The effect of firm-specific characteristics on the stock market returns during the COVID-19 pandemic: An event study

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ABSTRACT

This thesis investigated the Dutch stock market reaction to the COVID-19 pandemic with the use of an event study method with the event date set on the first trading day the lockdown was enforced (March 16th). The study uses a sample of 75 companies listed in the Netherlands on one of the three indices (AEX, AMX, AScX). Ten firm-specific characteristics were tested on their correlation to cumulative abnormal return with the use of a multiple regression analysis in SPSS, with each variable having a hypothesis. The study only found board size to have a (positive) statistically significant correlation to cumulative abnormal return. Meaning, firms with a larger board experience a less adverse impact on the COVID-19 pandemic than other firms.

KEYWORDS

Stock market reaction; exogenous events; COVID-19; pandemic: firm-specific characteristics; event study

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Contents

1. Introduction

According to the World Health Organization, the novel coronavirus (COVID-19) has reported over 100 million confirmed cases, spread to over 200 countries, and resulted in more than 2 million confirmed deaths as of January 2021. The WHO officially declared a pandemic on March 11, 2020, meanwhile, the virus is still ongoing and widespread (World Health Organization, 2021). Governments all over the world had to take measures to try to slow down the spread of the virus. These measures, which are still ongoing, have an enormous impact on daily life and businesses since a hard lockdown results in all non-essential shops closing down for customers completely. The Dutch government reacted similarly to its neighboring countries, when the virus entered Europe, to the COVID-19 outbreak, to try and protect the weak, people were asked to work at home and limit visits to vulnerable people. However, more rigorous action was needed to slow the virus down. The Prime Minister made a nationally broadcasted announcement that in the evening of March 15th the Netherlands would enter a so-called intelligent lockdown. This meant that some companies such as hotels, bars, restaurants, schools, and professions where physical contact is unavoidable, for example, hairdressers, were obligated to close. Figure 1 shows the number of confirmed COVID-19 deaths in the Netherlands. Noticeable is the spike around April 1st and the decline that sets in 2 weeks after the announced restrictions.

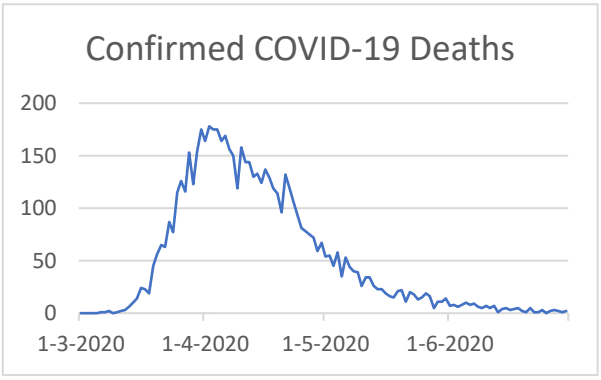

Figure 1 COVID-19 Deaths in the Netherlands

Literature previously identified that major events, such as disasters, sports, news, environmental and political events affect stock market returns (Al-Awadhi, Alsafi, Al-Awadhi, & Alhammadi, 2020). Additionally, prior pandemics such as the Severe Acute Respiratory Syndrome (SARS) outbreak (Chen, Jang, & Kim, 2007), and the Ebola Virus Disease (EVD) outbreak also caused a response on stock market returns (Ichev & Marinc, 2018). Therefore, this study aims to investigate whether the COVID-19 pandemic has a similar potential and anticipated impact on stock market returns, focusing on firm-specific characters influencing this response. The coronavirus differs from prior pandemics in terms of the implemented measures, like staying at home and closing businesses for the public, which has caused a gap in knowledge and should thus be studied extensively.

Recent studies examining the stock market volatility show a significant impact of the COVID-19 pandemic (Cox, Greenwald, & Luidvigson, 2020) (Mazur, Dang, & Vega, 2020). However, the market response is not uniform for each company. One method of comparing listed companies and the overall market response is with the use of firm-specific characteristics. Certain firm-specific characteristics might potentially be identified to have a significant influence on the stock market return of the investigated companies. Given the recency of the COVID-19 pandemic, the potential impact of firm-specific characteristics on stock market returns has not been studied intensively, except for one paper focusing on the impact on multiple Chinese listed companies (Xiong, Wu, Huo, & Zhang, 2020). The goal of this study is to examine the effect of the more recent pandemic disease, COVID-19, on the stock returns of Dutch listed companies in the year 2020. This is done to add to existing literature to better understand the impact of a pandemic on the stock market in the Netherlands and improve preparation for future crises. Furthermore, this paper contributes to financial risk mitigation literature, a key topic for financial managers. This study examines the impact of firm-specific characteristics on its market response to the COVID-19 pandemic, to determine if this response is potentially dependent on certain characteristics. This study will investigate the

impact of firm-specific characteristics on the COVID-19 pandemic market response. To reach this goal, the main research question is formulated as:

Which firm-specific characteristics affect the market reaction of companies listed in the Netherlands to the COVID-19 pandemic?

The main contribution of this paper is that it is the first to investigate the influence of firm-specific characteristics on market reaction to the COVID-19 pandemic in the Netherlands. Next, this study contributes to the growing number of papers on the COVID-19 pandemic and its impact on the economy. Furthermore, this study has practical relevance for scholars and practitioners in the financial markets to better understand certain market reactions which gives them potential advantages in handling such situations in the future.

To answer the main research question, several steps will be taken. First, a literature review will be done to gain an understanding of the existing literature. Then, a more detailed research approach is presented in chapter 3, research method. Specifically, the event study method and multiple regression analysis are elaborated upon. Next, the results of the regression and robustness tests are given, followed by a discussion of the results. Finally, a conclusion is presented in which the main findings of the study are stated.

2. Literature review

Financial market reactions to exogenous events is a common study topic addressed by financial scholars (Arshanapalli, Doukas, & Lang, 1995) (Wang, Meric, Liu, & Meric, 2009). For example, major exogenous events such as the 2001 terrorist attacks have been analyzed in terms of stock market reactions (Hon, Strauss, & Yong, 2004), but also pandemics such as the SARS and Ebola outbreak are addressed upon (Chen, Jang, & Kim, 2007) (Ichev & Marinc, 2018). Next to particular events impacting the stock market, the characteristics of a company can impact the degree of market reaction. These so-called firm-specific characteristics will be discussed based on previous studies and in the research design chapter, they will be further defined. Furthermore, Environmental-, Social- and Governance policy scores (hereafter ESG) will be introduced as an additional research variable potentially impacting market reaction.

2.1 Stock market reaction

The efficient market hypothesis (EMH) is a hypothesis that states that share prices fully reflect all information (Fame, 1970). This means that stocks trade at their fair market value on stock exchanges making the market efficient. According to EMH, it is impossible to purchase undervalued stocks and on the other hand sell overvalued stocks. Therefore, it should not be possible to beat the market through stock selection or timing and the only way to obtain higher returns is through riskier investments. Fama (1997) argues that there are several reasons why this might be incorrect (Fama, 1997). First, all investors view information differently and will therefore have different valuations. Second, stocks take time to respond to new information, investors who receive or act on this new information first can profit from this. Third, stock prices can be affected by human error or emotional decision-making. Fourth, investors have proven that they can beat the market, for example, Warren Buffet who is famous for investing in undervalued stocks. In reality, some level of inefficiencies is displayed in most markets, also due to low liquidity, transaction costs, and delays.

The way in which new information is perceived also varies, there is a difference in market responses to negative or positive news stories. Frank and Sanati found a negative drift in both positive and negative news stories. Furthermore, overreaction to good news and underreaction to bad news is found for the S&P 500 data set (Frank & Sanati, 2018). This is contradictory to a previous study that found overreaction to unexpected and dramatic news (de Bondt & Thaler, 1985).

2.2 Exogenous events

Numerous exogenous events have an impact on the stock market. For example, the stock market reaction to terrorist attacks. Financial markets reacted in a consistent pattern, Suleman found in his study in 2012. The studied attacks were the terrorist attacks in 2001 in the United States, the suicide blasts in Bali in 2002, the London and Madrid train bombings in 2004 and 2005, and suicide attacks in Pakistan. The terrorist attack news all had a negative impact on the returns of the Karachi Stock Exchange, and increased volatility (Suleman, 2012). A paper by Arin, Ciferri, and Spagnolo (2008) also shows a significant impact of terrorism on both stock markets and stock market volatility. They find this significance in their six investigated financial markets which suffered a form of terrorism; Indonesia, Israel, Spain, Thailand, Turkey, and the UK (Arin, Ciferri, & Spagnolo, 2008).

Another study found natural disasters to have a negative impact on the capital market in an event study analysis (Tavor & Teitler-regev, 2019). Furthermore, the research reveals an arbitrage opportunity when an investor short sells the index on the day of the disaster and holds it for two days. Additionally, they studied the impact of terrorism on the stock market and found that the market only drops on the day of the incident and the day after. So, investors

should short sell on the day of the incident and hold it for one more day in order to obtain arbitrage profits.

A study investigating the stock market reaction to disasters in potash mines came to a similar conclusion (Kowalewski & Spiewanowski, 2020). The affected companies experienced a cumulative drop in the market value of over 1% in the two days after the disaster. Moreover, the incident also has a significant negative impact on the stock of the competitor mining firms. This is due to the fear of increased safety regulations, which could result in higher production costs for all mining companies.

The stock markets react differently to different kinds of exogenous events. The coronavirus is a whole new category of exogenous events since this pandemic meant shutting down whole business sectors and limiting business and personal movements. Furthermore, the coronavirus is not a local exogenous event but a worldwide pandemic. How the stock market reacted to pandemics in the past and on the coronavirus is elaborated upon in the next chapter.

