

Master Thesis

The effect of company specific factors including financial ratios, industry, and country on share price reactions during the COVID-19 market crash on firms listed on the STOXX Europe 600.

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Abstract

This thesis investigates the economic downturn caused by the COVID-19 pandemic and the eventual recovery caused by measures taken by governmental bodies on companies listed on the STOXX Europe 600. Next to that, factors driving both cumulative abnormal returns and cumulative returns are researched through cross-sectional regression analyses. The results of the event study indicate a large significant market decline of 38.25% more than expected during the first wave of COVID-19 around early-mid March. The results of the regression analysis indicate that leverage, size, book-to-market value of equity, liquidity, beta, industry of operation, and country of operation all explain cross-sectional variation of returns during the pandemic in varying degrees. More specifically, beta negatively affected returns, book-to-market value of equity negatively affected returns, leverage negatively affected returns, size negatively affected returns, and liquidity positively affected returns. Besides these variables, the results indicate that the energy, consumer discretionary, industrials, real estate, financials, communication services, and utilities sectors performed worse than expected during the crisis whilst the materials, information technology, consumer staples, and health care sectors performed better than expected during the crisis. The robustness checks performed show consistency in the results, and the results are largely comparable to US based studies.

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1. Introduction

Stock market crashes have been researched extensively in the past and it is still a topic that is interesting for further research in order to learn from crashes and potentially prevent them from happening in the future. After The World Health Organization declared the COVID-19 outbreak a world-wide pandemic on March 11th in 2020 (Cucinotta & Vanelli, 2020), stock markets all over the world sustained major crashes that were associated with the first major wave of the pandemic (Contessi & De Pace, 2021). The severity of the crash can for instance be seen in the Dow Jones Industrial Average, which lost roughly 26% of its value during this crash (Mazur et al., 2021). Ramelli and Wagner (2020) argue that the pandemic opens up a valuable opportunity to research drivers of firm value during exogenous shocks. As pandemics like these are tail risk events, and data on how tail risk events affect the economy are scarce, outbreaks like these grant academics the possibility to learn more about the effects of these events.

Research on the effects of the pandemic on stock markets has been conducted extensively by academics prior to this thesis. Bash (2020) found statistically significant negative stock market returns following the COVID-19 outbreak, substantiating the phenomenon. Dutta et al. (2020) looked at energy markets in particular and found that these markets were negatively affected by the COVID-19 outbreak. Ramelli and Wagner (2020) found corporate debt to be negatively affecting stock prices, and cash holdings to be positively affecting stock prices during the COVID-19 pandemic. However, as with many other research in the field of economics, the current research mainly focuses on the United States stock markets. This opens up the possibility to conduct research on the effects on European stock markets and compare the results with results from U.S. data.

The first gap this thesis will address, is the disproportionality between U.S. based studies and European based studies by conducting research on European stock market data. The market index used is the STOXX Europe 600, which consists of 600 large cap, mid cap, and small cap public corporations from a variety of different European countries. Besides that, regardless of the preceding research, the effects of the COVID-19 pandemic on stock markets is still a novel topic that is open for discussion. Reason being is that the extent to which measures are taken in order to mitigate the negative effects of COVID-19 on people their health goes far beyond what is seen in previous pandemics. For this reason it is expected that the magnitude of the effects of COVID-19 on stock markets is way larger than the effects of previous pandemic outbreaks on stock markets.

In this thesis, both the effect of COVID-19 on stock returns in European markets, and

the effect of various corporate characteristics that influenced these stock returns during the COVID-19 market crash will be researched. The first analysis is conducted through an event study in which four different negative event windows, derived from Ramelli and Wagner (2020), three different positive event windows, derived from the European Commission (2021) and the European Central Bank (2020), and the entire negative and positive window are researched. The second analysis will be carried out through a cross-sectional regression methodology, in which the cumulative abnormal returns are determined by firms' multiple financial ratios, the industries they operate in, and the countries they operate in. Used for both analyses is the STOXX Europe 600 Europe index which represents large, mid, and small capitalization companies from Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. The research question that addresses the topic reads:

“What were the effects of company specific factors such as financial ratios, industry, and country on share price reactions during the COVID-19 market crash on firms listed on the STOXX Europe 600?”.

Conducting research on this topic contains both scientific and practical relevance as it adds to the literature of the effect of tail risk events on financial markets, it potentially helps corporations in their learning process in order to mitigate effects of tail risk events in the future, it opens up conversation for investors to reallocate their funds to investments more resilient to stock market crashes, it adds to the literature of the effects of the relatively recent COVID-19 outbreak on financial markets which is interesting as this pandemic differs significantly from past crises (Reinhart, 2020), it validates previous results and extends these results to Europe, it adds empirical results to the literature on economic consequences of pandemics in general, and it adds to the literature of the effect of a firm's riskiness on returns by including the listed firm's betas in the cross-sectional regression analyses.

The event study conducted in this thesis showed a steep market decline of 38.25% more than expected during the first wave of COVID-19 around early-mid March, and a market increase of 6.438% more than expected after the announcement of the extension of the asset purchasing program. The regression analyses that aimed at explaining variation in cross-sectional returns showed that leverage, size, book-to-market value of equity, liquidity, beta, industry of operation, and country of operation all explained parts of this variation. Another interesting finding was the notion that several industries performed significantly worse than others during the crisis, indicating that there was variation in how different sectors were

affected by the crisis. Unexpectedly, the technology sector performed significantly better than others whilst the consumer discretionary sector performed significantly worse than others

From here on the thesis starts off with the literature review, then goes on to the data and methodology, then goes on to the results, and at last the concluding remarks are given.

2. Literature overview

2.1 Stock market prices, reactions, crashes, and asset pricing models; Economic theory

Investors have been trying to investigate and forecast stock prices and capital market developments for years on end now. Important to note is that it has been established that macroeconomic factors, corporate financial results, political situations, and industry branch figures do indeed influence stock market prices (Celebi & Hönig, 2019). Especially in the digitalized world we currently live in, information that affects investors' beliefs is readily available on any online platform. According to Celebi and Hönig (2019), this results in both market returns and risks being more difficult to estimate. Haroon and Rizvi (2020) elaborate further on the notion of the digitalized world and its effects on the stock markets. They argue that the media can cause panic amongst investors which leads to investors not accurately assessing the potential effects of certain events causing substantial increases in markets' volatility. The notion that information affects stock market prices is a well-established fundamental economic theory called the efficient market hypothesis. This hypothesis entails that stock markets reflect information about individual stocks. This means that when information arises, this information will be incorporated into the prices of securities without significant delay (Malkiel, 1989). Malkiel and Fama (1970) defined three different forms of efficient markets:

- the weak form in which only historical prices are incorporated;
- the semi-strong form in which prices reflect all publicly available information;
- and the strong form in which all public and private information is reflected into stock prices.

According to Malkiel (1989), the semi-strong form is the conventional accepted market form. So relating this theory back to the topic of this thesis, what would happen when news regarding the eruption of a global pandemic reaches the masses? Well, this information then would be reflected in stock prices because investors' beliefs regarding this news will cause shifts in the supply and demand of certain stocks. And thus, we can expect share prices to react to certain events during COVID-19, which will be addressed in the event study

conducted in this thesis.

Looking at stock market crashes, due to both conditional volatility evolving over time and the fat-tailed nature of daily stock market returns, the risk of a stock market crash is hard to analyze (Bates, 2012). A phenomenon during crashes that has been observed in the past is the spillover effect, in which affected markets cause an increase in volatility and spillovers in other markets (Aslam et al., 2021). De Bondt and Thaler (1985) found that people often overreact to dramatic news events. They conclude this after empirical research showed that stocks that lost value after news events outperformed stocks that either didn't lose value or gained value after these news events. This is called the overreaction hypothesis, which might even be more apparent these days due to the digitalization of the world discussed by Celebi and Hönig (2019) and Haroon and Rizvi (2020).

Over the years, the cross-sectional variation between expected returns has received considerable attention. According to Fama and French (1992), trying to explain the cross-section of returns started with the capital asset pricing model of Sharpe (1964), Lintner (1965) and Black (1972). This model predicted that the market portfolio of invested wealth is mean-variance efficient in the sense of Markowitz (1959). This efficiency means that expected returns are a positive linear function of their market betas, and that market betas suffice to describe the cross-section of expected returns (Fama & French, 1992). This model is widely used in financial applications in which it measures risk and shows the relation between risk and expected returns (Fama & French, 2004).

As time went on, contradictions on the model were found due to extensive empirical research. For instance, Banz (1981) found that average returns on low market capitalization stocks were too high given their betas, and that average returns on large market capitalization stocks were too low given their beta. This phenomenon was called the size effect which argues that firm size, or market capitalization in which you multiply share price times outstanding shares, also explained cross-section in average returns.

Another contradiction of the initial model was established when Bhandari (1988) found that leverage also helped in explaining the cross-section in average returns. Even though leverage could be captured by market beta due to its relation to risk and expected return, Bhandari (1988) still found it to be a valuable addition in explaining the cross-section of stock returns, even when including both size and market beta (Fama & French, 1992).

The final contradictions discussed by Fama and French (1992) are both book-to-market value of equity found by Stattman (1980) and Rosenberg et al. (1985), and the relevance of the E/P ratio found by Ball (1978). Fama and French (1992) however conclude

that when using both size and book-to-market value of equity, the leverage and E/P effect in average stock returns is absorbed by the first two variables.

Later on, Acharya and Pedersen (2005) included the notion of securities with varying liquidity over time and derived a liquidity-adjusted capital asset pricing model. All in all, this paragraph shows the importance of book-to-market ratio of equity, size, liquidity, leverage, and firm beta in calculating expected returns. For this reason, and the reason of creating comparability between papers, the next paragraphs will look at these variables and its effects on stock returns during COVID-19 and other market crashes. These will also be the main independent variables in the regression part of this thesis, together with controlling for industries and countries in further regression analyses..

2.2 COVID-19 and stock markets

When COVID-19 was announced to be a world-wide pandemic by the World Health Organization in March 2020, stock markets all around the took a huge hit and started reaching volatility levels that surpassed those seen in preceding financial crises (Baker et al., 2020). Both the efficient market hypothesis and overreaction theory can be observed here. Since there was a massive reaction to the news regarding COVID-19 that was reflected in stock prices. According to Wagner (2020), the increasing volatility and decreasing stock market prices were brought to the financial markets due to uncertainty that COVID-19 brought to the world. Investors were uncertain about the virus' deadliness, the vaccine process, potential economic shutdowns, potential government responses, and consumers their behavior in response to the virus in general. A multitude of studies have empirically researched the effects on stock markets and did indeed find increased volatility and deep significant negative abnormal returns (Baker et al., 2020; Bash, 2020; Contessi & De Pace, 2021; Ramelli & Wagner, 2020; Singh et al., 2020; Zeren & Hizarci, 2020). For instance, it took only four trading days for the Dow Jones Industrial Average to lose 26% of its value (Mazur et al., 2021).

Long term effects of COVID-19 on the stock market were speculated on by Zeren and Hizarci (2020). They mainly speculate that the main long term effect of COVID-19 on investing could be that investors start reallocating their fund more into gold markets, cryptocurrencies, and countries that seem to be less affected by these tail-risk events. The notion of gold markets is pretty interesting as gold has been seen as a safe haven for investors long before COVID happened (Akhtaruzzaman et al., 2020). Akhtaruzzaman et al. (2020) found that in the very early days before mid-March, and thus before the global outbreak of

COVID and the severe market downturn, the dynamic conditional correlations between intraday gold and international equity returns were negative, indicating that gold was a safe haven before the massive market downturns. However, as time went on gold started losing its ability of being a safe haven to investors when hedging costs significantly increased after mid-March and investors started increasing the optimal weights of gold assets.

Ramelli and Wagner (2020) define three different periods when researching the effects on share prices. These periods being the incubation period from January 2nd until January 17th, the outbreak period from January 20th until February 21st, and the fever period from February 24th until March 20th. They for instance found that the Telecom industry performed well relative to the Food and Staples Retailing industry. They go on to say that utilities performed very well during the incubation and outbreak period, however in the fever period investors started worrying about the recession and started selling off all stocks, causing declines in the entire market.

In order to reduce the economic effects of the outbreak, the federal reserve expanded its balance sheet assets by 66% from March 4th to May 20th (Sunder, 2020). The massive cash injections from the government helped markets recover around March 20th. Around mid-late March both the European Central Bank (2020) and the European Commission (2021) started spreading news about the actions they were going to take in order to mitigate the effects of COVID-19, it can be assumed that this also reflected itself into both the volatility and price levels of European stock markets.

The first hypothesis will look at how the STOXX Europe 600 as an index responded to the COVID-19 outbreak, following the event windows defined by Ramelli and Wagner (2020). Hypothesis 2 looks at event windows after policy responses from the European Commission (2021) and the European Central Bank (2020), this can be seen as the recovery period.

H1: The STOXX Europe 600 experienced negative cumulative abnormal returns after the COVID-19 outbreak (Early January to early-mid March).

H2: The STOXX Europe 600 experienced positive cumulative abnormal returns after policy responses to the COVID-19 outbreak (Mid-late March to early December).

2.3 Firm characteristics and share price reactions to market crashes; previous research

Fauzi and Wahyudi (2016) analyzed characteristics of both firms and stocks that were affected by stock market crashes from 1997, 2000, and 2008 in Indonesia. They found that when firms were highly levered, stocks experienced a larger negative effect during stock

market crashes. The reason for this, according to Fauzi and Wahyudi (2016), is that during crashes the risk of bankruptcy is avoided by investors causing the demand for highly levered firm's stocks to fall. Secondly, they found that firms with lower levels of liquidity also experienced greater losses compared to highly liquid firms. Again, this is caused by the increased risk of bankruptcy according to them. Wang et al. (2009) found that stocks of companies with higher levels of liquid assets, higher debt ratios, lower cash flow per share, and lower profitability suffered from lower returns during stock market crashes. It can be seen that contrary to Fauzi and Wahyudi (2016), their results indicated that highly liquid firms tended to suffer lower returns. The reason for this could lie in the excess fund hypothesis, in which it is argued that high liquidity can be seen as a firm's management's inability to optimize their assets and invest in profitable long-term investments (Fauzi & Wahyudi, 2016). Fauzi and Wahyudi (2016) also found that firms with higher betas, larger capitalization, more return volatility, and lower asset profitability tended to lose more value during crises.

Ramelli and Wagner (2020) conducted research on firm characteristics of firms in the U.S. and its effects on share price reactions. They found that firms that conducted trade with China suffered lower returns during the first few months of the crisis, but once the pandemic started to affect Europe and the United States this effect turned around when the Chinese economy reopened. Secondly, they found that firms with little cash and that highly levered firms suffered lower returns during the crash.

