one day prior to up until one day after the Deepwater Horizon exploded. The second timeframe is obtained three days before up until three days after the event. Charity donations are measured in three sections: charity donation inside the US, charity donation outside the US and types of charity. Charity donations inside and outside the US are combined to one variable: charity donation. Each regression is performed on both timeframes and the two remaining charity measurements, leading to four regression models.

From the results it follows that the stock price reaction around the Deepwater Horizon disaster is significantly negative for one day around the event date, but not for three days around the event date. This means the first hypothesis of this research, stock price reactions of the American oil industry are significantly negative around the Deepwater Horizon oil spill, is true for the returns one day around the event. When looking at the difference in donations before and after the Deepwater Horizon oil spill, a significant negative difference is detected for charity donation, whereas a significant positive difference is found for types of charity. The second hypothesis is thus rejected for charity donation but accepted for types of charity. Furthermore, difference between charity donation and no charity donation on absolute cumulative abnormal returns is tested. The results show a negative significant difference between the mean of CAR and charity donation pre-2010 for the short timeframe but no significant difference for the long timeframe. The third hypothesis, assuming a positive difference between past charity donation and no donation on CAR, is thus rejected for both timeframes: companies that do not

donate to charity find a significant higher CAR around the Deepwater Horizon oil spill, measured by the short timeframe. In other words, donating to charity has a decreasing effect on stock returns. As a consequence, one might expect a negative effect of CAR on charity donation in the future, i.e. after the Deepwater Horizon oil spill.

Finally, to answer the research question, regressions of charitable giving on the absolute stock returns around the Deepwater Horizon oil spill are performed. These regressions account for fixed firm effects, year fixed effects and heteroskedasticity. The impact of stock price reaction in the high region combined with a post-2010 dummy is included as the independent variable. The used control variables are net income, fair value of assets, market value, size, ROA and leverage. Results from these regressions show evidence that the effect of stock prices around the Deepwater Horizon oil spill on charity donations is significantly negative for charity types, but not for charity donation, meaning that the last hypothesis is not accepted. On the contrary, the stock price reactions around the Deepwater Horizon oil spill show to have a higher chance of charity types to decrease after this event. This is compliant with results from the univariate test in Section 5.1 yet contrasts with existing literature. Existing literature namely suggested the expectation that a well performing firm donates more to charity and that charitable giving increases after a corporate disaster, in order to repair a firm's damaged brand. Hence, the research question can be answered as follows: the absolute high stock price reactions around the Deepwater Horizon oil spill have a significant negative impact on charity donation after this event, measured by charity types but not by charity donation.

Though this research finds a negative impact on charitable giving, there is plenty of room for further research. To start, this research only contains US oil industry firms, further research can use firms of another industry or from other countries. Because of the data combined from the three databases led to only 94 firms left in the dataset, different results may be obtained when including other industries or countries. Moreover, one can look at other measures to estimate charity. For example, obtain the monetary values of the amount donated to charity instead of ratings by MSCI, since this was out of the scope of this research. Also, as this is a case study on an event with a large impact, one can look at other major disasters and the impact of stock price reactions on charitable giving afterwards. Take for example the 9/11 terrorist attack or natural disasters such as tsunamis, which have been researched in the light of charity donation in general, but not including the stock prices of affected companies as an independent variable for the estimate of donation amounts. Charitable giving is likely to decrease with stock price reactions around the Deepwater Horizon oil spill and though this event probably is not the only determinant of charitable giving of the oil industry, it might have played a role in the past and may play a role in future decisions concerning donation. Future analysis can on that account also be performed in estimating or predicting donations to charity for the years after the Deepwater Horizon oil spill.

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