2.3 The Coronavirus outbreak

Pandemics can impact stock market reactions significantly, which has been the conclusion in many previously published papers (Jester, Uyeki, & Jernigan, 2018) (Chen, Jang, & Kim, 2007). Consequently, recent papers about the COVID-19 pandemic point in the same direction. For example, a stock market volatility study concludes that there is a significant effect due to COVID-19 on the stock markets worldwide (Cox, Greenwald, & Luidvigson, 2020). Another study also concluded that the U.S. stock market reacted more volatile to COVID-19 compared to other pandemics in 1918-1919, 1957-1958, and 1968 (Baker, et al., 2020). Cox, Greenwald & Ludvigson (2020) found that the stock market volatility due to the COVID-19 has been directed more by sentiment than substance as panic selling from March 9 until March 23 2020 led to a 26% drop in the Dow Jones Industrial Average. This drop was steeper compared to the drop of the 2007 financial crisis (Anand, Irvine, Puckett, & Venkataraman, 2013). A significant difference between the financial crisis in 2007 and the COVID-19 pandemic is that the COVID-19 crisis evolved into a lockdown for citizens and a total shutdown of service- and manufacturing businesses (Mazur, Dang, & Vega, 2020). This is something that has a greater impact on some companies compared to others who don't have physical store locations or manufacturing facilities.

The COVID-19 pandemic had spread around the world, impacting financial markets. With the use of an event study method, Lui, Manzoor, Wang, Zhang, and Manzoor (2020) studied the immediate and short-term effects of COVID-19 on major affected countries' stock markets. Their results of 21 leading stock markets indicate a relationship between COVID-19 and stock market performance. Countries in Asia, where the virus originated from, experience more negative abnormal returns as compared to countries in Europe and America (Liu, Manzoor, Wang, Zhang, & Manzoor, 2020). Another study found that multifractality in European stock markets existed during the COVID-19 outbreak, also indicating a relationship between COVID-19 and the European stock market performance (Aslam, Mothi, & Ferreira, 2020). However, specific studies with the Dutch stock market 'Euronext Amsterdam' have yet to be conducted, this is a gap in the existing literature which this paper seeks to address.

2.4 Firm-specific characteristics

In order to better understand specific market reactions, firm-specific characteristics can be identified and discussed which can (partially) explain certain reactions. Several firm-specific characteristics are identified, furthermore, hypotheses will be made accordingly.

2.4.1 Characteristics

Prior studies have shown that firm-specific characteristics can have an influence on market reactions (Akron, 2011). A broad range of firm-specific characteristics has been subject to examination of this influence. For example, the study by Akron (2011) emphasizes the importance of dividend announcements and the positive market reactions. Although the study by Akron shows the importance of a market reaction to a firm-specific event, it does show a significant relation between firm-specific characteristics and the market reaction (Akron, 2011). Xiong, Wu, Hou, and Zhang (2020) study the influence of firm-specific characteristics in more detail for the COVID-19 pandemic in particular. They conclude that the market-reaction of Chinese listed companies is more present for firms within vulnerable industries, firms with more fixed assets, and a large number of institutional investors (Xiong, Wu, Huo, & Zhang, 2020). In retrospect, they conclude that firms that have more growth opportunity, total assets, higher profitability, and combined leverage were less heavily impacted by the COVID-10 pandemic (Xiong, Wu, Huo, & Zhang, 2020).

A study by Fauzi and Wahyudi (2016) also shows the importance of firm-specific characteristics influencing the stock return during stock market crashes. They find that stocks with larger capitalization, higher betas, lower levels of illiquidity and more return volatility before the crash lose more value in stock market crashes. Furthermore, companies with high levels of liquid assets and debt ratios, lower cash flow per share, and lower asset profitability also tend to lose more value on the crash day. These firm-specific characteristics have a significant effect on the stock market reaction (Fauzi & Wahyudi, 2016). This implicates the importance of research on firm-specific characteristics in relationship with firm performance.

The two studies by Fama and French (1992, 1993) explore different characteristics that can affect the stock market reaction, they mainly focus on size and market-to-book ratio. They find that smaller firms and firms with a low market-to-book ratio consistently provide relatively higher returns compared with larger firms and firms with a high market-to-book ratio. Although these studies do not consider exogenous events when doing their research, they do however address the relationship between firm-specific characteristics and firm performance (Fama & French, 1992) (Fama & French, 1993).

Another firm-specific characteristic that also might have an impact on the market reaction is the Environmental-, Social- and Governance (ESG) score (Albuquerque, Koskinen, Yang, & Zhang, 2020). The study by Albuquerque, Koskinen, Yang, and Zang (2020) shows that firms with higher ESG ratings have higher returns, higher operating profit margins, and lower return volatility during the first quarter of 2020. Furthermore, Friede, Busch, and Bassen (2015) found over 2100 empirical studies suggesting a positive relation between ESG and corporate financial performance, making this another interesting firm-specific characteristic with a relationship with firm performance (Friede, Busch, & Bassen, 2015). However, Demers, Hendrikse, Joos, and Lev (2021) found disputing evidence claiming that ESG offers no explanation for returns during the COVID-19 pandemic. They did, however, first control for some factors including industry affiliation, market risk, and intangible investments (Demers, Hendrikse, Joos, & Lev, 2021). These disputing claims make ESG an interesting variable to measure firm performance. The ESG scores are designed to objectively measure a company's ESG performance across different themes based on publicly available and auditable data which is performed by Refinitiv. Refinitiv is one of the world's largest providers of financial market data and infrastructure (Refinitiv, 2020).

Vulnerable industries is another firm-specific characteristic that has been subject to research in relation to the COVID-19 pandemic and firm performance. Kong and Su (2019) and Shen et al. (2020) have researched this and concluded that the following industries are considered to be vulnerable: transportation, construction, entertainment, postal warehouse, real estate, tourism, and food and beverage retail (Kong & Su, 2019) (Shen, Fu, Pan, Yu, & Chen, 2020). These are industries that are affected the most by the regulations put in place by the government, like having to close down for customers. A way of grouping companies in industries is to use the Industry Classification Benchmark or ICB by the Dow Jones and FTSE Russel. The ICB uses a system of 11 industries, divided into 20 supersectors, which are divided into 45 sectors. This method is used by stock exchange providers to classify companies into industries.

2.4.2 Variables and hypothesis

This section will briefly touch upon the firm-specific characteristics, which are the independent variables that will be measured in this study. Furthermore, based on existing literature a hypothesis will be formulated for each independent variable.

2.4.2.1 Firm size

A study was performed to try to close the gap in the literature concerning the lack of market efficiency and misspecification on the pricing model, where it is thought that the size effect is of explanatory value (Reinganum, 1999). The study researching the empirical relationship between market capitalization and the stock performance found that smaller firms have a higher return, on average, than larger firms. Although it is noted that this effect mainly occurs for very small firms with less difference between the average-sized and large firms (Banz, 1981). Further studies about the outperformance of small firms over large firms underline this result (Reinganum, 1981). Size as a firm-specific characteristic is more intensely studied in recent previous literature to potentially influence the stock market response (Xiong, Wu, Huo, & Zhang, 2020) (Kong & Su, 2019) (Shen, Fu, Pan, Yu, & Chen, 2020). These recent studies, however, suggest a positive relationship between size and firm performance, meaning that a bigger company is more likely to better absorb the negative impact of the incident. Therefore the following hypothesis is formulated:

$\boldsymbol{H_1} = Ceteris\ paribus,$ a larger market capitalization leads to a less adverse impact on the firm's reaction to the pandemic.

2.4.2.2 Profitability

When the company's ability to generate more profit increases, this will have a positive effect on the stock price (Husnan, 2001). One of the financial ratio analyses of profitability is the return on assets ratio, which will be used in this study, which can partially explain this finding of Husnan. Greater profitability is a positive indicator for potential investors. A previous study also found this influence and concluded that a greater return on assets partially explains a positive influence on stock price (Manoppo, 2015). This study takes return on assets (ROA) as a variable for further research to try to explain abnormal returns. More recent literature also studied this effect (as shown by Husnan, 2001) and has shown that profitability positively influences the abnormal return (Xiong, Wu, Huo, & Zhang, 2020) (Shen, Fu, Pan, Yu, & Chen, 2020). Elaborating on this finding one comes to the following hypothesis for this study:

$\boldsymbol{H_2} = Ceteris\ paribus,$ a larger return on assets ratio leads to a less adverse impact on the firm's reaction to the pandemic.

2.4.2.3 Operating capacity

The operating capacity as used in this study is the total revenue divided by the total assets. This is an indicator of the efficiency of a company using its assets to generate revenue. This measurement is used to compare companies in the same sector in terms of efficiency where greater efficiency is better. The operating capacity of a company influencing the stock market reaction has been previously investigated. However, contrary to what is previously stated, researchers found a small significant (*p*=<10%) negative influence on the abnormal return (Xiong, Wu, Huo, & Zhang, 2020). The following hypothesis is constructed based on this analysis:

$\boldsymbol{H_3} = Ceteris\ paribus,$ a higher operating capacity ratio leads to a more adverse impact on the firm's reaction to the pandemic.

2.4.2.4 Cash flow ratio

The cash flow ratio can be used to evaluate the financial performance of a company in terms of sufficiency and efficiency. This ratio can be used to explain a company's ability to generate cash to meet the company's needs (Giacomino & Mielke, 1993). How well and how efficiently these cash needs are met are used to evaluate the company's financial performance where a higher ratio can be a positive indicator for stock performance. The cash flow ratio has been subject to investigation in more recent literature by Xiong et al. (2020), however, no significant relationship has been found. This variable will be subject to investigation in this study for validation purposes. The following hypothesis is constructed:

$\boldsymbol{H_4} = Ceteris\ paribus,$ a higher cash flow ratio leads to a less adverse impact on the firm's reaction to the pandemic.