The difference in sectors has also been researched in the past. During the COVID-19 market crash, Dutta et al. (2020) found that COVID-19 had a significant negative effect on the performance of energy companies. Lin and Falk (2021) found that travel and leisure firms were hit hardest by the pandemic whilst firms that operate online performed better. This is expectable due to the in-person risks of contracting the virus, the government shutting down the leisure industry, and other restrictions that make it harder for businesses to operate in person. The resilience of certain sectors during the COVID-19 crash on the S&P500 has also been researched by Mazur et al. (2021). They found that companies operating in the healthcare and medical devices industries outperformed companies operating in other sectors. Besides that, they found that the food and grocery sector, the software and technology sector, and the natural gas sector also performed very well compared to other industries.

All in all the results from preceding literature indicate that there are discrepancies in how negatively some industries and corporations are affected by stock market crashes. Essentially opening up the possibility for investors to reallocate their funds to corporations that have a lesser chance of negative returns during systemic stock market crashes. There is

however not much research on stock market reactions during pandemics, so this opens up the possibility for research in order to learn from COVID-19.

Several hypotheses can be drawn from this section:

From the viewpoint that investors try to avoid the risk of bankruptcy during crises, and thus avoid highly levered firms whilst preferencing liquid firms (Fauzi & Wahyudi, 2016):

H3: Highly levered firms experience more negative stock returns during the COVID-19 crisis, all else being equal.

H4: Liquid firms experience less negative stock returns during the COVID-19 crisis, all else being equal.

H5: Firms with higher betas experience more negative stock returns during the COVID-19 crisis, all else being equal.

H6: Firms with a larger capitalization experienced more negative stock returns during the COVID-19 crisis, all else being equal.

Following the results of Wang et al. (2009):

H7: Firms with higher book-to-market value ratios suffered more negative stock returns during the COVID-19 crisis, all else being equal.

Dutta et al. (2020) and Lin and Falk (2021) found that some sectors were hit harder by crises than other sectors. This shows that cross-section of returns could also be explained by the sector in which a firm operates in matters when it comes to stock returns during crises:

H8: Firms' cumulative returns during the COVID-19 crisis are influenced by the sector the firm operates in.

Besides that, the effects of the country in which a firms operates in will also be included:

H9: Firms' cumulative returns during the COVID-19 crisis are influenced by the country the firm operates in.

2.4 Historic pandemic outbreaks and their effects on stock markets

Early on in the COVID-19 pandemic outbreak, Ma et al. (2020) conducted research on the possible global economic and financial effects of COVID-19 by building upon the effects of similar health crises in the past. Following Jamison (2018), they identify five global pandemic and epidemic events in the 21st century: SARS in 2003, H1N1 in 2009, MERS in 2012, Ebola

in 2014, and Zika in 2016. Ma et al. (2020) found that GDP growth falls during these events, and that this effect is larger for countries in which a less aggressive first-year response in government spending is seen. They also find that stock markets respond very negatively to pandemic/epidemic events in the short run. They argue however that the COVID-19 pandemic will have a much larger toll on human's life due to the scale of lock downs that will hamper economic activity. They basically say that the effects of previous pandemics are extrapolatable to COVID-19, but that the effects will be stronger during the COVID-19 pandemic due to the larger effect the COVID-19 pandemic has on human life.

3. Methodology and data

The data and methodology section includes the data selection and sampling, and the methodology.

3.1 Data collection

In order to carry out the research, the following data is collected:

- Daily closing prices of the STOXX Europe 600;
- Daily closing prices of companies listed on the STOXX Europe 600;
- Year-end 2019 financial and non-financial information of the companies listed on the STOXX Europe 600.

The data ranges from 01-03-2019 until 31-12-2020 and is collected through Datastream through the following queries:

The daily stock prices for all listed companies:

```
=@TR("SCREEN(U(IN(indices(91873767/*SOURCE STOXX EUROPE 600 UCITS ETF*/))/*UNV:Public*/))";"TR.CommonName;TR.PriceClose;TR.PriceCloseDate";"SDate=2019-03-01 Frq=D Curn=EUR EDate=2020-12-31 CH=Fd RH=IN SORTA=IN")
```

The year-end financial data for all these listed companies:

```
=@TR("SCREEN(U(IN(indices(91873767/*SOURCE STOXX EUROPE 600 UCITS ETF*/))/*UNV:Public*/))";"TR.CommonName;TR.ExchangeCountry;TR.ISIN;TR.GICSIndustry;TR.GICSIndustryCode;TR.BetaFiveYear;TR.CompanySharesOutstanding;TR.TotalDebtOutstanding;TR.TotalEquity"&";TR.TotalLiabilities;TR.CashAndSTInvestments;TR.TotalCurrentAssets;TR.TangibleBVPS;TR.CashFromOperatingAct;TR.CashFromInvestingAct;TR.CashFromFinancingAct;TR.TangibleBookValueRptd;TR.CompanyMarketCap;TR.CompanySharesOutstanding;TR.EBIT";"SDate=2019-1"&"2-31 CH=Fd RH=IN")
```

These queries include: ticker code, company name, country of exchange, ISIN, GICS industry name, GICS industry code, the 5 year beta, outstanding shares, total debt, total equity, total liabilities, cash and short-term investments, total current assets, tangible book value per share, cashflow from operating/investing/and financing activities, reported tangible book value, market capitalization, and EBIT.

3.2 Methodology

3.2.1 Event study

Following MacKinlay (1997) and Lyon et al. (1999), an event study is conducted in order to calculate whether significant cumulative abnormal returns can be observed after critical events during the COVID-19 crisis. The event windows in which significant negative cumulative abnormal returns are expected are derived from Ramelli and Wagner (2020), and the event windows in which a significant recovery is expected are derived from the European Commission (2021) and the European Central Bank (2020).

These windows are:

- Incubation: January 02 - January 17 (10 trading days)
 - The first trading day after cases of pneumonia were detected in Wuhan.
- Outbreak: January 20 – February 21 (25 trading days)
 - The Chinese health authorities confirmed the contagiousness of the virus.
- Fever: February 24 – March 20 (20 trading days)
 - The first lockdown started in Italy.
- Combined: January 02 – March 20 (55 trading days)

The following expected positive event windows will be used, with the event date being the first day listed of the window, derived from the European Commission (2021) and the European Central Bank (2020):

- SME Funding: April 3rd (+7)
 - On April 6th, the European Commission (2021) unlocked an estimated 8 billion funding to provide liquidity to small and mid-cap companies hit by the economic impact of the coronavirus pandemic.
- Money raised for universal access to vaccine: May 4th (+7)
 - On May 4th, the European Commission (2021) registered 7.4 billion raised for universal access to vaccines.
- Continuation of the asset purchase program: October 29th (+7)
 - On October 29th, the European Central Bank (2020) put out a press release saying that they would continue the asset purchase program until the end of the year.

And at last, an overall period event window is used:

- Entire period: January 2nd – October 29th⁽⁺⁷⁾ (204 trading days)

In order to estimate normal performance during the event windows, an 150-day estimation window ending one trading day prior to the first event day is used, following the methodologies of Rahman et al. (2021) and Ramelli and Wagner (2020). This is kept consistent to prevent results to be biased by volatility in the market caused by COVID-19. For the positive event windows a +7 day event window is used.

Two hypotheses were formed following the literature review:

Table 1. Event study hypotheses

<i>H1: The STOXX Europe 600 experienced negative cumulative abnormal returns after the COVID-19 outbreak (Early January to early-mid March).</i>	H0 = CAR = 0 = There are no abnormal returns within the event window;
	Ha = CAR ≠ 0 = The Euro STOXX Europe 600 experienced abnormal returns during the COVID-19 outbreak.
<i>H2: The STOXX Europe 600 experienced positive cumulative abnormal returns after policy responses to the COVID-19 outbreak (Mid-late March to early December).</i>	H0 = CAR = 0 = There are no abnormal returns within the event window;
	Ha = CAR ≠ 0 = The STOXX Europe 600 experienced abnormal returns after the policy responses.

Notes: These hypotheses are tested through an event study, the robustness checks will be performed using different event windows.

In order to test the effect of COVID-19 on European stocks, the methodology as Singh et al. (2020) is carried out to create comparability between the papers. An event study is conducted, which, according to Kothari and Warner (2007), examines the return behavior for a sample of firms experiencing a common event.

Cumulative Abnormal Returns are calculated as follows:

First, the daily returns of the STOXX Europe 600 are calculated:

Equation 1. Stock return formula

$$R_{i,t} = \left(\ln \left(\frac{P_{i,t}}{P_{i,t-1}} \right) \right) * 100$$

Where:

$R_{i,t}$ = the return for index i on day t ,

$P_{i,t}$ = is the closing price from index i on day t

$P_{i,t-1}$ = is the closing price on the day prior to $P_{i,t}$.

Then, in order to calculate the abnormal returns, first both the beta and alpha are calculated through the market model, following MacKinlay (1997), Rahman et al. (2021), and Wagner (2020), with an estimation window of 150 days prior to the first event date (January 2nd).

Then, the normal/expected return is calculated as follow:

Equation 2. Normal return formula (market model)

$$\bar{R}_i = \alpha_i + \beta_i R_{mt} + \varepsilon_i.$$

Where:

\bar{R}_i = The normal/expected return of the index

R_{mt} = The return on the market portfolio, in this case the STOXX Europe 600.

α_i & β_i = The parameters of the market model

ε_i = The zero mean disturbance term

Third:

Equation 3. Abnormal Return Formula

$$AR_{i,t} = R_{i,t} - \bar{R}_i.$$

Where

$AR_{i,t}$ = The abnormal return for index i on time t

Last:

Equation 4. Cumulative abnormal returns formula

$$CAR_i(t_0, t_1) = \sum_{t=t_0}^{t_1} AR_{i,t}.$$

Where

$CAR_i(t_0, t_1)$ = The cumulative abnormal return from time t_0 until time t_1

$\sum_{t=t_0}^{t_1} AR_{i,t}$ = The sum of the abnormal returns of index i over t_0 until t_1

To test whether the cumulative abnormal return is significant, and thus the returns being significantly different during the event window, a t-test is conducted. Due to the impact of COVID-19 on investor beliefs, it is expected that the CAR_i is both negative and statistically significant during the negative event windows and both positive and significant during the positive event windows. The entire window is opened for questioning, that will depend on the magnitude of both the negative and positive returns during the event windows.

The T-test formula:

Equation 5. T-test formula

$$T = \sqrt{(\text{Days in event window})} * \left(\frac{\text{Cumulative Abnormal Return in event window}}{\text{Standard deviation abnormal return in event window}} \right)$$

3.2.2 Cross-sectional regression analysis

In order to investigate the effects of corporate characteristics, such as financial results and the industry and/or country the corporation operates in, cross sectional regression analyses are conducted with the dependent variable being the cumulative abnormal return during all eight event windows. The first eight analyses contain the independent variables in table 3, derived from Wang et al. (2009), Ramelli and Wagner (2020), Singh et al. (2020), Fauzi and Wahyudi (2016), and Rahman et al. (2021).

Following Fauzi and Wahyudi (2016), a second regression will be ran including dummies that control for different sectors. In this thesis, the GICS Sector classification is used to construct the dummies and to classify the companies listed on the STOXX Europe 600.

These sectors consist of: Energy, Utilities, Materials, Financials, Real Estate, Consumer Staples, Health Care, Industrials, Consumer Discretionary, Information Technology, Communication Services. Separate regressions with country effects, with both country and industry effects, and with both country, industry, and interaction effects following Ramelli and Wagner (2020) are also included. Besides that, as a robustness check and to investigate the effect of beta, cumulative returns is used as the dependent variable to see if the effects of the independent variables are consistent.

The main regressions include:

Equation 6. Regression without industry & country

$$CAR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 LIQUIDITY_{i,t} + \varepsilon_{i,t}$$

Equation 7. Regression with industries included (beta 5 until beta 10)

$$CAR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 LIQUIDITY_{i,t} + \beta_5 \dots \dots \beta_{14} + \varepsilon_{i,t}$$

Equation 8. Regression with countries included (beta 5 until beta 19).

$$CAR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 LIQUIDITY_{i,t} + \beta_{5,i,t} \dots \dots \beta_{19,i,t} + \varepsilon_{i,t}$$

Equation 9. Regression with industries (beta 5 until beta 14) and countries (beta 15 until beta 19) included.

$$CAR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 LIQUIDITY_{i,t} + \beta_{5,i,t} \dots \dots \beta_{14,i,t} + \beta_{15,i,t} \dots \dots \beta_{29,i,t} + \varepsilon_{i,t}$$

Several robustness checks will be conducted, looking at the cumulative returns rather than the cumulative abnormal returns to judge the consistency of the results.