2.4.2.5 Fixed assets to equity ratio

The fixed assets of a company, for example, machinery and plant, are long-term assets used to produce a firm's goods or services. These assets are noncurrent assets and are useful for more than one year. When a company has a high fixed assets ratio, a lot of capital is stuck in these fixed assets and the company is likely to produce the same product or goods for an extended period. Not being able to quickly convert capital into cash results in slower additive responses to external events. Recent literature investigating the influence of fixed assets ratios on the market reaction to the COVID-19 pandemic indicates a significant negative impact on the cumulative abnormal return (Xiong, Wu, Huo, & Zhang, 2020). Meaning, a higher fixed asset ratio negatively influences the abnormal return of the company during the COVID-10 pandemic. This leads to the following hypothesis for this study:

$\boldsymbol{H_5} = Ceteris\ paribus,$ a higher tangibility leads to a more adverse impact on the firm's reaction to the pandemic.

2.4.2.6 Board size

A larger board size will need more compromises to reach a consensus, consequently, the decisions of larger boards will be less extreme, which leads to less volatile stock returns (Cheng, 2008). One could argue that the lengthiness of decision-making hurts the adaptability of a company, negatively impacting firm performance. On the other hand, one could argue that the decision-making process is more extensive and a better conclusion is found. The size of the executive board of a company has been subject to investigation in more recent literature (Xiong, Wu, Huo, & Zhang, 2020). The researchers found a small significance (*p*=<10%) that a larger board size negatively influences the cumulative abnormal return. The following hypothesis is constructed:

$\boldsymbol{H_6} = Ceteris\ paribus,$ a larger board size leads to a more adverse impact on the firm's reaction to the pandemic.

2.4.2.7 Market to book ratio

The market to book effect states stocks with high ratios between their market and book value obtain lower returns compared to low ratios between the market value and the book value. An explanation for the predicted returns is that the book value proxy for future cash flows (Aras & Yilmaz, 2008). Two studies that explored the influence of market-to-book ratio on the stock market reaction found that a lower market-to-book ratio provided relative higher returns (Fama & French, 1992) (Fama & French, 1993). Although these studies were not conducted as a result of an exogenous event, they do however show the influence of the market-to-book ratio and its influence on the stock market reaction. Based on these studies the following hypothesis is constructed:

$\boldsymbol{H_7} = Ceteris\ paribus,$ a lower market-to-book ratio leads to a less adverse impact on the firm's reaction to the pandemic.

2.4.2.8 Environmental, social, and governance score

Environmental, social, and governance factors (ESG) is a term used to refer to a company's non-financial performance. The United Nations Principles for Responsible Investment (UN-PRI) have the goal to understand the implications of ESG and to make these non-financial performances comparable amongst companies. Listed companies are compelled to report their ESG activities. Responsible investors will consider these ESG scores in their investment decision-making process. Disputing claims have been made concerning the ESG score of companies and its influence on the firm performance (Albuquerque, Koskinen, Yang, & Zhang, 2020) (Friede, Busch, & Bassen, 2015) (Demers, Hendrikse, Joos, & Lev, 2021). Studies claim to have found a significant positive relationship between ESG scores and firm performance, while others claim that there is no significant relationship. The ESG score variable is therefore chosen for investigation in this study and the following hypothesis is constructed:

$\boldsymbol{H_8} = Ceteris\ paribus,$ a higher ESG score leads to a less adverse impact on the firm's reaction to the pandemic.

2.4.2.9 Vulnerably industry dummy

The regulations that have been put in place by the Dutch government are very industry-specific. The regulations called for some business sectors to close down completely since these sectors conducted physical business. Other sectors, for example, e-commerce, were not affected by the regulation to close a physical store. It could also be the case that the regulation positively affected the firm performance since more traffic was directed to online shopping. Therefore, it is very business-specific whether the regulations were of influence on the firm's financial performance. Research shows that several industries, which for example had to close down for customers, are affected more intensely than others (Kong & Su, 2019) (Shen, Fu, Pan, Yu, & Chen, 2020). Recent studies concluded that companies in vulnerable industries experience a significant negative impact on the cumulative abnormal return (Xiong, Wu, Huo, & Zhang, 2020). The following hypothesis is constructed:

$\boldsymbol{H_9} = Ceteris\ paribus,$ companies in a vulnerable industry experience a more adverse impact on the firm's reaction to the pandemic.

2.4.2.10 Financial leverage

A ratio of a firm's debt to total assets is used to measure the financial leverage of a company. High financial leverage ratios mean high levels of debt in the company which can cause financial limitations and negatively impacts the firm performance. High interest rates impact the financial health of a company, increasing the firm's liquidation risk, also limiting the operating freedom of a company and its ability to absorb shocks and unexpected events. Many researchers concluded that there is a negative influence of high financial leverage ratios and a firm's financial performance (Rehman, 2013) (Abdullah, Parvez, Karim, & Tooheen, 2015). However, other researchers find a positive relationship between higher financial leverage and higher stock returns. This can be due to the tax deductibility of interest payments and there are greater investment opportunities (Ozdagli, 2012) (Iqbal & Usman, 2018) (Hongli, Ajorsu, & Bakpa, 2019). The biggest risk of high financial leverage is when a firm's return on assets is not greater than the interest on the debt which reduces the return on equity, profitability, and stock value. A company would not take on debt when knowing the return will not be greater than the interest rates and therefore we construct the following hypothesis:

$\boldsymbol{H_{10}} = Ceteris\ paribus,$ higher financial leverage leads to a less adverse impact on the firm's reaction to the pandemic.

3. Research method

To investigate the relationship between firm-specific characteristics and firm performance, this study uses a multiple linear regression. The goal of a multiple regression is to model the linear relationship between the exploratory (independent) variables and response (dependent) variables. The overall layout of the research design will be as follows. First, the market response to the COVID-19 pandemic is examined using the event study method to calculate the cumulative abnormal return of stocks listed on the Euronext Amsterdam, the Dutch stock market. Also, a multiple linear regression is conducted, with the CAR as a dependent variable and firm-specific characteristics as the independent variables. Second, the existing literature is used as a reference for the selected firm-specific characteristics, which are the variables in the study. Third, the data collection for the variables is elaborated upon. Lastly, the scope of the research is explained in terms of selection and sample.

3.1 Method

The SPSS software program by IBM is the main program used to analyze the data. The software offers a variety of advanced statistical analyses and is widely used in the field of (financial) research. The data is first collected through the Capital IQ add-in in Microsoft excel. Thereafter the data is manipulated as described in table 1. Lastly, the data is loaded in SPSS which is used as the statistical analysis program.

As mentioned before, a relationship between firm-specific characteristics is thoroughly studied and documented. The following question that arises is how to measure this relationship or influence. The method used in prior literature, the event study method, is also central in this study. This method is an empirical analysis examining the potential impact of an event on the value of a company's stock. An event study can reveal interesting insight into how a company stock is likely to react to a given event. An assumption of an event study is the efficient market hypothesis. The efficient market hypothesis (EMH), on which an event study is based as in this study, states that share prices reflect all information, this means that stocks trade at their fair value on exchanges. Overreaction and underreaction to information are about as frequent, making these anomalies consistent with market efficiency. Furthermore, the post-event continuation of pre-event abnormal returns is about as frequent as post-event reversal making it consistent with market efficiency (Fama, 1997). Market inefficiencies may exist due to information asymmetries, low market liquidity, high transaction costs or delays. These market inefficient complications are accounted for on the Euronext Amsterdam which is central in this study for its data collection. The information is readily available, inside information and trading is a crime, there is no lack of buyers and sellers so there is no liquidity problem and there is no trading delay or disproportionate transaction fee.

This paper will perform an event study method to examine the market response to COVID-19 on a sample of Dutch listed companies. The event study method, in which an event date is chosen with an event window set with some days before and after the event. The event day in this study is the first trading day after the announcement that the Netherlands went into an intelligent lockdown, which is on March 16th, 2020 (Rijksoverheid, 2021). The day on which authorities issued the closure of all schools, cafes and restaurants, and sports locations was evidently on the 15th of March, a Sunday.

Figure 2. The Event Study Timeline

The estimation window is a period prior to the event in which no relevant factors would affect the target event and is used to calculate the normal return of the firms, as can be seen in figure 2. This period consists of 100 trading days starting on 25-9-2019 and will run until the buffer period starts, which is 17-2-2019. A buffer period, the period between the estimation window and the event window, is used to ensure that the estimation window has no relevant factors that would affect the target event and reflect the normal return of the company (Mackinlay, 1997). The event window starts one trading day before the event date and ends one trading day after the event day, so the event window runs from 12-3-2019 through 17-3-2019. The benchmark for the market return will be the respective index the firm is in, in this case, either AEX, AMX, or AScX. The daily stock return and the daily market return, taken from Capital IQ, are prepared for the market model (Mackinlay, 1997) and are calculated as follows:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \qquad R_{m,t} = \frac{P_{m,t} - P_{m,t-1}}{P_{m,t-1}} \qquad (1)$$

Where:
$P_{i,t}$ is the close price of stock i at date t.
$P_{i,t-1}$ is the close price of stock i at date t-1.
$P_{m,t}$ is the close price of the benchmark at date t.
$P_{m,t-1}$ is the close price of the benchmark at date t-1.