The following hypotheses were defined through the literature review:

Table 2. Regression analyses hypotheses

<p><i>H3: Highly levered firms experience more negative stock returns during the COVID-19 crisis, all else being equal.</i></p>	<p><i>H0 = $\beta_3 = 0$ = A firm's leverage did not influence share price reactions during the COVID-19 crisis.</i></p>
	<p><i>Ha = $\beta_3 \neq 0$ = A firm's leverage did influence share price reactions during the COVID-19 crisis.</i></p>

<i>H4: Liquid firms experience less negative stock returns during the COVID-19 crisis, all else being equal.</i>	<i>H0 = $\beta_4 = 0$ = A firm's liquidity did not influence share price reactions during the COVID-19 crisis.</i>
	<i>Ha = $\beta_4 \neq 0$ = A firm's liquidity did influence share price reactions during the COVID-19 crisis.</i>
<i>H5: Firms with higher betas experience more negative stock returns during the COVID-19 crisis, all else being equal. (Robustness check – cumulative returns)</i>	<i>H0 = $\beta_1 = 0$ = A firm's beta did not influence share price reactions during the COVID-19 crisis.</i>
	<i>Ha = $\beta_1 \neq 0$ = A firm's beta did influence share price reactions during the COVID-19 crisis.</i>
<i>H6: Firms with a larger capitalization experienced more negative stock returns during the COVID-19 crisis, all else being equal.</i>	<i>H0 = $\beta_1 = 0$ = A firm's capitalization did not influence share price reactions during the COVID-19 crisis.</i>
	<i>Ha = $\beta_1 \neq 0$ = A firm's capitalization did influence share price reactions during the COVID-19 crisis.</i>
<i>H7: Firms with higher book-to-market value ratios suffered more negative stock returns during the COVID-19 crisis, all else being equal.</i>	<i>H0 = $\beta_2 = 0$ = A firm's book-to-market value did not influence share price reactions during the COVID-19 crisis.</i>
	<i>Ha = $\beta_2 \neq 0$ = A firm's book-to-market value did influence share price reactions during the COVID-19 crisis.</i>
<i>H8: Firms' cumulative returns during stock market crashes are influenced by the sector the firm operates in.</i>	<i>H0 = $\beta_5 \dots \beta_{14} = 0$ = The sector a firm operates in does not influence cumulative abnormal return.</i>
	<i>Ha = $\beta_5 \dots \beta_{14} \neq 0$ = The sector a firm operates in does influence cumulative abnormal return.</i>
<i>H9: Firms' cumulative returns during stock market crashes are influenced by the country the firm operates in.</i>	<i>H0 = $\beta_5 \dots \beta_{29} = 0$ = The country a firm operates in does not influence cumulative abnormal return.</i>

	$H_a = \beta_5 \dots \beta_{29} \neq 0 =$ The country a firm operates in does influence cumulative abnormal return.
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The measurements are operationalized as follows:

Table 3. Operationalization of the variables

Type of variable	Variable name	Definition	Operationalization
Dependent variable	CAR	Cumulative abnormal return	Summation of abnormal returns (as explained earlier)
	CR	Cumulative returns	Summation of returns (robustness check)
Independent variable	BETA	Firm's beta	Calculated beta per company by regressing the company return on the market return in the estimation window
	SIZE	Firm's size	Logarithm of firm's market capitalization
	BVMV	Book-to-market ratio of equity	$\frac{\text{book value of equity}}{\text{market value of equity}}$
	TDTE	Leverage	$\frac{\text{total debt}}{\text{total equity}}$
	LAR	Liquidity	$\frac{\text{cash and short term investments}}{\text{liabilities}}$
	Interaction Variables	TDTALAR	Interaction effect leverage liquidity
	TDTABVMV	Interaction effect leverage	Leverage * Book-to-market value of equity

		book-to-market value of equity	
Control Variables	ENERGY	Energy industry	Global Industry Classification Standard
	FINANCIALS	Financial industry	Global Industry Classification Standard
	REALESTATE	Real Estate industry	Global Industry Classification Standard
	CONSUMERSTAPLES	Consumer Staples industry	Global Industry Classification Standard
	HEALTHCARE	Health Care industry	Global Industry Classification Standard
	INDUSTRIALS	Industrials industry	Global Industry Classification Standard
	CONSUMERDISCRETIONARY	Consumer Discretionary industry	Global Industry Classification Standard
	INFORMATIONTECHNOLOGY	Information Technology industry	Global Industry Classification Standard
	COMMUNICATIONSERVICES	Communication Services industry	Global Industry Classification Standard
	COUNTRIES	All Countries	Countries derived from EIKON

In order to see what variables drove abnormal returns during the crisis, a regression will be ran excluding the beta with dependent variable being cumulative abnormal returns. In the robustness check part of the regression analysis, a regression with cumulative returns will be ran in order to see the effect of beta on cumulative returns and to see whether the effects of the other variables remain consistent.

Starting off, the initial data extraction contains 600 companies. In order to prepare the data for the regression analysis, only companies that have all data needed to calculate the

independent variable are kept and certain days are deleted in order to keep the weights of days of all companies equal. Some companies might have more or less days than other companies due to country-specific holidays or other reasons as of why the market closed on a certain day in that country. So as mentioned, this is fixed to mitigate the possibility of getting biased estimates due to some companies having more dates than others.

4. Results

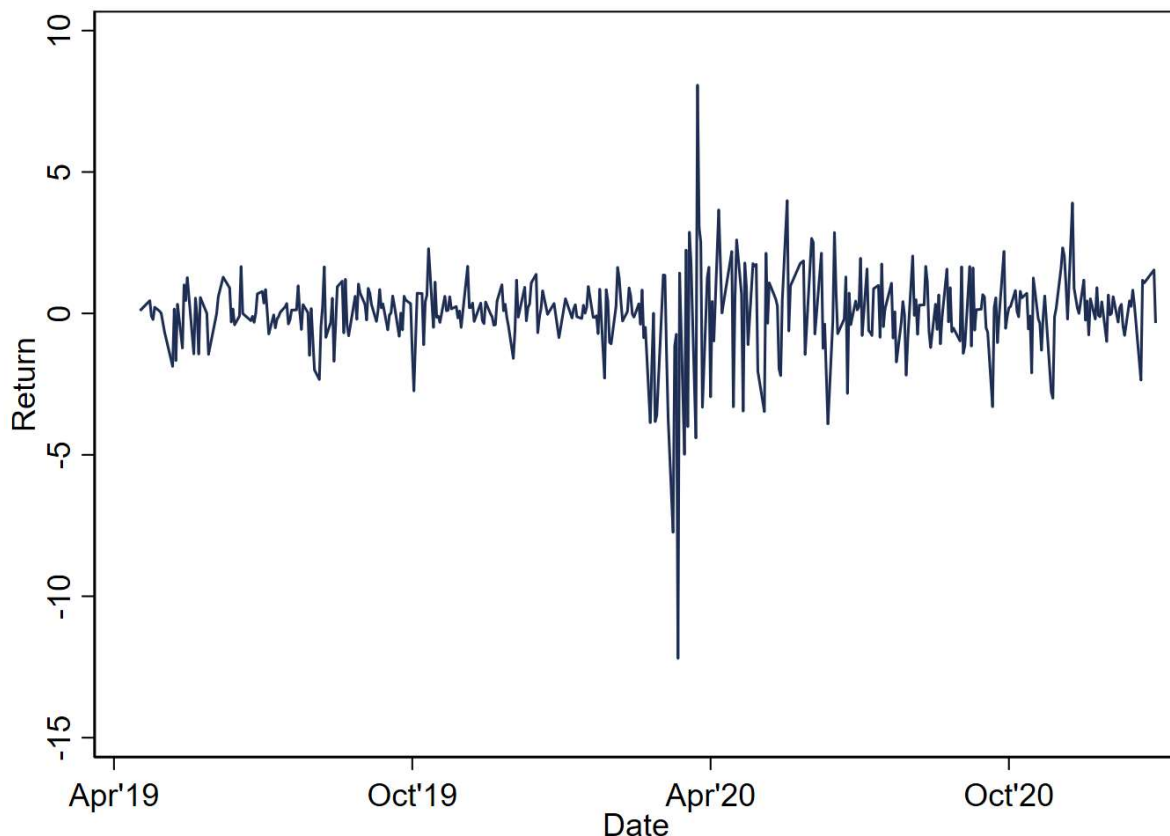
In this chapter the results of both the event studies and the cross-sectional regression analyses will be analyzed.

4.1 Event Study

This subchapter contains both summary statistics and results.

4.1.1 Summary Statistics

Figure 1. Market return over the entire event period



Notes: This figure shows the market return of the STOXX Europe 600 during the entire dataset. Disproportionate spikes can be seen around March-April 2020, indicating that this was when the market was first/most affected by COVID-19. Interestingly enough the price movements seem to be way larger after this spike compared to before the spike, indicating that there was indeed visually increased volatility on the STOXX Europe 600 during the entire event window.

4.1.2 Event study results

Table 4. Event study results - Negative event windows

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined
Cumulative Abnormal Returns	1.419	-0.620	-39.05***	-38.25**
T-Statistic	1.286	-0.147	-2.346	-2.082

*** p<0.01, ** p<0.05, * p<0.1

Notes: This is the main event study for the negative event windows in which the cumulative abnormal returns over the event windows are displayed with the T-Statistic, which indicates the significance of the cumulative abnormal returns, shown below the cumulative abnormal returns.

Table 4 presents the cumulative abnormal returns on the STOXX Europe 600 during the four negative event windows, which were based on research conducted by Ramelli and Wagner (2020). Interestingly enough, although statistically insignificant, the incubation period still experienced 1.419% higher returns than expected. Indicating that the negative effects of COVID-19 were still not to be seen on the STOXX Europe 600 at the time. The same goes for the outbreak period, in which the returns did start to turn negative, 0.620% less than expected, but still remained insignificant. Both the fever and combined period show statistically significant negative cumulative abnormal returns, showing that the market really took a hit early-mid March. This hit is quantified by the coefficients shown in the table, during the fever period the market experienced 39.05% less returns than expected, and during the combined period this was 38.25% less than expected. The difference between the two is caused by the positive returns in the incubation period. The magnitude of the negative downturn in March was also enough to turn the combined negative window statistically significant, showing the extent to which the market declined during the first major wave of COVID. The reason for this delayed response can be caused by several factors: the timing of the government restrictions, panic caused by the media, overreaction by investors after the initial news announcements regarding the outbreak, and possibly some momentum caused by panic selling early on.

Table 5. Event study results - Positive event windows

VARIABLES	(1) Sme Funding [+7]	(2) Vaccine News [+7]	(3) APP News [+7]
Cumulative Abnormal Returns	3.628	-2.202	6.438**
T-Statistic	0.599	-0.439	2.336

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table essentially contains the same information as table 4, but with the positive event windows.

Table 5 contains the positive event windows, which were 7 day windows after positive news articles were published by either the European Commission (2021) or the European Central Bank (2020). The news about the funding for small- to mid-cap companies and the early news about the vaccine seem to, due to the insignificance of the cumulative abnormal returns, not have affected the cumulative abnormal returns in the 7 day event windows. The reason for this can be twofold, either the negative news outweighed the positive news in that period, or the news was so early on during the pandemic that investors' negative outlooks couldn't be swayed towards a more positive outlook. This brings us to the news about the extension of the asset purchasing program, which is both statistically significant and highly positive. This indicates that the positive news later on during the pandemic assured investors that better times were coming and brought a pretty steep recovery to the market. The effects of this news can be quantified by looking at the figure reported under the cumulative abnormal returns. This figure indicates that during the 7 days after the news reported about the asset purchasing program, the market grew 6.438% more than expected.

Table 6. Event study results - Combined event windows

VARIABLES	(1) Combined
Cumulative Abnormal Returns	-24.52
T-Statistic	-0.880

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table contains the same information again but now for the positive and negative windows combined.

Looking at the entirety of all event windows, the cumulative abnormal returns are deeply negative but not significant. This could indicate that the significant recovery during the recovery period nulled out the negative effects of COVID-19 on the stock market during the first few months. Overall it can be seen that the market still experienced 24.52% lower returns than expected, this figure is however insignificant so no concluding remarks can be given looking at this figure.

4.1.3 Event study robustness checks

For the event study robustness checks, I look at the positive event windows with a +5 and a +10 window. The negative event windows remain the same due to the comparability to Ramelli and Wagner (2020).

Table 7. Robustness check event study [+5] days

VARIABLES	(1) Sme Funding [+5]	(2) Vaccine News [+5]	(3) APP News [+5]
Cumulative Abnormal Returns	6.466	-0.386	5.706**
T-Statistic	1.576	-0.0811	1.952

*** p<0.01, ** p<0.05, * p<0.1

Notes: Table 7 shows the cumulative abnormal returns with an event window of 5 days rather

than 7 days as an robustness check.

Table 8. Robustness check event study [+10] days

VARIABLES	(1) Sme Funding [+10]	(2) Vaccine News [+10]	(3) APP News [+10]
Cumulative Abnormal Returns	3.267	-0.120	11.26***
T-Statistic	0.432	-0.0173	2.733

*** p<0.01, ** p<0.05, * p<0.1

Notes: Table 8 shows the cumulative abnormal returns with an event window of 5 days rather than 7 days as an robustness check.

The two tables show that the results of the positive event windows remain consistent in both a +5 and a +10 window. It can be seen that as time went on, the news on the asset purchasing program really started to positively influence the market giving investors a lot more confidence in a recovery. Looking at the figure reported after the asset purchase program announcement, it can be seen that the market experienced a gradual recovery during the 10 trading days after this announcement. It can be seen that during the 5 days after the announcement, the market grew 5.706% more than expected, which is less than the 7 day recovery reported in the previous paragraph, and grew 11.26% more than expected during the 10 days after the announcement which is more than the 7 day figure. This indicates that the market kept growing more than expected for at least 10 days after the announcement regarding the asset purchasing program.

4.2 Cross-sectional regression analysis

This subchapter contains both summary statistics and results.

4.2.1 Summary statistics

Figure 2. Distribution of companies by sector and by country

GICS Sector	Freq.	Country	Freq.
Communication Services	37	Austria	5
Consumer Discretionary	60	Belgium	14
Consumer Staples	47	Denmark	19
Energy	16	Finland	15
Financials	20	France	72
Health Care	54	Germany	67
Industrials	113	Ireland; Republic of	7
Information Technology	34	Italy	24
Materials	53	Netherlands	24
Real Estate	41	Norway	15
Utilities	33	Poland	4
		Portugal	4
		Spain	19
		Sweden	56
		Switzerland	43
		United Kingdom	120
Total	508	Total	508

Notes: In this figure the distribution of companies by sector and by country is shown.

Industry-wise, most companies are operating in the industrials sector. Country-wise, most companies are operated in the United Kingdom.

Table 9. Summary statistics of the estimation window

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Company Return	76,200	0.0768	1.778	-26.59	24.82
Market Return	76,200	0.0577	0.776	-2.736	2.286
Predicted Return	76,200	0.0768	0.874	-7.883	6.135
Abnormal Return	76,200	-7.70e-11	1.549	-26.77	24.28

Notes: This table shows the summary statistics of the estimation window. Company and market returns are calculated as shown in equation 1, the predicted return calculation is shown

in equation 2, and abnormal return is calculated as company or market return – predicted return.

Table 10. Summary statistics of the negative window

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Company Return	27,940	-0.695	3.682	-52.91	27.60
Market Return	27,940	-0.638	2.455	-12.19	2.869
Predicted Return	27,940	-0.637	2.760	-34.28	7.763
Abnormal Return	27,940	-0.0582	2.799	-39.45	25.11

Notes: This table shows the summary statistics of the negative window. Company and market returns are calculated as shown in equation 1, the predicted return calculation is shown in equation 2, and abnormal return is calculated as company or market return – predicted return.

Table 11. Summary statistics of the positive window

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Company Return	61,976	0.103	2.451	-27.90	45.23
Market Return	61,976	0.0628	1.351	-3.902	3.987
Predicted Return	61,976	0.0820	1.513	-11.14	10.88
Abnormal Return	61,976	0.0207	2.066	-28.82	42.47

Notes: This table shows the summary statistics of the positive window. Company and market returns are calculated as shown in equation 1, the predicted return calculation is shown in equation 2, and abnormal return is calculated as company or market return – predicted return.

Table 12. Summary statistics from the first negative event day to the last day in the positive window

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Company Return	103,632	-0.0369	3.130	-52.91	45.23
Market Return	103,632	-0.0624	1.945	-12.19	8.070
Predicted Return	103,632	-0.0464	2.175	-34.28	22.28
Abnormal Return	103,632	0.00953	2.454	-39.45	42.47

Notes: This table shows the summary statistics of the negative window and positive window combined. Company and market returns are calculated as shown in equation 1, the predicted return calculation is shown in equation 2, and abnormal return is calculated as company or market return – predicted return.

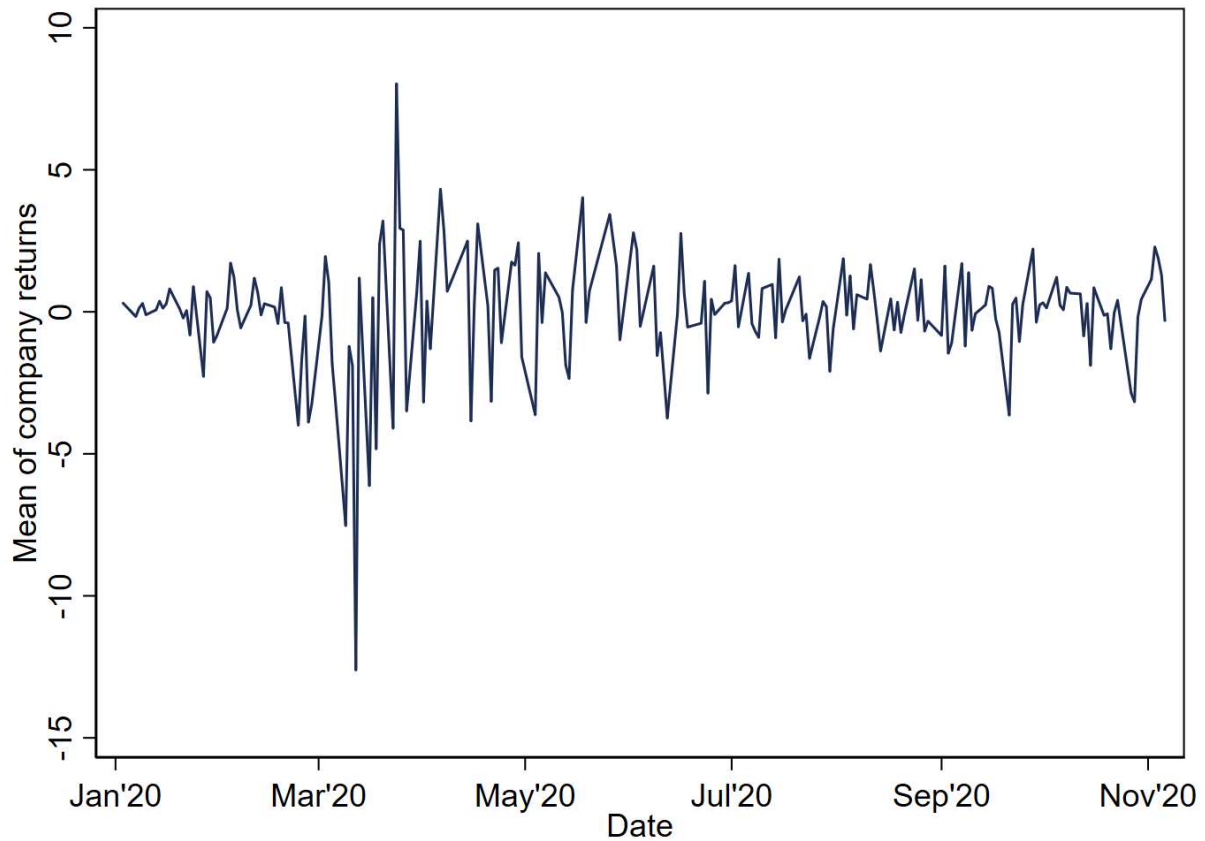
Table 13. Financial ratios

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Alpha	508	0.0176	0.114	-0.379	0.515
Beta	508	1.026	0.442	0.0109	2.792
Size	508	10.17	0.538	8.971	11.86
Book-to-market value of equity	508	0.441	0.388	-0.139	3.275
Leverage	508	0.800	1.099	-8.499	7.579
Liquidity	508	0.317	1.035	0.00000322	14.09

Notes: Alpha & beta are calculated through the market window with an estimation window of 150 days, size is calculated by taking the logarithm of the market capitalization, book-to-market value of equity is calculated as (book value of equity/market value of equity), leverage is calculated as (total debt/total equity), and liquidity is calculated as (cash and short term investments/liabilities). These figures all stay constant during the timeframe as alpha and beta are calculated through an estimation window before the first event window and size, book-to-

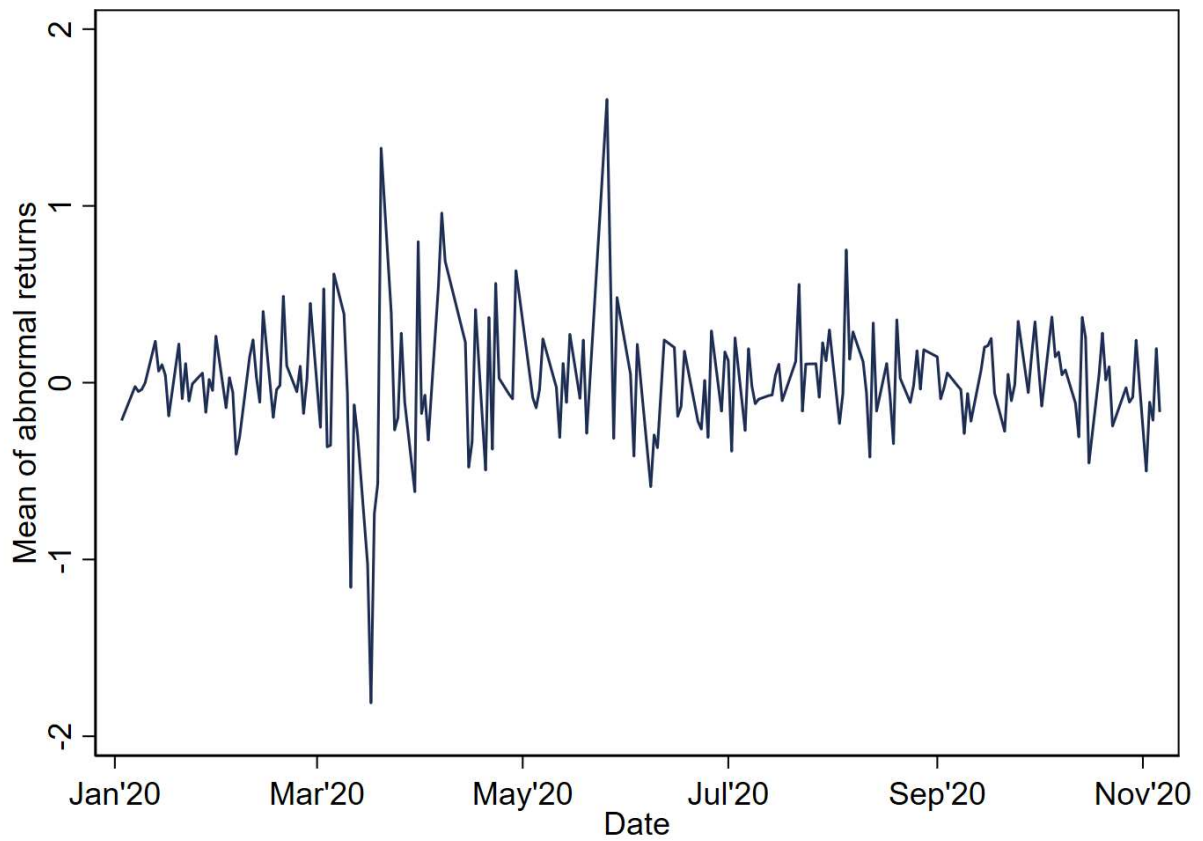
market value of equity, leverage, and liquidity are derived through values from the end-of-year 2019 data.

Figure 3. Mean of company returns during the entire event window



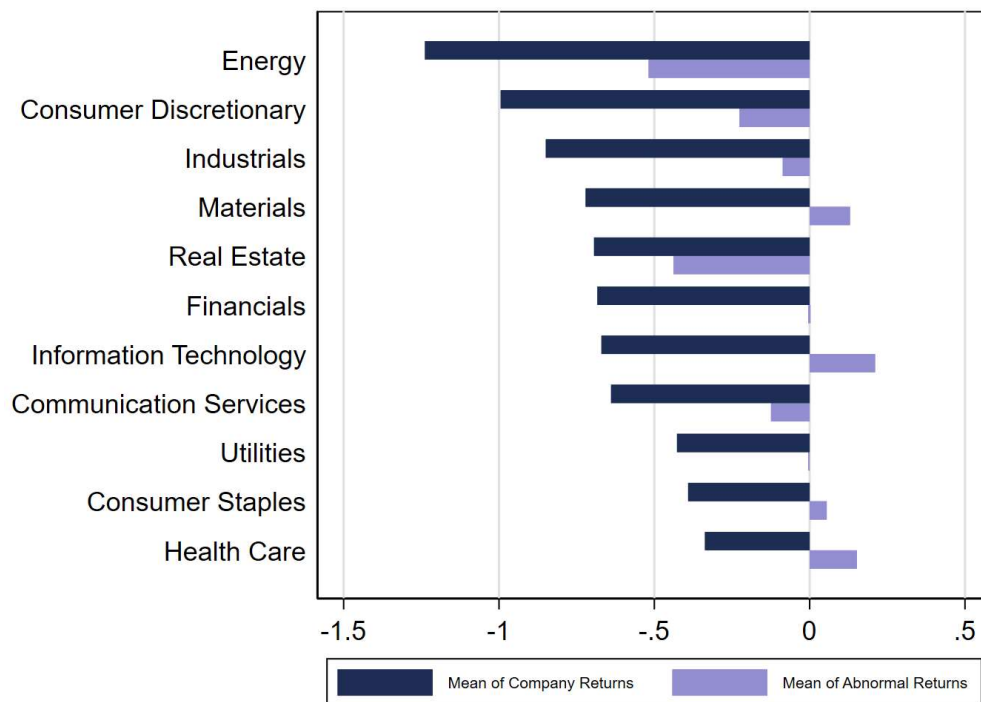
Notes: This figure shows the mean of all companies' returns during the entire event window. The same impact as the market return in the event window summary statistics part around early- to mid-March can be observed – steeply negative around March followed by a steep positive recovery.

Figure 4. Mean of abnormal returns during the entire event window



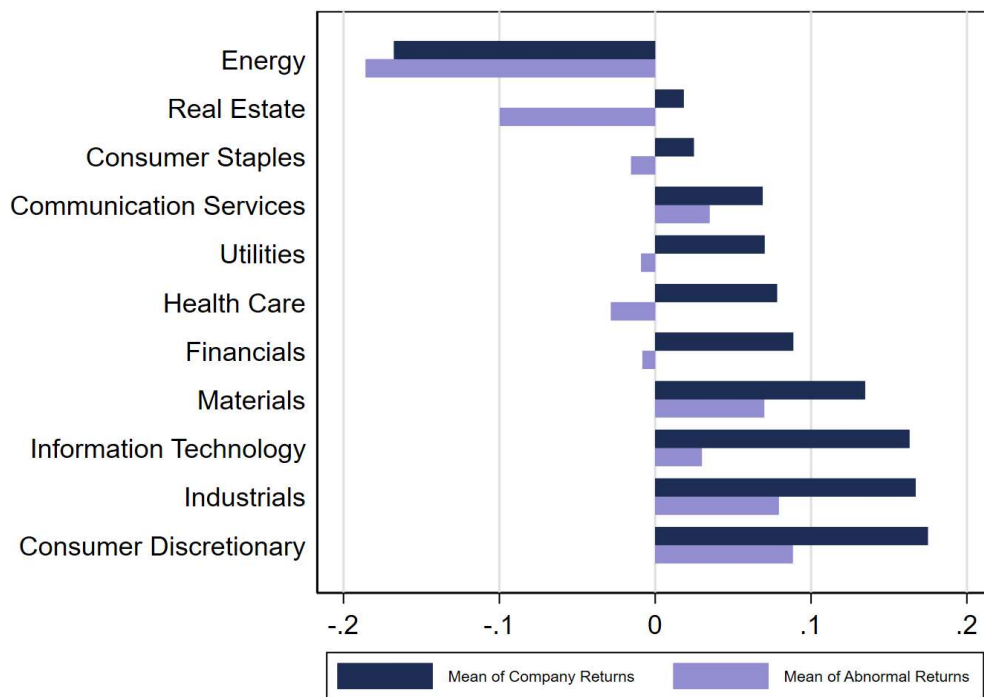
Notes: This figure depicts the mean of the abnormal returns during the entire event window. Deep negative abnormal returns around March can be seen with the abnormal returns skewing more to the positive side as time goes one, indicating a recovery being in place after the initial hit the market took.

Figure 5. Returns and Abnormal returns per industry over the entire negative window



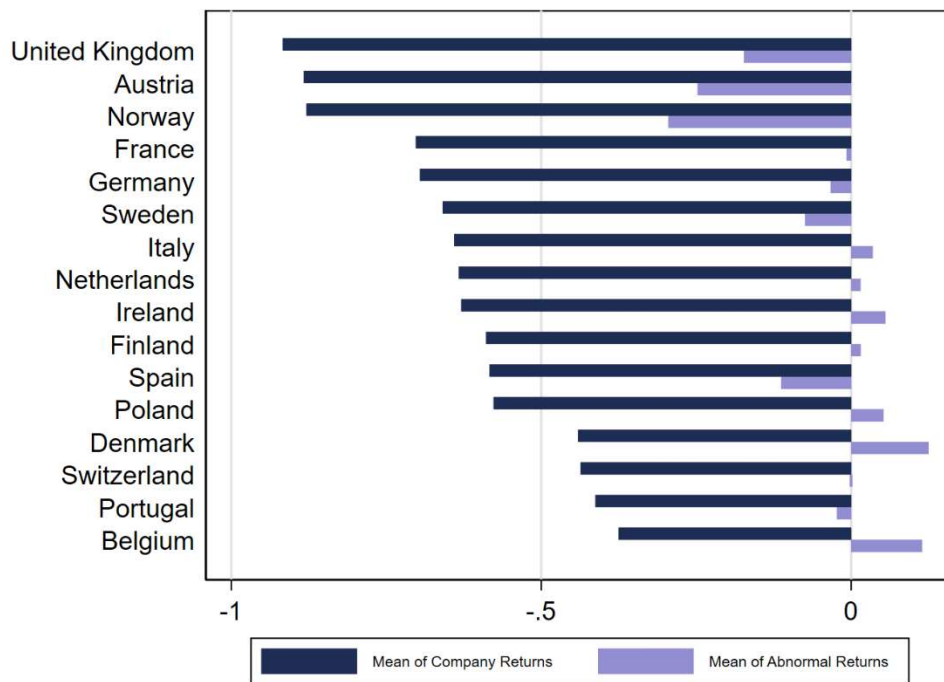
Notes: In this figure, the returns and abnormal returns per industry over the entire negative window can be seen. Especially interesting is the distribution of the mean of abnormal returns, indicating that some industries performed better than expected whilst other industries performed worse than expected. For instance, the information technology sector performed very well whilst the energy sector performed very poorly compared to the expectations derived through the market model using the 150 day pre-event estimation window.