After the normal returns are calculated it is possible to calculate the abnormal return. To measure the impact of the COVID-19 pandemic on stock price requires estimating abnormal returns using the market model method of (Mackinlay, 1997). This is done by subtracting the normal return from the actual return. The calculation is as follows:

$$AR_t = Actual\ return_t - Normal\ return_t \qquad (2)$$

The actual return is the return that the stock made in the event period. In this research, the AEX, AMX, and AScX, the three indices of the Netherlands on the Euronext Amsterdam are used as a benchmark to determine the expected return, together with the market model. The parameters of the market model α and β will be calculated over the estimation window period (Ziobrowski, Cheng, Boyd, & Ziobrowski, 2004). The normal return for any stock *i* is:

$$R_{i,t} = \alpha_i + \beta_i\left(R_{m,t} - R_{f,t}\right) + \varepsilon_{i,t} \qquad (3)$$

$R_{i,t}$ = the actual stock return at time *t*
$R_{m,t}$ = the return of the respective market index at time *t*
$R_{f,t}$ = the risk free rate at time *t*
$\varepsilon_{i,t}$ = the error term at time *t*

Where:

$$\beta_i = \frac{Cov\,(R_i, R_m)}{Var(R_m)} \quad (3.1)$$

$$\alpha_i = R_i - \beta_i R_m \quad (3.2)$$

$$Cov(R_i, R_m) = \frac{1}{T_2 - T_1} \sum_{t=T_1}^{T_2} (R_{it} - R_i)(R_{mt} - R_m) \quad (3.3)$$

$$Var(R_m) = \frac{1}{T_2 - T_1} \sum_{t=T_1}^{T_2} (R_{mt} - R_m)^2 \quad (3.4)$$

$$R_i = \frac{1}{T_2 - T_1 + 1} \sum_{t=T_1}^{T_2} R_{it} \quad (3.5)$$

The yearly risk free rate that is used in this study is 1,6% for 2020 (Fernandez, de Apellaniz, & Acin, 2020). The risk free rate is a theoretical rate of return that any investment should yield with zero risk. The rate represents the minimum return an investor would expect to achieve from a risk-free investment. Nevertheless, it is only a theoretical measurement as all investments carry risk.

Then, the abnormal returns are aggregated over time into the measure of cumulative abnormal return (CAR). $CAR\ [-\tau, +\tau]$ is used to obtain the market reaction on COVID-19 over an interval starting $-\tau$ and ending $+\tau$ trading days around the event date. The cumulative abnormal return can be calculated as follows:

$$\sum_{t=T_1}^{T_2} AR_{it} = CAR_i \quad (4)$$

$$CAR_{it}[-\tau, +\tau] = \sum_{t=T_1}^{T_2} (AR_{it}) \quad (5)$$

where $AR_{i,t}$is the abnormal return of the company and $CAR_{i,t}$is the cumulative abnormal return of the company.

Then a multiple regression is run to predict the value of a variable based on the value of two or more variables. The multiple regression also allows determining the overall fit of the model and the relative contribution of each of the independent variables. The CAR is the dependent variable in a regression model to establish the importance of the independent variables (the firm-specific characteristics) on the market reaction to the COVID-19 pandemic in the following model:

$$\begin{aligned} CAR_{i,t}\,[-\tau, +\tau] = {} & \alpha_0 + \alpha_1 VIND_i + \alpha_2 SIZE_i + \alpha_3 ROA_i \\ & + \alpha_4 OCAP_i + \alpha_5 CASH_i + \alpha_6 FIX_i + \alpha_7 BOARD_i \\ & + \alpha_8 MTB_i + \alpha_9 ESG_i + \alpha_{10} FLEV_i + \varepsilon_i \end{aligned} \quad (6)$$

$CAR_{i,t}\,[-\tau, +\tau]$= the CAR for firm *i* over and interval starting $-\tau$ and ending $+\tau$ trading days respective to the event day. This means $CAR_{i,t}\,[-\tau, +\tau]$ is the three days (-1 to +1) CAR for firm *i* around the day of the lockdown. The ten independent variables have an explanatory value on the dependent variable, CAR.

Then, robustness tests with differences in estimation window and event window are run. This is done to validate the results of the multiple regression. The first robustness test that is run is prolonging the estimation window by 25 and 50 days. Furthermore, the event window is adjusted to -5 +5 and -10 +10 trading days around the event date, March 16th.

Multicollinearity is an assumption that is accounted for as well with the use of SPSS. Multicollinearity refers to a situation where more than two independent variables in a multiple regression are highly linearly related. A Spearman's Rho test is run to check for multicollinearity where correlations of above 0,8 can be a problem. When two variables have correlations of above 0,8 the VIV scores are checked, the VIV score needs to be below 10 for it to be acceptable.

The used data is checked for outliers before the tests. Some extreme observations exert influence on the model biasing the estimates. To eliminate this problem the winsorize method is used. Winsorizing is the transformation of statistics by limiting extreme values in the data to reduce the effect of possible outliers (Dixon, 1960). This study performs a 98% winsorization, meaning; revaluing the top and bottom 1% with the next highest/lowest data point. The top and bottom 1%, in this case, results in just 2 data points since this study has 75 data points per variable.

3.2 Definition of Variables

As previously described, numerous firm-specific characteristics are affecting the market reaction. Several exogenous shocks impact the market reaction and firm-specific characteristics influence this reaction (Haroon & Rizvi, 2020) (Ali, Alam, & Rizvi, 2020). The variables that will be used in this paper are in line with previously published articles studying these exogenous shocks and combined in this research to come to the following variables which are presented on the next page in Table 1 (Xiong, Wu, Huo, & Zhang, 2020) (Kong & Su, 2019) (Shen, Fu, Pan, Yu, & Chen, 2020). The table shows the definition, observation frequency, data source, and the method of data manipulation needed to use the data, per variable.

Table 1. Variables and data overview

The majority of the data is collected through the Capital IQ platform, which is explained in the next chapter, these include; CAR, SIZE, ROA, OCAP, CASH, FIX, MTB, and FLEV. The number of executive board members is obtained with the use of the annual reports. The ESG variable is obtained through the Refinitiv website and the VIND variable through the Euronext Amsterdam website, which is the website of the stock exchange. The independent variables that are used in this study are taken from existing literature. The superscript number you find after the variable is the corresponding study it is taken from. Furthermore, the method of measurement is elaborated upon for each variable.

VARIABLE	DEFINITION	OBSERVATION FREQUENCY	MEASUREMENT
CAR[1,2]	Cumulative Abnormal Return	Daily	See chapter 3.1 Method
SIZE[1,2,3]	Firm Size	Annually	The total assets are used and then the natural logarithm is calculated using Microsoft Excel.
ROA[1,3]	Return on Assets	Annually	The net income is divided by the total assets.
OCAP[1]	Operating capacity	Annually	The total revenue is divided by the total assets.
CASH[1,3]	Cash flow ratio	Annually	The unlevered free cash flow is divided by the total assets.
FIX[1]	Fixed assets to equity ratio	Annually	Adding the net property, plant and equipment, and long-term investments, then dividing it by the total equity value.
BOARD[1]	Board size	Annually	The number of executive board members.
MTB[1,6,7]	Market to Book ratio	Annually	Dividing the market capitalization by the book value.
ESG[4,5]	Environmental, Social, Governance score	Continuously (20-3-21)	The environmental, social and governance score is calculated by the Refinitiv website.
VIND[1,2,3]	Vulnerable industry dummy variable	Continuously (20-3-21)	Firms in the following industries are scored 1: transportation, food and beverage retail, hotel and tourism, postal warehouse, real estate, video entertainment, and construction. The rest of the firms are scored 0.
FLEV[2]	Financial leverage	Annually	The ratio of debt to total assets

1. (Xiong, Wu, Huo, & Zhang, 2020)
2. (Kong & Su, 2019)
3. (Shen, Fu, Pan, Yu, & Chen, 2020)
4. (Albuquerque, Koskinen, Yang, & Zhang, 2020)
5. (Friede, Busch, & Bassen, 2015)
6. (Fama & French, 1992)
7. (Fama & French, 1993)

3.3 Data collection

The data used for the variables as stated above are collected through several channels. The independent variables take the value of the fiscal year before the event. Most of the data, which is financial data, is accessed through a program called Capital IQ. Executive board data is taken from annual reports. Industry allocation and the ESG scores are taken from websites. The 4 channels are elaborated upon in this chapter.

Capital IQ is designed by Standards & Poor's (S&P) and is a market intelligence platform (S&P Global, 2021). The platform is widely used in the financial world, including corporate finance, asset management, equity research, and investment banking. The platform provides data, research, and analysis on private and public companies. This study made use of the excel plugin that allows embedding data queries from the Capital IQ database directly into spreadsheets and formulas.

Every listed company is obliged to deposit an annual report which is public information. An annual report includes for example a balance sheet and profit and loss statement among other information. The 2020 annual reports can be downloaded from company websites which is what this study used to access board size information.

Refinitiv is a London Stock Exchange Group business and is a provider of financial market data and infrastructure (Refinitiv, 2020). Refinitiv provides technology, insights, and information used for investing, trading, and risk decision-making. This study makes use of the website in terms of their Environmental, Social, and Governance scores (ESG). These scores are designed to objectively and transparently measure a company's ESG performance, commitment, and effectiveness. This is done across ten main themes (emissions, human rights, and corporate social responsibility for example) and is based on publicly available data (Refinitiv, 2020). The ESG score ranges from 0-100.

The Euronext Amsterdam is the exchange where the companies used in this study are listed on. One of the things that can be accessed is the individual company page where you can find stock data and company characteristics (Euronext, 2021). Another piece of information found on this website is the industry classification benchmark (ICB) which is used in this study for the vulnerable industry dummy variable. This benchmark is launched by the Dow Jones and FTSE Group which is the British provider of stock market indices. The ICB is globally used to divide markets into increasingly specific categories, from industry level to sector level.