Figure 6. Returns and Abnormal returns per industry over the entire positive window



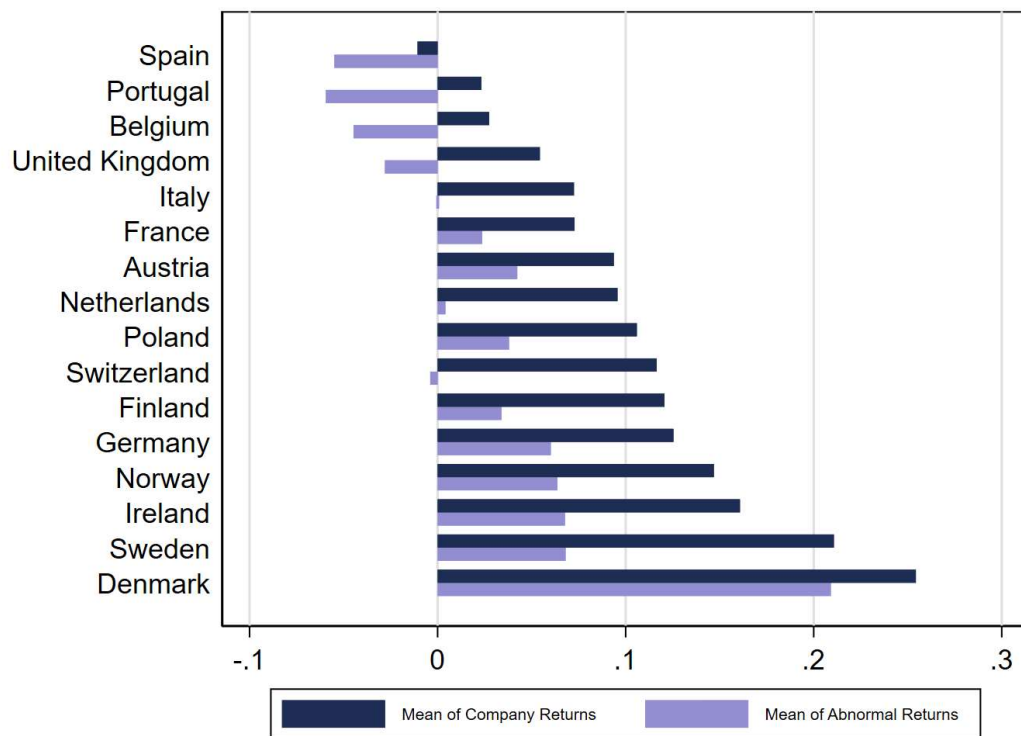
Notes: This figure shows the returns and abnormal returns per industry over the entire positive window. It can be seen that the energy sector still performed worse than expected, however more sectors are now experiencing positive returns and also positive abnormal returns. This pretty much visualizes the recovery that can be seen in the positive event window.

Figure 7. Returns and Abnormal returns per country over the entire negative window



Notes: This figure shows the returns and abnormal returns per country over the entire negative window. It can be seen that all companies in all countries on average experienced deep negative returns. The positive cumulative returns some countries experienced means that, even though the companies performed better than expected, they still experienced negative returns during the negative event window.

Figure 8. Returns and Abnormal returns per country over the entire positive window



Notes: This figure shows the returns and abnormal returns per country over the entire positive window. It can be seen that now, except for Spain, all countries experienced positive returns, and also most countries experienced positive abnormal returns. This indicates that companies in most countries started experiencing large returns that exceeded the expectations made based on an estimation window before the COVID-19 pandemic.

4.2.2 Cross-sectional regression analysis results

Table 14. Effect of corporate characteristics on the cumulative abnormal returns

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Size	0.531 (1.336)	-0.895 (-1.285)	1.239 (0.660)	0.875 (0.444)	-0.785 (-1.367)	0.504 (0.830)	1.495*** (3.658)	1.020 (0.322)
Book-to-market value of equity	-2.565*** (-4.660)	-1.321 (-1.370)	-6.953*** (-2.674)	-10.84*** (-3.969)	-2.759*** (-3.469)	-5.556*** (-6.606)	0.606 (1.070)	-12.74*** (-2.907)
Leverage	-0.00499 (-0.0256)	0.610* (1.787)	-2.547*** (-2.768)	-1.942** (-2.009)	0.243 (0.863)	0.0950 (0.319)	0.210 (1.047)	-1.948 (-1.255)
Liquidity	-0.297 (-1.433)	0.173 (0.477)	1.740* (1.776)	1.616 (1.571)	0.230 (0.767)	1.062*** (3.354)	0.103 (0.483)	0.556 (0.337)
Constant	-4.238 (-1.034)	9.562 (1.331)	-11.61 (-0.599)	-6.283 (-0.309)	10.21* (1.724)	-3.331 (-0.532)	-16.31*** (-3.866)	-1.431 (-0.0438)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.042	0.006	0.033	0.040	0.021	0.101	0.020	0.014

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: In this table the following equation is carried out through cross-sectional regression analyses to determine the effects of financial factors on the cumulative abnormal returns during the 8 different event windows: $CAR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 LIQUIDITY_{i,t} + \varepsilon_{i,t}$.

Table 14 shows the effects of size, book-to-market value of equity, leverage, and liquidity on the cumulative abnormal returns within the event windows. Regression (1), (2), (3), and (4) make up for the negative event windows. Regression (5), (6), and (7) make up for the positive event windows, where there is an event window of +7 days after a certain news announcement. Regression (8) shows the entire period.

The adjusted R-squared of the regressions shown in table 14 are all very small. This indicates that the independent variables shown in the regression analysis don't explain much of the variation in the cumulative abnormal returns. I speculate that the reason for this mainly is an omitted variable problem in which there are missing strong predictors such as country of operation, and industry of operating in explaining variation in cross-sectional returns. This will be accounted for in the following regressions. Besides country of operation and industry of operation, stock returns can be dependent on a variety of different independent variables that aren't included in the regressions.

The size variable is only significant after the asset purchasing program announcement,

in which the positive sign of the coefficients indicates that larger companies experience higher cumulative abnormal returns. The high t-statistics indicates that there is a very strong relation between size and cumulative abnormal returns during the 7 day window after the asset purchase program, however the insignificance of the variable during all other windows indicates that size wasn't really an important predictor of cumulative abnormal returns during the entire event window. Interestingly enough, bigger corporations weren't more resilient against negative abnormal returns during the market downturn in the negative event windows.

Book-to-market value of equity seems to have been a very important predictor of cumulative abnormal returns during the entire event window used in this thesis. Overall, the variable is highly statistically significant during all event windows excluding the outbreak and asset purchasing program window. The negative sign of the coefficients in all significant windows shows that higher book-to-market companies experienced more negative cumulative abnormal returns than lower book-to-market companies. This variable is also the only variable that shows significance in the entire period event window, indicating the significance of book-to-market ratio in explaining cumulative abnormal returns during the COVID-19 negative event windows and during the recovery windows. As Fama and French (1992) stated, high book-to-market firms seem to have poor prospects regarded by the market. For this reason it isn't surprising that book-to-market ratio of equity has a negative effect on cumulative abnormal returns, as according to Fama and French (1995), high BE/ME signals persistent poor earnings which could shy away investors from this stock during highly volatile times.

The next variable in the regression is leverage, which is the total debt to total equity ratio in this thesis. Leverage is significant during the outbreak period, fever period, and the entire negative window. During the outbreak period, leverage is positively significant on a 10% significance level, indicating a rather weak correlation between leverage and cumulative abnormal returns during this period. During the fever and entire negative window, leverage negatively influenced the cumulative abnormal returns and is also strongly correlated to the cumulative abnormal returns. Relating back to Fauzi and Wahyudi (2016), who speculated that investors allocate their funds towards companies that have lower leverage in order to reduce the risk of bankruptcy, this result seems to be very plausible in that leverage only mattering during the negative event windows. So, overall highly levered companies experienced lower cumulative abnormal returns during the negative event windows.

Liquidity is weakly significant during the fever period on a 10% significance level and strongly significant during the vaccine news period on a 1% significance level, and has a positive effect as predicted. Even though the effect is consistent with the prediction, it is

surprising that liquidity wasn't a more pronounced factor driving cumulative abnormal returns during the event windows due to the decreased risk of bankruptcy as stated by Fauzi and Wahyudi (2016).

Table 15. Effect of corporate characteristics on the cumulative abnormal returns, controlling for industry

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Size	0.656* (1.697)	-0.311 (-0.466)	0.0696 (0.0400)	0.415 (0.223)	-0.216 (-0.402)	0.360 (0.602)	1.752*** (4.349)	0.616 (0.201)
Book-to-market value of equity	-2.328*** (-4.105)	-2.157** (-2.206)	-0.161 (-0.0630)	-4.646* (-1.701)	-2.179*** (-2.770)	-4.253*** (-4.844)	-0.383 (-0.647)	-3.533 (-0.787)
Leverage	-0.144 (-0.740)	-0.0459 (-0.137)	-2.065** (-2.358)	-2.255** (-2.410)	0.207 (0.767)	-0.0607 (-0.202)	0.156 (0.772)	-1.845 (-1.199)
Liquidity	-0.391* (-1.930)	0.0855 (0.245)	1.133 (1.241)	0.828 (0.848)	0.0271 (0.0965)	0.717** (2.287)	0.170 (0.805)	-0.385 (-0.240)
Consumer Discretionary	0.369 (0.386)	-4.476*** (-2.717)	-2.964 (-0.688)	-7.071 (-1.536)	5.643*** (4.258)	-3.791** (-2.562)	0.0135 (0.0135)	5.570 (0.736)
Consumer Staples	1.473 (1.460)	-1.397 (-0.803)	7.646* (1.681)	7.723 (1.590)	1.565 (1.119)	-1.669 (-1.069)	0.0518 (0.0492)	4.324 (0.541)
Energy	-0.128 (-0.0917)	-9.298*** (-3.874)	-14.38** (-2.290)	-23.80*** (-3.549)	-11.82*** (-6.121)	-3.840* (-1.781)	1.673 (1.153)	-38.23*** (-3.467)
Financials	1.103 (0.875)	0.992 (0.457)	4.030 (0.709)	6.125 (1.009)	1.840 (1.053)	-0.521 (-0.267)	0.612 (0.466)	4.588 (0.460)
Health Care	1.618 (1.635)	0.772 (0.453)	9.628** (2.159)	12.02** (2.523)	1.695 (1.236)	2.075 (1.355)	0.211 (0.204)	10.61 (1.355)
Industrials	-0.213 (-0.245)	-2.997** (-2.003)	3.419 (0.874)	0.209 (0.0500)	-0.606 (-0.503)	-3.083** (-2.294)	0.0779 (0.0860)	5.666 (0.824)
Information Technology	2.006* (1.823)	-2.928 (-1.544)	16.02*** (3.231)	15.10*** (2.850)	2.697* (1.768)	1.974 (1.159)	-1.493 (-1.302)	18.08** (2.075)
Materials	-3.320*** (-3.385)	-1.192 (-0.705)	17.36*** (3.926)	12.85*** (2.720)	0.509 (0.374)	-2.728* (-1.797)	-1.106 (-1.082)	19.61** (2.525)
Real Estate	1.672 (1.592)	3.916** (2.163)	-22.31*** (-4.712)	-16.72*** (-3.306)	1.015 (0.697)	-5.503*** (-3.384)	5.129*** (4.684)	-30.13*** (-3.622)
Utilities	3.287*** (3.028)	6.403*** (3.422)	-1.929 (-0.394)	7.762 (1.485)	-1.100 (-0.730)	0.503 (0.299)	0.813 (0.719)	-0.715 (-0.0831)
Constant	-5.952 (-1.465)	5.624 (0.803)	-5.704 (-0.311)	-6.032 (-0.308)	3.460 (0.614)	-0.438 (-0.0697)	-18.84*** (-4.450)	-4.363 (-0.136)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.137	0.133	0.207	0.186	0.188	0.169	0.094	0.122

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: In this table, the same regression is carried out but now controlling for the industries

the companies operate in.

When controlling for industry in table 15, the results of the independent variables remain consistent except for liquidity which is now weakly negatively significant during the incubation period. The reason for this can be that very early on, the excess fund hypothesis was still in effect in which investors believe that managers of highly liquid companies fail in picking profitable investments. However, some coefficients seem to be highly significant for some industries, indicating that certain industries were affected more negatively during the COVID-19 market crash. Which is to be expected since for instance information technology was able to thrive due to life moving to an online environment whilst the energy sector took large hits, consistent with Dutta et al. (2020) and Zeren and Hizarci (2020).

During the entire event window, regression (8), the real estate industry and energy industry seem to have performed significantly worse than all other industries in terms of cumulative abnormal returns. During this entire window, both the information technology sector and health care sector performed significantly better than all other industries in terms of cumulative abnormal returns. These findings are consistent with the graphs shown in the summary statistics subchapter that looked at the returns per industry and further proof that during the COVID-19 market crash, cross-section differences in abnormal returns can be partially explained by the industry a company operated in.