3.4 Selection

The scope of this study is to explore the market reaction of companies listed in the Netherlands to the corona pandemic. The Euronext Amsterdam is the only stock exchange in the Netherlands and therefore selected to take the sample from. The Euronext Amsterdam consists of three main indices; AEX, AMX, and AScX. These three indices contain the 75 largest companies listed in the Netherlands, with the largest companies (by market capitalization) listed on the AEX and the smallest on the AScX. ''The AEX is a free float market capitalization weighted index that reflects the performance of the 25 largest and most actively traded shares listed on Euronext Amsterdam and is the most widely used indicator of the Dutch stock market'' (Euronext, 2021). The remainder of the companies listed in the Netherlands, which are not listed on any of the three discussed indices, are pooled under Euronext 'Lokaal' which consists of around 50 to 60 listed companies with lower market capitalization and trading volume.

3.5 Sample

The sample used in this study for the CAR variable consists of 100 daily observations of the 75 companies listed on the Euronext Amsterdam (divided into the AEX, AMX, and ASCX) around the event date, March 16th, 2020, that are obtained from (Euronext, 2021). The number of daily observations (100) for the estimation period is taken from literature and is the common duration (Mackinlay, 1997). The selection of companies is representative of the population (companies listed in the Netherlands) since these 75 stocks make up more than 50% of the total number of companies listed in the Netherlands (Euronext, 2021). The remainder of the companies listed in the Netherlands are of a much smaller scale, furthermore, the trading volume is a lot smaller and information accessibility is lower. Companies listed in the Netherlands are chosen for this study since the Netherlands is very much a trading country, which is a vulnerability when international trading is slowed down due to a pandemic (Centraal Bureau voor de Statistiek, 2020). Table 2 shows the industry distribution of the companies that make up the sample for this study.

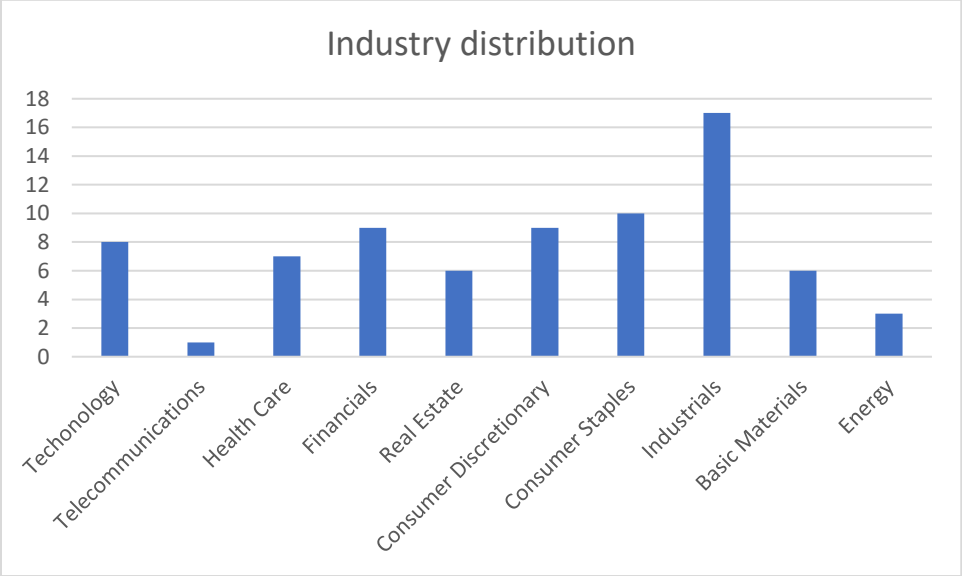

Figure 2 Sample distribution across industries

4. Results

This section will explain the results of the study, starting with addressing the stock market returns in general. Further, the descriptive and statistical analysis is elaborated upon.

Table 2. The AAR and CAAR scores

The average of the results of the average abnormal return and cumulative average abnormal return of the three indices (AEX, AMX, and AScX) is shown below. The first column shows the time period respective to the event date. AAR shows the average abnormal return, this is an average of the 75 companies which is the sample of this study. CAAR is the average of all abnormal returns where the time window t_{-10} means the cumulative average abnormal return 10 days before the event date t and t_{10} means the cumulative average abnormal return during -10 to 10. RR reports the average of the raw returns. The results are presented in decimals, not in percentages.

t	AAR	CAAR	RR
-10	,00	,00	,00
-9	,01	,01	,03
-8	,00	,01	,00
-7	-,02	-,01	-,02
-6	-,02	-,03	-,03
-5	-,07	-,10	-,07
-4	,00	-,10	-,01
-3	-,02	-,12	-,02
-2	-,11	-,23	-,12
-1	,02	-,21	,01
0	-,06	-,27	-,06
1	,00	-,27	,00
2	-,04	-,31	-,05
3	,00	-,30	,02
4	,03	-,27	,03
5	-,02	-,30	-,03
6	,06	-,24	,08
7	,02	-,22	,03
8	,01	-,21	,02
9	-,03	-,24	-,04
10	,00	-,24	,00

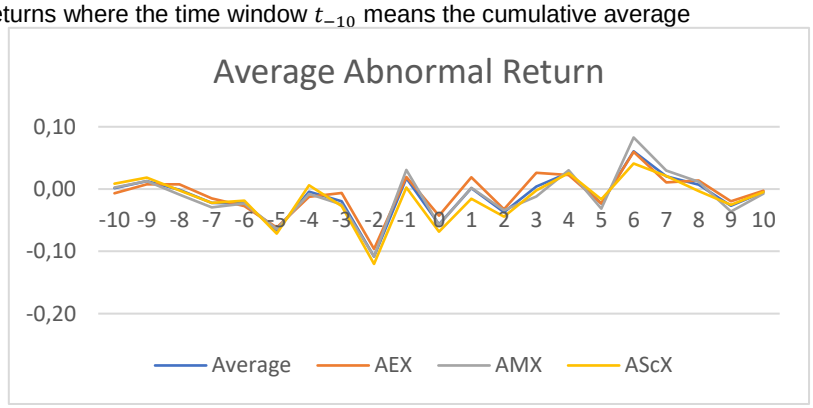

Figure 4 Average Abnormal Return

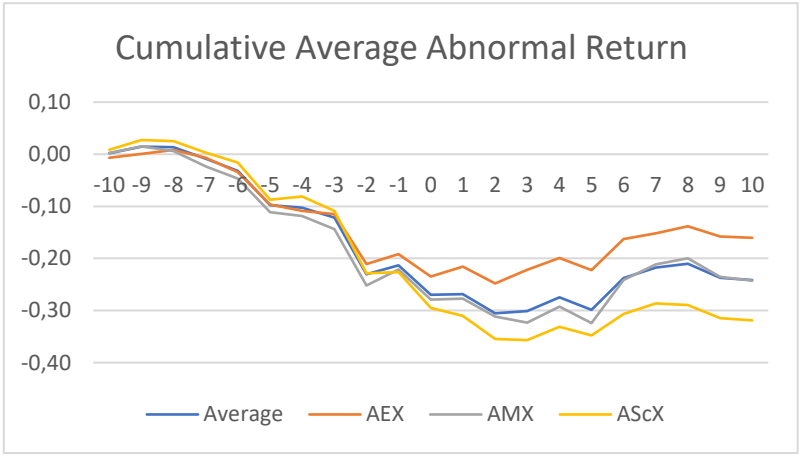

Figure 5 Cumulative Average Abnormal Return

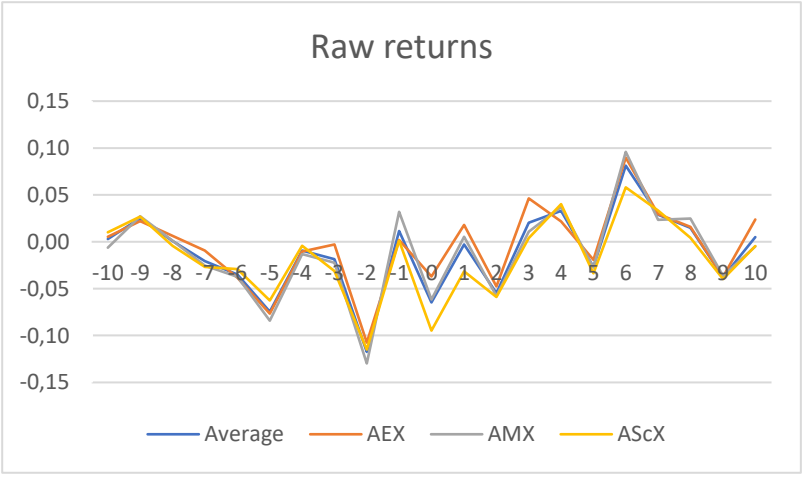

Figure 6 The raw returns

Table 2 presents the results for the average abnormal return, the cumulative average abnormal return, and the raw returns for various days. The time window t_8 for example shows the abnormal return and raw return of only day 8 after the event date t_0. However, for the cumulative average abnormal return, t_8 represents the window of t_{-10} through t_8. The CAAR is the cumulative average abnormal return, which is the average of the abnormal returns of all the companies in the sample. The decimal change is presented in the table, where ,01 corresponds to a positive increase of 1%. Noticeably is the -7% five days prior to the event date and -11% two days prior to the event date. The event date reports a negative change of -6%. The CAAR shows a negative change of -27% in the ten days prior to the event date. In the ten days after the event date, the cumulative average abnormal return is positive with a positive change of 3%. The all-time low of the cumulative average abnormal return is at two days after the event date at -31% as shown in figure 5. Furthermore, figure 5 shows that the AEX performs relatively better than the other 2 indices where the AScX shows the poorest performance. Table 2 and figure 6 show the raw returns with most of the negative performance prior to the event date. After the event date, the raw returns show positive performance.

4.1 Descriptive analysis

4.1.1 Descriptive statistics

As mentioned in chapter 3, the data that is used in this study is winsorized. A table with all the adjustments can be found in appendix A. The descriptive statistics of the variables used in this study are reported in table 3.