Table 16. Effect of corporate characteristics on the cumulative abnormal returns, controlling for country

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Size	0.292 (0.591)	-2.637*** (-3.085)	4.034* (1.742)	1.689 (0.696)	-1.223* (-1.753)	-0.800 (-1.082)	0.0932 (0.196)	-8.859** (-2.310)
Book-to-market value of equity	-2.591*** (-4.559)	-0.747 (-0.759)	-8.707*** (-3.262)	-12.05*** (-4.305)	-2.509*** (-3.119)	-5.413*** (-6.354)	0.922* (1.677)	-10.95** (-2.479)
Leverage	-0.0319 (-0.159)	0.642* (1.846)	-2.794*** (-2.965)	-2.184** (-2.211)	0.359 (1.263)	0.227 (0.754)	0.281 (1.447)	-0.941 (-0.603)
Liquidity	-0.374* (-1.751)	-0.0224 (-0.0605)	1.337 (1.332)	0.940 (0.893)	0.179 (0.592)	0.989*** (3.088)	-0.0305 (-0.148)	-0.537 (-0.323)
Belgium	3.126 (1.253)	8.212* (1.899)	4.865 (0.415)	16.20 (1.319)	1.573 (0.445)	-3.541 (-0.947)	1.402 (0.581)	6.512 (0.336)
Denmark	2.705 (1.090)	12.30*** (2.861)	-5.078 (-0.436)	9.929 (0.813)	7.309** (2.082)	-0.660 (-0.177)	3.828 (1.595)	49.41** (2.561)
Finland	3.783 (1.535)	3.093 (0.724)	2.431 (0.210)	9.307 (0.767)	1.847 (0.529)	-3.754 (-1.016)	-1.090 (-0.457)	13.10 (0.684)
France	2.531 (1.144)	4.462 (1.164)	3.087 (0.297)	10.08 (0.926)	2.527 (0.807)	-5.078 (-1.531)	1.456 (0.680)	7.141 (0.415)
Germany	2.705 (1.222)	3.659 (0.953)	2.287 (0.220)	8.651 (0.794)	6.508** (2.077)	-0.413 (-0.125)	0.722 (0.337)	17.26 (1.002)
Ireland	0.504 (0.180)	6.684 (1.379)	4.133 (0.315)	11.32 (0.822)	3.114 (0.787)	-5.159 (-1.231)	5.014* (1.854)	19.89 (0.915)
Italy	3.555 (1.512)	4.894 (1.201)	5.016 (0.454)	13.46 (1.163)	1.428 (0.429)	-2.796 (-0.793)	2.738 (1.204)	8.569 (0.469)
Netherlands	3.198 (1.361)	4.724 (1.160)	2.559 (0.232)	10.48 (0.906)	3.813 (1.147)	-5.156 (-1.464)	0.712 (0.313)	10.81 (0.592)
Norway	2.281 (0.903)	7.145 (1.633)	-19.78* (-1.668)	-10.35 (-0.833)	3.796 (1.062)	0.0239 (0.00631)	2.835 (1.161)	14.38 (0.732)
Poland	3.511 (1.091)	3.814 (0.684)	3.369 (0.223)	10.69 (0.675)	9.960** (2.188)	-4.184 (-0.867)	11.35*** (3.647)	29.47 (1.178)
Portugal	4.299 (1.345)	12.68** (2.289)	-7.927 (-0.528)	9.054 (0.575)	-0.898 (-0.199)	-1.838 (-0.384)	0.981 (0.317)	1.778 (0.0715)
Spain	3.019 (1.252)	6.556 (1.569)	-4.383 (-0.387)	5.192 (0.437)	3.771 (1.106)	-4.190 (-1.159)	2.037 (0.874)	-4.677 (-0.249)
Sweden	2.264 (0.988)	7.117* (1.793)	-7.193 (-0.669)	2.188 (0.194)	5.568* (1.718)	-1.407 (-0.410)	2.849 (1.286)	21.40 (1.202)
Switzerland	3.021 (1.332)	3.886 (0.989)	0.239 (0.0224)	7.146 (0.640)	3.537 (1.102)	-2.465 (-0.725)	3.582 (1.633)	2.309 (0.131)
United Kingdom	1.075 (0.493)	3.464 (0.917)	-4.010 (-0.392)	0.529 (0.0493)	5.686* (1.844)	-5.621* (-1.721)	-1.428 (-0.678)	-4.118 (-0.243)
Constant	-4.088 (-0.772)	22.10** (2.409)	-37.59 (-1.512)	-19.58 (-0.752)	10.02 (1.339)	13.13* (1.655)	-3.426 (-0.669)	88.81** (2.158)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.047	0.032	0.049	0.060	0.066	0.139	0.138	0.064

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Again, the same regression is carried out but now controlling for the countries of

operation.

Table 16 controls for the country the companies operate in. Interestingly enough, some variables do start to change sign when controlling for the country a company operates in.

The size variable turns around entirely and starts to have a negative effect on the cumulative abnormal returns during the outbreak period, the funding period, and the entire period. The earlier result in which size positively influenced cumulative abnormal returns is only found during the fever period. Looking at this change, I speculate that overall, during the COVID-19 event window, larger companies were affected more negatively than smaller companies. The change in the coefficient's sign is then a result of larger companies being situated in countries in which there were higher cumulative abnormal returns overall. By controlling for country, this upwards bias is then captured in the country dummy variables and by this the true sign of the size variable is revealed.

Book-to-market value of equity, leverage, and liquidity seem to be fairly consistent with earlier regressions.

Table 17. Effect of corporate characteristics on the cumulative abnormal returns, controlling for country and industry

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Size	0.494 (1.008)	-1.706** (-2.033)	1.631 (0.741)	0.419 (0.179)	-0.677 (-1.015)	-1.307* (-1.767)	0.632 (1.325)	-11.68*** (-3.114)
Book-to-market value of equity	-2.339*** (-3.996)	-1.619 (-1.615)	-2.248 (-0.855)	-6.206** (-2.215)	-1.907** (-2.395)	-3.863*** (-4.369)	-0.191 (-0.336)	-1.404 (-0.314)
Leverage	-0.127 (-0.639)	0.00955 (0.0280)	-2.370*** (-2.648)	-2.488*** (-2.608)	0.255 (0.939)	0.168 (0.559)	0.206 (1.061)	-0.847 (-0.556)
Liquidity	-0.466** (-2.231)	-0.0834 (-0.233)	0.911 (0.971)	0.362 (0.362)	-0.0747 (-0.263)	0.673** (2.134)	0.0446 (0.220)	-1.603 (-1.003)
Consumer Discretionary	0.676 (0.699)	-4.289*** (-2.590)	-3.108 (-0.716)	-6.721 (-1.453)	5.820*** (4.427)	-3.178** (-2.177)	0.576 (0.612)	9.175 (1.240)
Consumer Staples	1.571 (1.541)	-1.785 (-1.022)	8.306* (1.813)	8.092* (1.658)	1.736 (1.251)	-0.994 (-0.646)	0.121 (0.122)	7.020 (0.899)
Energy	-0.493 (-0.343)	-9.724*** (-3.948)	-14.52** (-2.248)	-24.73*** (-3.594)	-11.61*** (-5.940)	-2.874 (-1.324)	1.305 (0.933)	-35.32*** (-3.211)
Financials	1.368 (1.069)	0.735 (0.335)	3.425 (0.596)	5.528 (0.902)	2.644 (1.519)	-0.0713 (-0.0369)	1.038 (0.834)	7.001 (0.715)
Health Care	1.472 (1.456)	0.740 (0.427)	8.644* (1.904)	10.86** (2.244)	2.048 (1.490)	2.040 (1.337)	-0.0442 (-0.0450)	10.89 (1.408)
Industrials	-0.139 (-0.158)	-3.219** (-2.138)	3.369 (0.854)	0.0107 (0.00255)	-0.309 (-0.258)	-2.830** (-2.132)	0.0908 (0.106)	6.262 (0.931)
Information Technology	1.853* (1.664)	-3.141 (-1.646)	14.59*** (2.915)	13.30** (2.494)	3.045** (2.009)	2.403 (1.428)	-1.562 (-1.441)	17.65** (2.070)
Materials	-3.386*** (-3.396)	-1.255 (-0.735)	18.10*** (4.043)	13.46*** (2.822)	0.361 (0.266)	-2.865* (-1.903)	-1.100 (-1.134)	19.91*** (2.609)
Real Estate	1.712 (1.608)	3.361* (1.842)	-21.23*** (-4.439)	-16.16*** (-3.170)	0.862 (0.595)	-6.211*** (-3.861)	5.168*** (4.987)	-33.24*** (-4.079)
Utilities	3.322*** (2.972)	5.806*** (3.031)	-2.896 (-0.577)	6.231 (1.165)	-0.460 (-0.303)	0.879 (0.520)	0.746 (0.686)	0.711 (0.0831)
Belgium	1.613 (0.669)	5.156 (1.247)	10.52 (0.971)	17.29 (1.497)	-1.687 (-0.514)	-3.295 (-0.904)	-0.248 (-0.105)	12.76 (0.691)
Denmark	1.246 (0.520)	9.953** (2.424)	-1.093 (-0.102)	10.11 (0.881)	3.559 (1.092)	-0.602 (-0.166)	2.631 (1.128)	51.48*** (2.806)
Finland	3.081 (1.308)	2.370 (0.587)	5.849 (0.553)	11.30 (1.002)	-0.381 (-0.119)	-3.328 (-0.935)	-1.827 (-0.797)	15.37 (0.853)
France	0.932 (0.436)	3.674 (1.003)	7.808 (0.813)	12.41 (1.213)	-1.114 (-0.383)	-5.285 (-1.636)	0.623 (0.299)	8.513 (0.520)
Germany	1.473 (0.688)	2.200 (0.600)	6.162 (0.641)	9.835 (0.960)	2.579 (0.886)	-0.446 (-0.138)	-0.194 (-0.0931)	18.18 (1.109)
Ireland	0.197 (0.0735)	6.548 (1.426)	3.761 (0.312)	10.51 (0.819)	-0.460 (-0.126)	-4.135 (-1.022)	4.578* (1.755)	16.02 (0.781)
Italy	1.612 (0.715)	3.646 (0.944)	11.03 (1.088)	16.28 (1.509)	-0.923 (-0.301)	-3.563 (-1.046)	1.962 (0.894)	11.93 (0.691)
Netherlands	2.372 (1.053)	5.207 (1.350)	4.665 (0.461)	12.24 (1.136)	1.882 (0.614)	-5.133 (-1.509)	0.195 (0.0890)	13.30 (0.771)

Norway	1.183 (0.487)	5.642 (1.357)	-11.06 (-1.014)	-4.233 (-0.364)	2.282 (0.691)	1.033 (0.282)	1.225 (0.518)	26.12 (1.406)
Poland	3.308 (1.076)	4.218 (0.801)	8.514 (0.617)	16.04 (1.090)	10.14** (2.424)	-3.531 (-0.760)	10.54*** (3.523)	39.30* (1.670)
Portugal	1.594 (0.520)	10.40** (1.981)	1.884 (0.137)	13.87 (0.946)	-0.481 (-0.115)	-2.830 (-0.612)	-0.202 (-0.0679)	14.24 (0.608)
Spain	0.821 (0.354)	4.037 (1.017)	4.273 (0.411)	9.130 (0.823)	1.567 (0.497)	-4.453 (-1.273)	0.723 (0.321)	3.020 (0.170)
Sweden	0.971 (0.436)	5.335 (1.397)	0.804 (0.0803)	7.110 (0.666)	1.819 (0.600)	-0.117 (-0.0346)	1.130 (0.521)	27.88 (1.634)
Switzerland	1.930 (0.881)	2.477 (0.660)	2.820 (0.287)	7.226 (0.689)	-0.0404 (-0.0136)	-2.435 (-0.736)	2.668 (1.252)	2.694 (0.161)
United Kingdom	-0.104 (-0.0496)	2.699 (0.750)	0.523 (0.0554)	3.118 (0.310)	1.966 (0.688)	-5.166 (-1.628)	-2.374 (-1.161)	-2.832 (-0.176)
Constant	-5.372 (-1.027)	16.01* (1.786)	-23.75 (-1.011)	-13.12 (-0.524)	6.647 (0.934)	19.07** (2.414)	-7.777 (-1.527)	106.7*** (2.665)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.140	0.146	0.215	0.198	0.221	0.211	0.212	0.182

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Same regression but now controlling for both country and industry.

Table 17 shows the regression when controlling for both country and industry. It can be observed that the size variable is still highly significant with a negative sign in this regression, further confirming that the size had a negative effect on cumulative abnormal returns during the COVID-19 pandemic. Again, the effects of book-to-market value of equity, leverage, and liquidity remain consistent with the earlier found results.

Table 18. Effect of corporate characteristics on the cumulative abnormal returns, controlling for country and industry, and including interaction terms (next page – 44)

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Size	0.590 (1.201)	-1.794** (-2.119)	1.297 (0.587)	0.0933 (0.0397)	-0.506 (-0.761)	-1.284* (-1.730)	0.718 (1.499)	-11.44*** (-3.032)
Leverage*Book to market Equity	-1.374** (-2.018)	0.272 (0.232)	-4.347 (-1.420)	-5.449* (-1.671)	-2.527*** (-2.741)	-2.560** (-2.491)	-1.250* (-1.885)	-8.369 (-1.601)
Leverage*Liquidity	2.299 (1.368)	-2.462 (-0.851)	-11.40 (-1.509)	-11.56 (-1.437)	4.020* (1.767)	-0.273 (-0.108)	2.037 (1.245)	3.658 (0.284)
Book-to-market value of equity	-1.479** (-2.076)	-1.825 (-1.487)	0.145 (0.0452)	-3.159 (-0.926)	-0.328 (-0.340)	-2.340** (-2.176)	0.590 (0.851)	3.653 (0.668)
Leverage	-0.117 (-0.425)	0.202 (0.424)	-0.530 (-0.427)	-0.446 (-0.337)	0.293 (0.783)	0.628 (1.505)	0.220 (0.818)	0.215 (0.101)
Liquidity	-0.501** (-2.404)	-0.0633 (-0.176)	0.919 (0.980)	0.355 (0.355)	-0.139 (-0.491)	0.636** (2.021)	0.0126 (0.0618)	-1.753 (-1.095)
Consumer Discretionary	0.578 (0.599)	-4.195** (-2.525)	-2.723 (-0.628)	-6.340 (-1.372)	5.649*** (4.323)	-3.190** (-2.190)	0.489 (0.520)	8.965 (1.210)
Consumer Staples	1.604 (1.578)	-1.822 (-1.041)	8.123* (1.778)	7.904 (1.624)	1.792 (1.302)	-1.004 (-0.654)	0.149 (0.151)	7.059 (0.905)
Energy	-0.696 (-0.484)	-9.541*** (-3.855)	-13.83** (-2.140)	-24.07*** (-3.497)	-11.97*** (-6.152)	-2.929 (-1.350)	1.124 (0.803)	-35.83*** (-3.246)
Financials	1.231 (0.964)	0.863 (0.392)	3.935 (0.685)	6.029 (0.985)	2.403 (1.389)	-0.0962 (-0.0499)	0.917 (0.737)	6.691 (0.682)
Health Care	1.363 (1.352)	0.766 (0.441)	8.344* (1.841)	10.47** (2.169)	1.849 (1.354)	1.849 (1.215)	-0.143 (-0.146)	10.26 (1.325)
Industrials	-0.200 (-0.228)	-3.177** (-2.106)	3.460 (0.879)	0.0835 (0.0199)	-0.417 (-0.352)	-2.874** (-2.174)	0.0363 (0.0425)	6.049 (0.899)
Information Technology	1.660 (1.492)	-3.030 (-1.581)	14.66*** (2.929)	13.29** (2.493)	2.697* (1.790)	2.209 (1.315)	-1.736 (-1.601)	16.85** (1.971)
Materials	-3.525*** (-3.542)	-1.213 (-0.708)	17.79*** (3.977)	13.06*** (2.740)	0.107 (0.0793)	-3.092** (-2.059)	-1.226 (-1.265)	19.13** (2.505)
Real Estate	1.955* (1.829)	3.173* (1.725)	-21.77*** (-4.531)	-16.64*** (-3.252)	1.293 (0.894)	-6.077*** (-3.768)	5.385*** (5.174)	-32.49*** (-3.960)
Utilities	3.530*** (3.156)	5.761*** (2.992)	-2.271 (-0.452)	7.020 (1.311)	-0.0788 (-0.0520)	1.258 (0.745)	0.935 (0.858)	1.959 (0.228)
Belgium	1.759 (0.731)	5.099 (1.232)	10.72 (0.992)	17.58 (1.527)	-1.422 (-0.437)	-3.087 (-0.851)	-0.116 (-0.0495)	13.50 (0.731)
Denmark	1.295 (0.542)	9.972** (2.425)	-0.678 (-0.0631)	10.59 (0.926)	3.651 (1.129)	-0.448 (-0.124)	2.675 (1.150)	51.92*** (2.831)
Finland	3.052 (1.300)	2.389 (0.591)	5.884 (0.558)	11.32 (1.008)	-0.433 (-0.136)	-3.351 (-0.946)	-1.853 (-0.811)	15.27 (0.847)
France	1.027 (0.481)	3.763 (1.024)	9.110 (0.949)	13.90 (1.360)	-0.928 (-0.321)	-4.864 (-1.509)	0.712 (0.343)	9.646 (0.588)

Germany	1.529 (0.716)	2.241 (0.610)	6.819 (0.711)	10.59 (1.036)	2.687 (0.930)	-0.225 (-0.0698)	-0.142 (-0.0683)	18.78 (1.146)
Ireland	0.164 (0.0613)	6.604 (1.436)	4.112 (0.342)	10.88 (0.851)	-0.517 (-0.143)	-4.086 (-1.014)	4.549* (1.749)	16.07 (0.784)
Italy	1.956 (0.868)	3.601 (0.928)	12.34 (1.217)	17.89* (1.658)	-0.288 (-0.0945)	-2.868 (-0.843)	2.276 (1.036)	14.15 (0.818)
Netherlands	2.339 (1.042)	5.298 (1.370)	5.339 (0.529)	12.98 (1.207)	1.830 (0.602)	-5.005 (-1.477)	0.167 (0.0765)	13.52 (0.785)
Norway	0.961 (0.397)	5.834 (1.399)	-10.37 (-0.953)	-3.579 (-0.309)	1.891 (0.577)	0.958 (0.262)	1.027 (0.436)	25.54 (1.374)
Poland	3.251 (1.061)	4.225 (0.801)	8.292 (0.602)	15.77 (1.075)	10.03** (2.419)	-3.647 (-0.789)	10.49*** (3.516)	38.93* (1.655)
Portugal	1.776 (0.582)	10.30* (1.960)	1.897 (0.138)	13.97 (0.956)	-0.153 (-0.0370)	-2.628 (-0.570)	-0.0388 (-0.0131)	15.04 (0.642)
Spain	0.816 (0.353)	4.117 (1.035)	4.998 (0.481)	9.931 (0.898)	1.567 (0.501)	-4.281 (-1.228)	0.721 (0.320)	3.403 (0.192)
Sweden	0.967 (0.435)	5.389 (1.409)	1.287 (0.129)	7.642 (0.718)	1.816 (0.604)	-0.00427 (-0.00127)	1.127 (0.521)	28.13* (1.649)
Switzerland	1.795 (0.822)	2.648 (0.704)	3.737 (0.380)	8.180 (0.782)	-0.273 (-0.0924)	-2.358 (-0.715)	2.549 (1.198)	2.618 (0.156)
United Kingdom	-0.0738 (-0.0352)	2.679 (0.743)	0.487 (0.0518)	3.092 (0.308)	2.020 (0.713)	-5.142 (-1.627)	-2.347 (-1.151)	-2.720 (-0.169)
Constant	-6.478 (-1.234)	16.93* (1.873)	-20.74 (-0.879)	-10.29 (-0.409)	4.685 (0.659)	18.60** (2.348)	-8.764* (-1.714)	103.6** (2.571)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.146	0.144	0.220	0.203	0.234	0.218	0.217	0.183

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: In this table there are interaction terms added to the regressions including the countries and industries.

Following Ramelli and Wagner (2020), I also look at whether there is an interaction between leverage and cash, and leverage and book-to-market ratio of equity. The interaction between leverage and book-to-market ratio of equity contains several significantly negative coefficients. This indicates that in the incubation, sme funding, and vaccine news, investors saw high leverage problematic for high book-to-market firms. No interaction effect between leverage and liquidity is found. And again, the size variable is negative.

4.2.3 Cross-sectional regression analysis – Robustness checks (Cumulative Returns)

In the robustness checks chapter, first all regressions are shown with clarifying notes and at the end an ending note on the robustness of the results is given.

Table 19. Cumulative returns regression

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Beta	-1.639*** (-3.470)	-5.811*** (-6.886)	-18.70*** (-9.021)	-26.15*** (-11.40)	2.903*** (4.096)	-3.352*** (-4.497)	1.268*** (2.764)	-8.548** (-2.436)
Size	0.271 (0.699)	-1.394** (-2.010)	2.350 (1.379)	1.228 (0.651)	-0.880 (-1.510)	0.383 (0.625)	1.127*** (2.988)	0.546 (0.189)
Book-to-market value of equity	-3.222*** (-6.001)	-3.116*** (-3.248)	-9.919*** (-4.208)	-16.26*** (-6.232)	-3.307*** (-4.104)	-6.077*** (-7.173)	0.335 (0.642)	-31.03*** (-7.780)
Leverage	-0.172 (-0.904)	0.291 (0.853)	-1.813** (-2.166)	-1.695* (-1.830)	0.183 (0.640)	0.0179 (0.0595)	-0.0296 (-0.160)	-2.198 (-1.552)
Liquidity	-0.0859 (-0.424)	0.633* (1.751)	1.426 (1.605)	1.973** (2.007)	0.338 (1.114)	1.183*** (3.704)	0.335* (1.704)	2.686* (1.787)
Constant	2.664 (0.655)	22.78*** (3.133)	-41.42** (-2.318)	-15.97 (-0.808)	12.71** (2.082)	-0.132 (-0.0206)	-6.484 (-1.640)	10.28 (0.340)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.087	0.109	0.178	0.264	0.060	0.150	0.028	0.126

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the regression analysis in which I use cumulative returns as the dependent variables, use the regular financial ratios as independent variables, and at last add beta as an independent variable to look at the effect of riskiness during crisis periods.

Table 20. Cumulative returns regression - Controlling for industry

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Beta	-1.551*** (-2.635)	-3.953*** (-3.810)	-18.58*** (-7.386)	-24.08*** (-8.724)	1.687** (2.019)	-3.987*** (-4.264)	0.401 (0.692)	-17.31*** (-3.978)
Size	0.489 (1.282)	-0.448 (-0.667)	1.541 (0.946)	1.581 (0.884)	-0.323 (-0.596)	0.263 (0.435)	1.365*** (3.635)	1.841 (0.653)
Book-to-market value of equity	-2.754*** (-4.860)	-3.959*** (-3.965)	-5.780** (-2.388)	-12.49*** (-4.703)	-2.502*** (-3.110)	-4.604*** (-5.116)	0.0338 (0.0607)	-24.45*** (-5.837)
Leverage	-0.203 (-1.064)	-0.175 (-0.520)	-2.062** (-2.532)	-2.439*** (-2.729)	0.166 (0.614)	-0.101 (-0.332)	0.0970 (0.517)	-2.737* (-1.942)
Liquidity	-0.180 (-0.904)	0.493 (1.402)	0.787 (0.923)	1.099 (1.175)	0.170 (0.602)	0.856*** (2.702)	0.432** (2.201)	1.941 (1.316)
Consumer Discretionary	2.118** (2.184)	-1.821 (-1.065)	-10.57** (-2.551)	-10.27** (-2.259)	6.810*** (4.945)	-2.690* (-1.746)	2.902*** (3.039)	12.77* (1.781)
Consumer Staples	1.239 (1.251)	-1.770 (-1.014)	8.549** (2.021)	8.017* (1.727)	1.408 (1.001)	-1.818 (-1.156)	-0.318 (-0.326)	3.062 (0.418)
Energy	0.601 (0.437)	-8.502*** (-3.510)	-19.54*** (-3.328)	-27.44*** (-4.259)	-11.35*** (-5.814)	-3.404 (-1.559)	3.175** (2.346)	-40.36*** (-3.972)
Financials	2.623** (2.100)	3.594 (1.633)	-0.666 (-0.125)	5.551 (0.948)	2.864 (1.615)	0.456 (0.230)	2.835** (2.306)	15.75* (1.705)
Health Care	2.273** (2.338)	2.072 (1.210)	8.771** (2.113)	13.12*** (2.879)	2.142 (1.552)	2.509 (1.626)	0.993 (1.038)	18.41** (2.562)
Industrials	1.504* (1.684)	-0.567 (-0.361)	-5.162 (-1.353)	-4.226 (-1.009)	0.532 (0.420)	-2.016 (-1.421)	3.079*** (3.502)	9.852 (1.492)
Information Technology	4.737*** (4.104)	1.064 (0.523)	3.174 (0.644)	8.975* (1.659)	4.513*** (2.754)	3.682** (2.009)	3.162*** (2.783)	26.81*** (3.142)
Materials	-1.465 (-1.453)	1.366 (0.769)	7.634* (1.773)	7.535 (1.595)	1.737 (1.214)	-1.579 (-0.986)	2.206** (2.223)	22.99*** (3.085)
Real Estate	1.880* (1.794)	5.739*** (3.109)	-13.47*** (-3.011)	-5.855 (-1.192)	1.204 (0.809)	-5.264*** (-3.164)	4.012*** (3.890)	-4.287 (-0.554)
Utilities	3.617*** (3.392)	7.540*** (4.013)	0.754 (0.166)	11.91** (2.383)	-0.858 (-0.567)	0.756 (0.447)	0.741 (0.706)	11.20 (1.421)
Constant	-1.405 (-0.345)	11.29 (1.575)	-33.40* (-1.921)	-23.51 (-1.232)	6.450 (1.116)	2.335 (0.361)	-10.15** (-2.533)	-6.004 (-0.200)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.165	0.207	0.288	0.373	0.230	0.213	0.087	0.209

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: The same goes for this table but in this table I control for the industry of operation.

Table 21. Cumulative returns regression - Controlling for country

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Incubation	Outbreak	Fever	Combined Negative	Sme Funding	Vaccine News	APP News	Entire Period
Beta	-1.524*** (-3.072)	-5.742*** (-6.563)	-16.25*** (-7.679)	-23.51*** (-9.979)	2.353*** (3.249)	-2.859*** (-3.738)	1.561*** (3.431)	-5.703 (-1.635)
Size	0.0162 (0.0336)	-3.265*** (-3.836)	4.255** (2.067)	1.007 (0.439)	-1.395** (-1.979)	-0.955 (-1.283)	-0.175 (-0.396)	-12.36*** (-3.641)
Book-to-market value of equity	-3.259*** (-5.855)	-2.517** (-2.565)	-11.33*** (-4.772)	-17.10*** (-6.470)	-3.011*** (-3.706)	-5.944*** (-6.927)	0.580 (1.136)	-28.11*** (-7.183)
Leverage	-0.159 (-0.807)	0.416 (1.195)	-1.863** (-2.213)	-1.606* (-1.713)	0.302 (1.047)	0.196 (0.643)	0.0753 (0.416)	-0.281 (-0.202)
Liquidity	-0.0949 (-0.452)	0.583 (1.573)	0.699 (0.780)	1.187 (1.189)	0.342 (1.114)	1.126*** (3.476)	0.283 (1.466)	1.873 (1.268)
Belgium	2.377 (0.973)	6.817 (1.582)	9.473 (0.909)	18.67 (1.608)	1.216 (0.341)	-3.766 (-1.000)	0.279 (0.125)	8.022 (0.467)
Denmark	1.972 (0.812)	10.66** (2.491)	-4.039 (-0.390)	8.598 (0.746)	6.864* (1.936)	-1.050 (-0.281)	3.069 (1.378)	41.35** (2.422)
Finland	3.875 (1.606)	3.290 (0.774)	2.200 (0.214)	9.366 (0.818)	1.900 (0.540)	-3.710 (-0.998)	-0.985 (-0.445)	13.84 (0.816)
France	2.701 (1.247)	4.637 (1.214)	0.219 (0.0237)	7.557 (0.735)	2.558 (0.809)	-5.116 (-1.532)	1.890 (0.952)	1.791 (0.118)
Germany	2.890 (1.334)	3.959 (1.036)	0.573 (0.0620)	7.422 (0.721)	6.580** (2.080)	-0.386 (-0.115)	1.057 (0.532)	15.30 (1.005)
Ireland	1.090 (0.398)	7.809 (1.618)	0.932 (0.0798)	9.831 (0.756)	3.405 (0.852)	-4.963 (-1.176)	5.854** (2.333)	19.84 (1.031)
Italy	3.985* (1.731)	5.664 (1.395)	1.959 (0.200)	11.61 (1.062)	1.622 (0.483)	-2.686 (-0.757)	3.424 (1.622)	6.580 (0.407)
Netherlands	3.625 (1.576)	5.595 (1.379)	0.895 (0.0912)	10.11 (0.926)	4.043 (1.204)	-4.981 (-1.405)	1.258 (0.596)	12.60 (0.779)
Norway	2.464 (0.997)	7.544* (1.732)	-20.19* (-1.916)	-10.18 (-0.867)	3.903 (1.082)	0.115 (0.0301)	3.040 (1.342)	16.00 (0.921)
Poland	3.316 (1.053)	3.382 (0.609)	3.677 (0.274)	10.38 (0.694)	9.843** (2.142)	-4.286 (-0.883)	11.14*** (3.860)	27.42 (1.239)
Portugal	3.649 (1.166)	11.67** (2.114)	-1.365 (-0.102)	13.95 (0.939)	-1.138 (-0.249)	-1.908 (-0.395)	-0.246 (-0.0857)	10.12 (0.460)
Spain	2.261 (0.958)	5.074 (1.219)	-0.614 (-0.0610)	6.721 (0.599)	3.386 (0.982)	-4.461 (-1.226)	0.988 (0.456)	-5.610 (-0.338)
Sweden	3.319 (1.481)	9.547** (2.415)	-7.751 (-0.811)	5.115 (0.480)	6.233* (1.905)	-0.799 (-0.231)	3.850* (1.873)	35.59** (2.258)
Switzerland	2.890 (1.302)	3.930 (1.004)	4.737 (0.500)	11.56 (1.096)	3.576 (1.103)	-2.324 (-0.679)	3.023 (1.485)	12.72 (0.815)
United Kingdom	1.780 (0.834)	4.727 (1.256)	-9.018 (-0.991)	-2.511 (-0.248)	6.003* (1.926)	-5.442* (-1.653)	-0.305 (-0.156)	-7.371 (-0.491)
Constant	2.513 (0.482)	35.85*** (3.899)	-59.66*** (-2.683)	-21.30 (-0.860)	13.68* (1.797)	16.03** (1.994)	4.658 (0.974)	126.5*** (3.452)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.083	0.128	0.220	0.293	0.106	0.185	0.130	0.213

(the font in this table has been changed in order to keep the document's flow better).