Table 3. Descriptive analysis of the variables
The descriptive statistics for the dependent variable (CAR -1, +1) and ten independent variables. The sample consists of 75 companies from the AEX, AMX, and AScX.

VARIABLE	N	MEAN	MEDIAN	STD. DEVIATION	MINIMUM	MAXIMUM
CAR (-1,+1)	75	-,02	-,015	,09	-,26	,15
SIZE	75	8,12	8,02	2,19	4,34	12,99
ROA	75	3,48	3,17	6,02	-14,91	15,66
OCAP	73	,82	,71	,69	,02	2,84
CASH	72	,02	,016	,03	-,07	,11
FIX	61	,98	1,03	3,42	-11,43	9,75
BOARD	75	7,40	7	3,37	2,00	15,00
MTB	73	3,76	2,14	5,14	,23	25,20
ESG	56	61,20	62	17,61	28,00	91,00
VIND	75	,39	0	,49	,00	1,00
FLEV	75	,57	,56	,23	,04	,95

Figure 7 shows a histogram of the data distribution of CAR (-1,+1). The histogram shows a normal distribution of the data. The mean value of CAR is -1,75 %, the minimum value is -26% and the maximum value is 15%. The median of CAR is -1,5%. These results are comparable to prior literature with a similar study concerning Chinese companies (Xiong, Wu, Huo, & Zhang, 2020).

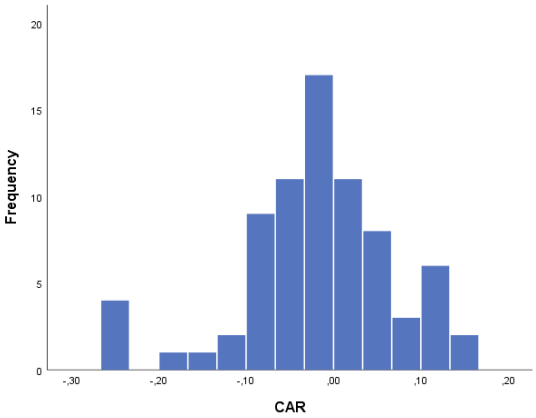

Figure 7 Histogram Cumulative Abnormal Return

The natural logarithm of the data of the size variable is taken to respond to skewness towards large values. The standard deviation from the mean is 2,18982 which is an acceptable value. The raw size of the companies varies a lot, from a couple of hundred billion to around 50 million.

The mean and median of the return on assets variable are 3,47% and 3,16% respectively which is similar to a similar study, however, with Chinese data (Xiong, Wu, Huo, & Zhang, 2020). The standard deviation of ROA is around 6%.

The operating capacity measuring the efficiency of a firm's assets in generating revenue has a mean of ,8189, another study using this measure had a value of ,6 which is lower, however, the Netherlands has a more retail and service driven industry (Xiong, Wu, Huo, & Zhang, 2020). The ratios can't be compared between firms, since the firms are operating in many different industries where different ratios are considered high or low. Retail or service industry companies have relatively high ratios compared to the manufacturing industry since those firms have large asset bases.

The free cash flow to total assets ratio also shows how efficiently a company generates cash flow from its assets. The variable has a mean and median of ,0201 and ,0164 respectively. These values are lower compared to previous literature since the free cash flow is used rather than the total cash flow (Xiong, Wu, Huo, & Zhang, 2020).

The fixed assets ratio measures the contribution of shareholders and the contribution of debt financing in the fixed assets of the company. The mean value of 1,0323 indicates that the shareholders' equity is less than the fixed assets and that the company is using debt to finance a portion of the fixed assets. If the score is below 1 it means that the shareholders' equity is more than the fixed assets of the company and the shareholders' equity if also financing a part of the working capital.

The board size variable has a mean and median of 7,4 and 7 respectively. The smallest board, after winsorizing, consists of only 2 people while the largest board has a size of 15 people. The board size is a lot larger compared with the other study where they found a mean of 2.225 with Chinese companies.

The market to book ratio evaluates the company's current market value relative to its book value. The mean value of 3,7646 could be an indication that the stock is overvalued or that the company is performing well.

The non-financial performance of a company is measured in the ESG variable. A mean score of 62 indicated a good performance and above average degree of transparency in reporting ESG data. The ESG score ranges from 0-100 and is split up into quartiles; poor, satisfactory, good, and excellent. Scores above 25 are considered to be satisfactory meaning that all companies perform satisfactorily (Refinitiv, 2020).

The vulnerable industry variable is measured as either 0 or 1. The mean value of ,3867 indicates that 38,67% of the companies operate in a vulnerable industry. The reasoning behind the allocation of a company to either be in a vulnerable industry or not can be found in chapter 3. This value differs from the other study by Xiong et al. (2020), 18,6%. The difference can be caused by the sample size since the industry classification benchmark is indisputable.

The financial leverage variable shows the proportion of debt to assets of a company. The mean value of ,5748 is seen as relatively high meaning that more than half of the total assets are financed with debt. For every 0,5748 dollars of debt, the companies have 1 dollar of assets.

4.1.2 Bivariate test

Table 4. Multicollinearity matrix and VIF scores

Represented are the results of the multicollinearity analysis in SPSS with an additional column showing the VIF scores. The VIF estimates how much the variance of the regression is inflated due to the multicollinearity. High VIF scores make the regression results less reliable. VIF scores range from 1 upwards where; 1 is not correlated, 1-5 is moderately correlated and 5-10 or greater is highly correlated. The correlations are valued 0 through 1, where 1 means fully correlated and 0 not correlated at all.

	CAR	SIZE	ROA	OCAP	CASH	FIX	BOARD	MTB	ESG	VIND	FLEV	VIF
CAR	1	,03	-,02	,16	,06	,08	,24	,03	,08	-,10	,10	
SIZE	,03	1	,09	-,41	,20	,14	,58	-,26	,59	-,07	,35	2,32
ROA	-,02	,09	1	,20	,51	-,13	,08	,25	,07	,13	,07	1,15
OCAP	,16	-,41	,20	1	,00	,01	-,17	,12	-,15	,04	-,17	1,39
CASH	,06	,20	,51	,04	1	-,06	,08	-,03	,07	-,07	,01	1,24
FIX	,08	,14	-,13	,01	-,06	1	-,06	-,18	,03	-,09	,12	1,10
BOARD	,24	,58	,08	-,17	,08	-,06	1	,02	,39	-,10	,20	1,51
MTB	,03	-,26	,25	,12	-,03	-,18	,02	1	-,16	-,18	,17	1,42
ESG	,08	,59	,07	-,15	,07	,03	,39	-,16	1	,13	,27	2,00
VIND	-,10	-,07	,13	,04	-,07	-,09	-,10	-,18	,13	1	,04	1,27
FLEV	,10	,35	,07	-,17	,01	,12	,20	,17	,27	,04	1	1,25

The pair-wise correlation among the variables is generally low (<,60) as shown in table 4 according to the multicollinearity analysis. From table 4, the most significant correlation between independent variables is shown between SIZE and ESG with a coefficient of correlation at ,59. A multicollinearity problem occurs when the correlation between two or more variables is ,8 or above (Gujarati, 2004). Therefore, there is no multicollinearity problem between variables in this study. Although there is no multicollinearity problem, a multiple regression is run without SIZE included, however, the results barely change which can be found in appendix B. A multiple regression is also conducted without the ESG variable with the same results, which can be found in appendix C.

Furthermore, to confirm the variables are acceptable, the variance inflation factor (VIF) scores are consulted and reported in table 4 in the column on the right. The variance inflation factor detects multicollinearity in multiple regression analysis. VIF scores below 10 are acceptable; however, scores below 5 are more reliable and are used as a benchmark (Dodge, 2008). The VIF scores of all the variables are all well under the benchmark of 10, so there is no further action needed and all variables are acceptable.

4.2 Statistical analysis

4.2.1 Empirical results

Table 5 presents the results of the multiple regression performed in SPSS. The proportion of variance in the dependent variable which can be predicted from the independent variables is R-Square=,260. This value indicates that 26% of the variance of the dependent variable can be predicted from the independent variables. This is an overall measure of association, it does not reflect to which any singular independent variable is associated with the dependent variable. Each independent variable will explain a part of the found the variance in the dependent variable due to chance. The Adjusted R-Square attempts to yield a more truthful value to estimate the R-Square. Note that the R-Square is small (relative to the ratio of parameters to cases), the Adjusted R-Square is ,043. The standard deviation of the error term calculated as the square root of the mean square residual equals ,08043. Table 5 also shows the F-value which explains something about whether the overall regression model is a good fit for the data. The total variance is partitioned into the variance which is explained by the independent variables (regression) and the variance that is not explained by the independent variables (residual or error). The F-value is the mean square regression of 0,008 divided by the mean square residual of ,006 resulting in F=1,196. The p-value associated with this F-value is high at ,328 which is greater than the alpha level of ,05. This p-value means that the independent variables as a group do not show a statistically significant relationship with the dependent variable, or it does not reliably predict the dependent variable. The ability of any singular independent variable to predict the dependent variable is also shown below in table 5.

Table 5. Multiple regression coefficients

The multiple linear regression estimates including the intercept and significance levels are presented. A non-significant intercept is found together with a lot of insignificant variables. Only 'BOARD' shows a significant coefficient of ,015. The F-value explaining the overall fit of the model is 1,196. The R-squared and adj. R-squared are ,260 and ,043 respectively.

	B	STD. ERROR	T	SIG.
(CONSTANT)	-,076	,087	-,879	,385
SIZE	-,004	,010	-,393	,697
ROA	,001	,003	,333	,741
OCAP	,010	,024	,424	,675
CASH	,004	,420	,009	,993
FIX	,002	,003	,480	,634
BOARD	,012	,005	2,561	,015*
MTB	-,003	,003	-1,040	,306
ESG	-,001	,001	-1,097	,280
VIND	,032	,028	1,133	,265
FLEV	,091	,061	1,493	,145
N				45
F				1,196
R-SQUARED				,260
ADJ. R-SQUARED				,043

Note.

* indicates significance level at 5% level.

Table 5 shows the coefficients of the multiple regression run in SPSS. The first variable, (constant), represents the Y-intercept, the predicted value of the dependent variable when all other independent variables are 0, which is -,076. The second column β shows the estimates for the regression equation for predicting the dependent variable from the independent variable. The estimates tell the amount of increase or decrease in CAR that would be predicted by a 1 unit increase in the independent variable. The column SIG. represents the p-value of the respective variable.

The only variable that has a coefficient that is statistically significantly different from 0 using an alpha of ,05 is 'BOARD'. All the other variables have a coefficient that is larger than ,05. The coefficient for BOARD (,015) is statistically significantly different from 0 using an alpha of ,05 because its p-value (,012) is smaller than ,05. This result suggests that for every unit increase, meaning an additional person on the board, a ,012 increase in CAR is predicted when all other variables are held constant.

Figure 8 shows a scatterplot with the trendline of the BOARD variable and CAR at time intervals -1 to +1. The trendline is upwards indicating that more board members result in a higher cumulative abnormal return at -1, +1.

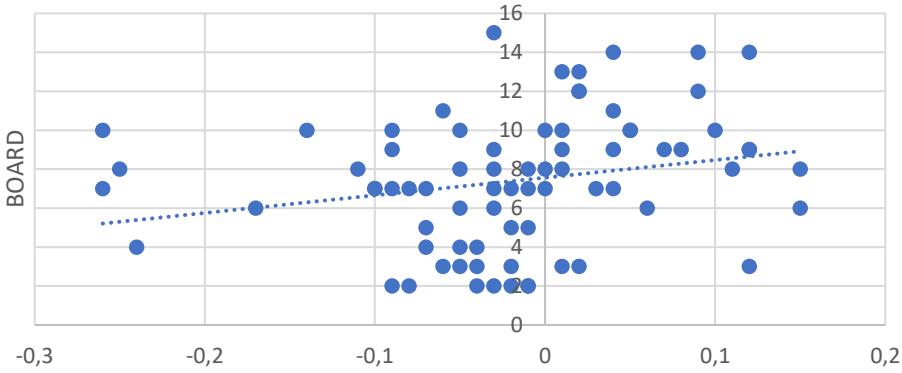

Figure 8 CAR vs BOARD scatterplot with trendline

The majority of the remaining variables have coefficients that are as expected and hypothesized, though they are insignificant. The following variables move as expected; ROA, OCAP, FIX, MTB, VIND, and VLEF. A movement as expected means that the coefficient either positive or negative, is in the same direction as hypothesized. Two variables moved in a different direction than was expected, though still insignificant, which were SIZE and ESG. A larger market capitalization and higher ESG score are indicated to have a negative impact on the abnormal return (although these results are insignificant).

Omitting non-statistically relevant variables analysis gives similar results to the results shown previously. The statistically relevant variable BOARD remains statistically relevant. The non-statistically relevant variables remain irrelevant.

4.2.2 Robustness tests

To ensure that the results in table 5 are robust, several robustness tests are run. The event window and estimation window are prolonged. The event window of the cumulative abnormal return is prolonged to -5 before the event date and +5 days and in another test to -10 and +10 days.

4.2.2.1 Robustness test using an alternative event window (CAR *-t* , *+t)*

Table 6 reports the p-values of the independent variables. Using an event window of 11 days, CAR(-5,+5), results in an insignificant p-value for the board variable. The ESG variable however does have a significant p-value since it is a 1-tailed test which means the p-value needs to be divided by 2 resulting in a significantly different p-value of ,043 which is less than the alpha of ,05. The coefficient for ESG at CAR(-5,+5) is -,003.

Using an event window of 21 days, CAR(-10,+10), results in significant p-values for both board and ESG. The p-values of Board and ESG are ,022 and ,024 respectively. The β values for Board and ESG at CAR(-10,+10) are ,021 and -,005 respectively. A higher ESG resulting in a lower cumulative abnormal return is surprising since a higher ESG score is perceived positively by investors.

Table 6. Event window robustness tests
The event window is prolonged from -1,+1 which is shown for comparison, to -5,+5 and -10,+10 days around the event date. A multiple linear regression is performed with the significance values presented below. The alpha level is ,05. The table shows 'BOARD' and 'ESG' with statistically significant values.

DEPENDENT VARIABLE CAR	**CAR (-1,+1)**		**CAR (-5, +5)**		**CAR (-10,+10)**	
	β	t Value	β	t Value	β	t Value
(INTERCEPT)	-,076	-,879	-,199	-1,307	-,102	-,551
SIZE	-,004	-,393	,011	,617	,008	,403
ROA	,001	,333	,004	,748	,003	,471
OCAP	,010	,424	,029	,685	,003	,063
CASH	,004	,009	-,725	-,986	-,250	-,279
FIX	,002	,480	-,003	-,556	-,001	-,188
BOARD	,012*	2,561	,009	1,055	,022*	2,151
MTB	-,003	-1,040	,000	,049	,004	,499
ESG	-,001	-1,097	-,003*	-1,921	-,005*	-2,582
VIND	,032	1,133	,016	,324	,004	,059
FLEV	,091	1,493	,070	,658	,027	,206
N						45
F		1,196		,821		1,427
R-SQUARED		,260		,195		,296
ADJ. R-SQUARED		,043		-,042		,088

Note.
* indicates significance level at 5% level.

Out of the ten variables, two variables change from being significant to insignificant or vice versa when adjusting the event window to -5 and +5 days (BOARD and ESG). The variable Board is insignificant with an event window of -5 and +5 days. ESG becomes significant with an event window of -5 and +5. Out of the ten variables only 1 variable changed from being insignificant to significant when adjusting the event window to -10 and +10 days (ESG). Both ESG and Board are statistically significantly different from 0 using an alpha of ,05 with an event window of -10 and +10. The other results are qualitatively similar to the main test of CAR(-1,+1), suggesting that the data is robust.

4.2.2.2 Robustness test using an alternative estimation window

Table 7 reports the significance levels of the independent variables. The estimation window is prolonged with 25 and 50 days for the robustness tests concerning the estimation window. The variable board is significantly different from 0 in both tests with significant p-values of ,015 and ,016 respectively. The β values corresponding to the p-values are ,012 and ,012 respectively, these results also suggest that for every additional person on the board that the CAR is predicted to increase with ,012, when all other variables are held constant. All results are qualitatively similar to the main test with CAR(-1,+1), suggesting that the data is robust.

Table 7. Estimation window robustness tests
The estimation window is prolonged from 100 days, which is shown as a comparison, to 125 and 150 days. The event window remains the same at -1 to +1. A multiple linear regression is performed with the significance values presented below. The alpha level is ,05. The table shows only 'BOARD' with statistically significant values.

DEPENDENT VARIABLE CAR -1, +1	**CAR 100 DAYS**		**CAR 125 DAYS**		**CAR 150 DAYS**	
	β	t Value	β	t Value	β	t Value
(INTERCEPT)	-,076	-,879	-,080	-,927	-,081	-,934
SIZE	-,004	-,393	-,003	-,349	-,004	-,357
ROA	,001	,333	,001	,331	,001	,310
OCAP	,010	,424	,011	,435	,010	,430
CASH	,004	,009	,026	,062	,023	,056
FIX	,002	,480	,002	,438	,002	,456
BOARD	,012*	2,561	,012*	2,563	,012*	2,538
MTB	-,003	-1,040	-,003	-1,049	-,003	-1,017
ESG	-,001	-1,097	-,001	-1,114	-,001	-1,080
VIND	,032	1,133	,031	1,101	,031	1,104
FLEV	,091	1,493	,090	1,486	,091	1,486
N						45
F		1,196		1,182		1,176
R-SQUARED		,260		,258		,256
ADJ. R-SQUARED		,043		,040		,037

Note.
* indicates significance level at 5% level.

4.2.2.3 Robustness test using an extended event and estimation window

Table 8 shows the results of the robustness test with a combined extended event window and estimation window. The event window is again extended to -5 +5 and -10 +10 in combination with an extended estimation window of 125 days and 150 days. As presented in the table below, both Board and ESG show statistically significant values. One surprising thing is the significance of ESG since it did not show significant results when only the estimation window was extended. Nevertheless, the results are similar to the main test with CAR (-1, +1) suggesting that the data is robust.

Table 8. Event and estimation window robustness tests

The event window and estimation window are both extended at the same time. The event window and estimation window are extended with the same period as previous robustness tests, however, this time it is done simultaneously. The alpha level remained at 5%. Both Board and ESG show statistically significant values.

DEPENDENT VARIABLE CAR	CAR 125 DAYS + -5, +5		CAR 125 DAYS + -10, +10		CAR 150 DAYS + -5, +5		CAR 150 DAYS + -10,+10	
	β	t Value	β	t Value	β	t Value	β	t Value
(INTERCEPT)	-,220	-1,395	-,131	-,692	-,248	-1,526	-,151	-,773
SIZE	,015	,812	,012	,567	,015	,824	,013	,574
ROA	,004	,727	,003	,399	,004	,658	,003	,381
OCAP	,033	,751	,011	,205	,036	,787	,012	,219
CASH	-,555	-,728	-,075	-,082	-,577	-,736	-,114	-,121
FIX	-,005	-,761	-,003	-,342	-,004	-,649	-,002	-,285
BOARD	,008	,943	,021*	2,022	,007	,836	,020*	1,918
MTB	,000	-,058	,004	,509	,001	,114	,004	,577
ESG	-,004*	-2,010	-,006*	-2,597	-,003*	-1,803	-,005*	-2,424
VIND	,011	,217	-,003	-,041	,014	,277	,001	,018
FLEV	,066	,597	,024	,179	,068	,595	,023	,168
N								45
F		,777		1,408		,689		1,262
R-SQUARED		,186		,293		,168		,271
ADJ. R-SQUARED		-,053		,085		-,076		,056

Note.

* indicates significance level at 5% level.

5. Conclusion and Discussion

5.1 Conclusion

This research aimed to identify the effect of firm-specific characteristics on the stock market returns to the COVID-19 pandemic in the Netherlands based on the three main stock market indices. This was done with the use of an event study method with multiple regression run in SPSS. A multiple regression with ten firm-specific characteristics was run with data collected mainly through CapitalIQ and annual reports. The event date of the event study was the day on which the national lockdown was in effect (March 16th), which was the day after it was announced. The study showed a negative stock price movement around the event date.

Based on the results of the multiple regression it can be concluded that the only firm-specific characteristic that has shown to have a significant impact on stock market reaction to COVID-19 was the variable board size. Board size was the only variable with statistical differences indicating that a higher board size resulted in a less adverse impact on the firm's reaction to the pandemic in terms of their cumulative abnormal return.

This is, however, contradictory to the hypothesis and previous literature that was used to construct the hypothesis (Xiong, Wu, Huo, & Zhang, 2020). It was hypothesized that a larger board would have a negative impact on the cumulative abnormal return, however, the opposite was found.

This study furthermore rejects all other hypotheses since no significantly different values from 0 have been found. This is contradictory to previous literature claiming the influence of firm-specific characteristics on the stock markets returns to the COVID-19 pandemic (Xiong, Wu, Huo, & Zhang, 2020) (Kong & Su, 2019) (Shen, Fu, Pan, Yu, & Chen, 2020) (Albuquerque, Koskinen, Yang, & Zhang, 2020). Yet, this study concludes that firm-specific characteristics do not have an impact on the stock market returns to the COVID-19 pandemic in the Netherlands.

To reach the research goal of this study, the following research question was formulated: *Which firm-specific characteristics affect the market reaction of companies listed in the Netherlands to the COVID-19 pandemic?* The only variable with a statistically significant value was the variable board size. Although it was not the expected direction as the hypothesis is formulated, it can be concluded that the board size of a company does affect the market reaction of companies listed in the Netherlands to the COVID-19 pandemic. A larger board size has, as concluded in this study, a positive influence on the cumulative abnormal return. The p-values for the other 10 variables in the multiple regression had insignificant values.

Despite the results of the multiple regression, this study does fill a gap in the literature as it adds to the existing literature on the relationship between firm-specific characteristics and the market reaction to the COVID-19 pandemic and is the first to investigate this in the Netherlands. Moreover, this study contributes to the understanding of how firm-specific characteristics influence the economic impact of the COVID-19 pandemic.

Furthermore, this study has practical relevance in understanding certain market reactions with the finding that larger boards absorb such an exogenous shock better than smaller boards. The increase of one board member increases the cumulative abnormal return with ,012. As can be concluded from the robustness tests, when using a longer time frame for the cumulative abnormal return the ESG score is also significant. However, the correlation is negative, indicating that a higher ESG score is negatively impacting the cumulative abnormal return which is not as expected (Albuquerque, Koskinen, Yang, & Zhang, 2020) (Friede, Busch, & Bassen, 2015). The practical relevance practitioners, executives, and managers can take from this study is that the firm-specific characteristics do not have a major impact on the stock market reaction as stated in this study except for board size.

5.2 Discussion

The study demonstrates a correlation between the board size and the cumulative abnormal return as hypothesized. The analysis does not support any of the other hypotheses of other variables influencing the cumulative abnormal return in this data set.

The reliability of the data is impacted by the sample size of this study. Although more than half of the total population is included in the data sample, not every listed company in the Netherlands is taken into consideration, only the companies listed on the three indices (AEX, AMX, AScX). The remainder of the companies could be included, however, data collection will be problematic since the remainder of the companies are a lot smaller by size with less elaborate annual reports making data collection difficult resulting in a greater number of missing values. The relatively small sample size could be the reason why this research shows contradictory results compared to the literature this research study's hypothesis was based on.

Another limitation of this research is the event date, as COVID-19 did not suddenly appear and was present in countries around the world, businesses and stock markets reacted to this exogenous shock before the lockdown was announced. Although there is a strong reaction measured around the event date, this may be only the partial reaction of the stock market. As the results showed, the stock market reacted heavily before the event date, meaning that the companies already reacted to the upcoming announcement. A reason for this could be that the cases in the Netherlands increased rapidly on the 11th of March 2020, resulting in additional restrictions the next day. The actual lockdown occurred on the 16th of March, i.e. the event date. The economy and stock market usually move before the news is out. Adding to this, since the COVID-19 pandemic is worldwide, the Dutch stock market saw the regulatory announcements in other countries, weeks or even months prior, and moved before the Dutch government implemented regulations themselves. Instead of looking at the lockdown as the event date, one could look at the infection rate or death rate and take a different event window.

Furthermore, more firm-specific characteristics could be investigated that are not included in this study. This research chose to discard the TOBIN's Q ratio as a characteristic due to its multicollinearity and similarity with the market-to-book ratio. There are also different study methods, for example, a time series analysis, that are applicable but not chosen in this study, these other methods could result in different conclusions as this study scopes in on the event date.

The practicality of this study lies in financial portfolio management. The results of this study should be taken into account when considering how to diversify financial portfolios in terms of exogenous shock absorbency. The results show a clear correlation that a larger board results in greater abnormal returns during a pandemic.

5.3 Further research

As described in Section 5.2, several limitations require further research. First, to extend the sample size used, one could add additional stock listed Dutch companies to test if the conclusions still hold with increased sample size.

In addition to increasing the sample size with Dutch companies, one could use the same research methodology to investigate German listed companies as the COVID-19 restrictions of the Netherlands and Germany have often been compared as well as both countries sharing similar economic characteristics. Although this would require an adjusted estimation window and event date, the sample size of German listed companies is expected to be larger compared to the sample size used in this research study.

In addition to testing the conclusions of this research study by addressing the limitations, conducting more detailed further research in separate sectors within the current sample size of Dutch listed companies is suggested. Expected is to see differences in the impact of firm-specific characteristics on COVID-19 depending on the sector the company is in. In addition, certain sectors experience very negative results from the lockdown whilst others have greatly benefited from it. Follow-up research is suggested as this might provide additional findings

Lastly, conduct additional research into the event date by comparing Dutch COVID-19 restriction news announcements with those of neighboring countries or major events in global markets such as the United States or China. As expected that the market has responded to potential lockdown expectations before the actual announcement, i.e. the event date, taking the lockdown announcements of other countries, and comparing them with the results of the Dutch listed companies from this thesis might provide additional insight on which firm-specific characteristics affect the market reaction of COVID-19.

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7. Appendix

Appendix A

The following adjustments have been made in the winsorize method.

VARIABLE	MINIMUM	MAXIMUM	NEW MINIMUM	NEW MAXIMUM
CAR (-1,+1)	-0,35 Eurocommercial	0,19 OCI	-0,26 Grandvision	0,15 Justeat
SIZE	3,83 Vivoryon	13,70 ING	4,34 Alfen	12,99 Aegon
ROA	-74,68 Kiadis	20,29 Pharming	-14,90 Avantium	14,99 ASMI
OCAP	0,02 ING	6,52 AMSCOM	0,022 ABN	2,84 ForFarmers
CASH	-,21 Kiadis	,59 Galapagos	-0,072 Accell	0,11 Hunterdouglas
FIX	-12,94 KPN	53,08 AirfranceKLM	-11,43 Heineken	9,75 OCI
BOARD	1,00 AMSCOM	19,00 AirfranceKLM	2 Multiple companies	14 Multiple companies
MTB	-47,33 PostNL	44,96 CMcom	0,22 Aegon	25,19 Alfen
ESG	24,00 Prosus + Brunel	92,00 Unilever	28 BSgroup	91 URW
FLEV	0,03 Vivoryon	0,96 van Lanschot	0,03 ForFarmers	0,95 Flow

Appendix B

The multiple regression output from SPSS with the dependent variable CAR (-1, +1) without the SIZE variable.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-,099	,064		-1,562	,127	-,228	,030
	ROA	,001	,003	,073	,427	,672	-,005	,007
	OCAP	,014	,022	,098	,609	,547	-,032	,059
	CASH	,031	,409	,012	,077	,939	-,798	,861
	FIX	,001	,003	,065	,433	,668	-,005	,008
	BOARD	,011	,004	,438	2,630	,013	,003	,020
	MTB	-,003	,003	-,179	-1,033	,309	-,010	,003
	ESG	-,001	,001	-,266	-1,449	,156	-,003	,000
	VIND	,034	,027	,200	1,243	,222	-,021	,089
	FLEV	,091	,060	,247	1,515	,139	-,031	,214

a. Dependent Variable: CAR

Appendix C

The multiple regression output from SPSS with the dependent variable CAR (-1, +1) without the ESG variable.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-,086	,075		-1,151	,256	-,236	,064
	SIZE	-,009	,008	-,221	-1,113	,271	-,025	,007
	ROA	-8,152E-5	,003	-,005	-,031	,975	-,005	,005
	OCAP	,013	,021	,099	,639	,526	-,029	,056
	CASH	,006	,381	,002	,016	,988	-,762	,774
	FIX	,004	,003	,155	1,116	,270	-,003	,010
	BOARD	,011	,004	,438	2,502	,016	,002	,020
	MTB	,000	,003	-,021	-,138	,891	-,005	,005
	VIND	,019	,023	,114	,818	,417	-,028	,066
	FLEV	,070	,056	,181	1,260	,214	-,042	,182

a. Dependent Variable: CAR