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Again, same variables but now controlling for country of operation.

Table 22. Cumulative returns regression - Controlling for industry and country

VARIABLES	(1) Incubation	(2) Outbreak	(3) Fever	(4) Combined Negative	(5) Sme Funding	(6) Vaccine News	(7) APP News	(8) Entire Period
Beta	-1.357** (-2.160)	-4.271*** (-3.896)	-14.44*** (-5.530)	-20.06*** (-6.962)	0.868 (0.999)	-3.762*** (-3.875)	0.757 (1.300)	-14.57*** (-3.325)
Size	0.295 (0.610)	-2.017** (-2.393)	2.935 (1.462)	1.212 (0.547)	-0.862 (-1.290)	-1.425* (-1.909)	0.282 (0.629)	-11.98*** (-3.554)
Book-to-market value of equity	-2.750*** (-4.689)	-3.228*** (-3.155)	-8.400*** (-3.448)	-14.38*** (-5.345)	-2.050** (-2.529)	-4.218*** (-4.656)	0.181 (0.334)	-21.55*** (-5.269)
Leverage	-0.160 (-0.817)	-0.0502 (-0.147)	-2.232*** (-2.740)	-2.442*** (-2.716)	0.226 (0.835)	0.148 (0.488)	0.158 (0.867)	-1.067 (-0.780)
Liquidity	-0.213 (-1.032)	0.426 (1.180)	0.295 (0.343)	0.507 (0.535)	0.132 (0.464)	0.835*** (2.616)	0.360* (1.881)	1.074 (0.745)
Consumer Discretionary	2.292** (2.329)	-1.573 (-0.916)	-12.02*** (-2.940)	-11.30** (-2.504)	7.280*** (5.353)	-2.201 (-1.448)	3.211*** (3.523)	15.34** (2.236)
Consumer Staples	1.347 (1.342)	-2.205 (-1.259)	9.150** (2.195)	8.293* (1.802)	1.544 (1.113)	-1.135 (-0.732)	-0.197 (-0.212)	5.297 (0.757)
Energy	0.257 (0.181)	-8.789*** (-3.534)	-21.64*** (-3.654)	-30.18*** (-4.615)	-10.86*** (-5.510)	-2.459 (-1.116)	2.899** (2.195)	-39.06*** (-3.929)
Financials	2.750** (2.162)	3.243 (1.461)	-2.497 (-0.473)	3.495 (0.599)	3.847** (2.188)	0.786 (0.400)	3.082*** (2.616)	16.03* (1.807)
Health Care	2.348** (2.351)	2.441 (1.401)	5.903 (1.423)	10.69** (2.334)	2.783** (2.017)	2.597* (1.683)	1.126 (1.217)	18.86*** (2.708)
Industrials	1.503 (1.643)	-0.677 (-0.424)	-7.671** (-2.019)	-6.845 (-1.632)	1.228 (0.972)	-1.863 (-1.319)	3.015*** (3.558)	8.145 (1.277)
Information Technology	4.613*** (3.879)	1.342 (0.647)	-2.064 (-0.418)	3.891 (0.713)	5.577*** (3.393)	4.053** (2.206)	3.117*** (2.829)	25.03*** (3.018)
Materials	-1.582 (-1.523)	1.459 (0.805)	5.238 (1.213)	5.115 (1.073)	2.070 (1.441)	-1.812 (-1.129)	2.204** (2.290)	20.35*** (2.809)
Real Estate	1.955* (1.837)	4.950*** (2.666)	-11.74*** (-2.656)	-4.838 (-0.991)	0.788 (0.536)	-5.926*** (-3.604)	4.223*** (4.283)	-8.421 (-1.135)
Utilities	3.858*** (3.507)	7.272*** (3.789)	-0.672 (-0.147)	10.46** (2.073)	-0.116 (-0.0765)	1.269 (0.747)	0.979 (0.961)	14.19* (1.850)
Belgium	1.530 (0.644)	4.632 (1.118)	7.472 (0.757)	13.63 (1.252)	-1.667 (-0.508)	-3.390 (-0.924)	0.0512 (0.0233)	4.687 (0.283)
Denmark	0.672 (0.285)	8.258** (2.007)	-4.613 (-0.471)	4.317 (0.399)	3.221 (0.988)	-1.034 (-0.284)	2.522 (1.154)	34.53** (2.099)
Finland	3.348 (1.444)	2.642 (0.653)	2.754 (0.286)	8.744 (0.822)	-0.0954 (-0.0298)	-3.187 (-0.890)	-1.191 (-0.554)	12.82 (0.793)
France	1.184 (0.562)	3.586 (0.975)	1.712 (0.195)	6.482 (0.670)	-0.758 (-0.260)	-5.192 (-1.594)	1.618 (0.828)	-0.903 (-0.0614)
Germany	1.794 (0.850)	2.313 (0.628)	0.476 (0.0543)	4.583 (0.474)	2.975 (1.020)	-0.302 (-0.0925)	0.815 (0.417)	10.76 (0.731)
Ireland	1.002 (0.379)	7.771* (1.687)	-1.865 (-0.170)	6.908 (0.570)	0.299 (0.0819)	-3.664 (-0.898)	6.039** (2.468)	16.48 (0.895)
Italy	2.296 (1.031)	4.391 (1.131)	3.558 (0.385)	10.25 (1.003)	-0.205 (-0.0666)	-3.197 (-0.930)	3.535* (1.714)	6.385 (0.411)

Netherlands	2.814 (1.269)	5.873 (1.518)	1.517 (0.165)	10.20 (1.003)	2.301 (0.751)	-4.875 (-1.423)	1.004 (0.489)	13.42 (0.868)
Norway	2.168 (0.904)	6.972* (1.667)	-19.47* (-1.954)	-10.33 (-0.939)	3.253 (0.982)	1.591 (0.430)	3.200 (1.441)	23.31 (1.394)
Poland	3.915 (1.293)	5.056 (0.957)	3.492 (0.278)	12.46 (0.898)	10.73** (2.565)	-3.185 (-0.681)	11.74*** (4.186)	37.92* (1.796)
Portugal	1.930 (0.640)	10.96** (2.085)	0.0325 (0.00259)	12.92 (0.935)	-0.177 (-0.0425)	-2.627 (-0.564)	0.345 (0.124)	15.53 (0.739)
Spain	0.522 (0.229)	3.092 (0.777)	1.858 (0.196)	5.473 (0.523)	1.407 (0.447)	-4.685 (-1.330)	0.739 (0.350)	-7.080 (-0.445)
Sweden	2.167 (0.985)	7.450* (1.941)	-4.825 (-0.528)	4.792 (0.475)	2.873 (0.945)	0.618 (0.182)	2.961 (1.453)	34.58** (2.254)
Switzerland	2.012 (0.934)	2.768 (0.737)	3.780 (0.422)	8.560 (0.866)	-0.00471 (-0.00158)	-2.368 (-0.712)	2.626 (1.316)	6.122 (0.408)
United Kingdom	0.792 (0.381)	3.753 (1.034)	-8.558 (-0.990)	-4.013 (-0.421)	2.888 (1.005)	-4.677 (-1.456)	-0.400 (-0.208)	-8.551 (-0.590)
Constant	-1.243 (-0.240)	22.93** (2.534)	-46.62** (-2.163)	-24.93 (-1.048)	10.38 (1.448)	21.57*** (2.691)	-1.030 (-0.214)	122.3*** (3.379)
Observations	508	508	508	508	508	508	508	508
Adjusted R-squared	0.163	0.221	0.325	0.398	0.269	0.254	0.190	0.294

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Same variables, now controlling for industry of operation and country of operation.

Table 19, 20, 21, and 22 show the regressions with beta added as an independent variable but rather than having cumulative abnormal returns as the dependent variable, cumulative returns is now the dependent variable. The sign of beta is highly significant in most periods and negative during the expected negative windows, and positive during the expected positive windows. However, the beta in the vaccine news period is also negative. This is fairly interesting as high beta companies often experience lower returns during market downturns and higher returns when the market is doing well. This result can be explained by looking at the results our event study, we can see that in the event study the cumulative abnormal returns in the vaccine news window is also negative. These two results combined could indicate that regardless of the positive news about the potential vaccine, at the time this news wasn't enough to positively influence the market towards highly positive returns.

Overall the variables besides beta seem to be fairly consistent with the results when using cumulative abnormal returns as the dependent variable, indicating that leverage, book-to-market ratio of equity, size, and liquidity all played a role in explaining cross-section differences in returns during various event windows during the COVID-19 pandemic. In that, size has a negative effect on cumulative returns, book-to-market value of equity also has a

negative effect on cumulative returns, leverage also has a negative effect on cumulative returns, and liquidity has a positive effect on cumulative returns.

4.3 Hypotheses conclusions

In this subchapter an ending note on the hypothesis conclusions will be given for both the event study and the regression analyses.

4.3.1 Event study

Table 23. Hypothesis conclusion event study

<i>H1: The STOXX Europe 600 experienced negative cumulative abnormal returns after the COVID-19 outbreak (Early January to early-mid March).</i>	H0 = CAR = 0 = There are no abnormal returns within the event window;	The null-hypothesis can be accepted for the incubation window and the outbreak window.
	Ha = CAR ≠ 0 = The Euro STOXX Europe 600 experienced abnormal returns during the COVID-19 outbreak.	The alternative hypothesis can be accepted for the fever window and the combined negative window.
<i>H2: The STOXX Europe 600 experienced positive cumulative abnormal returns after policy responses to the COVID-19 outbreak (Mid-late March to early December).</i>	H0 = CAR = 0 = There are no abnormal returns within the event window;	The null-hypothesis can be accepted for the smefunding window and the vaccinenews window.
	Ha = CAR ≠ 0 = The STOXX Europe 600 experienced abnormal returns after the policy responses.	The alternative hypothesis can be accepted for the asset purchasing window.
Besides that, there were no significant cumulative abnormal returns when combining both the positive and negative window, indicating that the recovery period evened out the effects of the negative period.		

Notes: This table contains the hypothesis conclusions for the event studies conducted.

Looking at the distribution of the returns during the entire dataset, huge spikes can be observed in March marking initial effect COVID-19 had on the STOXX Europe 600. After these spikes, initial volatility can be seen in the graph by looking at the extent the returns

moved after the initial spikes. These visual effects are consistent with Baker et al. (2020), Bash (2020), Contessi and De Pace (2021), Ramelli and Wagner (2020), Singh et al. (2020), and Zeren and Hizarci (2020) who all found significant economic downturn and increased volatility during the COVID-19 pandemic.

The results of the event studies conducted speak volumes too. First of all the negative event windows showed significantly negative cumulative abnormal returns during the fever period, a decline of 39.05% more than expected, and the entire negative event window, a decline of 38.25% more than expected. This was in line with the initial research conducted by Ramelli and Wagner (2020), from which the negative event window periods were derived. They stated that the fever period really shifted investors' views by raising concerns about broader systemic issues such as for instance disruption in firms' operations caused by lockdown measures. The real positively influencing news announcement found in this thesis was the extension of the asset purchase program at the end of October with an increase of 6.438% more than expected. The reason for this late positive effect can be due to investors already starting to regain confidence in the market as time went on since the first two news announcements seem to both not have had a significant effect on the cumulative abnormal returns.

4.3.2 Regression analysis

When looking at the effects of the independent variables on the returns during the COVID-19 pandemic, very diverse results can be seen. For this reason, it is hard to pinpoint which characteristics drove returns either upwards or downwards in general during the crisis.

One thing that can be observed is that during market downturns, high beta companies seem to be consistently worse off than low beta companies whilst during bull markets, high beta companies seem to consistently experience higher returns. This result of beta however vanishes during the positive event windows when controlling for both industry and country. During the entire event window, beta seems to have a negative effect on the cumulative returns. This result could have been expected by looking at the cumulative abnormal returns during the entire event window, which, even though insignificant, showed a decline of 24.52% more than expected. This is further proof that during market downturns, riskier companies experience higher negative returns.

Leverage overall seemed to have a negative effect on cumulative abnormal returns and cumulative returns during the entire event window. This means that highly levered companies experienced both higher negative cumulative abnormal returns and higher cumulative

negative returns during the entire event window.

When controlling for both country and industry, it shows that size has a negative effect on both cumulative abnormal returns and cumulative returns during the entire event window. This indicates that firm size negatively affected a stock's returns during the COVID-19 pandemic. This indicates that during the pandemic, it was better to be invested in smaller companies as they were less negatively affected by the market's reaction to the virus.

Book-to-market value of equity shows a very clear negative effect on returns during the COVID-19 pandemic. This indicates that companies with higher book-to-market value of equity were affected more negatively than companies with lower book-to-market values of equity.

The findings on the explanatory power of liquidity, beta, leverage, and book-to-market value of equity are in line with the findings of Ramelli and Wagner (2020) and Fauzi and Wahyudi (2016), showing that their results are extrapolatable to Europe.

What also could be seen in the regressions is that some countries and industries experienced significantly worse or significantly better cumulative abnormal returns and cumulative returns during certain event windows. This was to be expected as some industries were severely restricted due to measures taken by governments, which can also translate to the countries in which governments took stricter measures. The countries and industries that were hit with strict measurements, due to for instance high amounts of confirmed COVID cases, probably experienced significantly worse returns than other countries. The finding that certain industries were affected more negatively than others during crises was also found by Dutta et al. (2020), Lin and Falk (2021), and Mazur et al. (2021). The energy, consumer discretionary, industrials, real estate, financials, communication services, and utilities sector performed worse than expected during the crisis whilst the materials, information technology, consumer staples, and health care sectors performed better than expected during the crisis. Country-wise, difference in positive and negative cumulative abnormal returns can also be seen. However, all countries and industries experienced negative cumulative returns, indicating that this is a global phenomenon rather than a phenomenon restricted to a certain market. Interestingly enough, the returns of the energy sectors were the only returns to remain negative during the positive window deployed in this thesis.

5. Conclusion and Discussion

5.1 Conclusion

In this thesis both an event study and a regression analysis were conducted in order to: (1) find out whether COVID-19 significantly impacted European firms through the means of an event study, and (2) which factors drove returns during the event windows. The sample consisted of 508 firms situated in 11 different sectors and 16 different countries.

The visual representation of the returns of the STOXX Europe 600 showed disproportionately large spikes both negative and positive at the beginning of March 2020 which marked the first major wave of COVID-19. This visual observation was statistically confirmed by the conducted event study, which shows that around March large significantly negative cumulative abnormal returns were found on the STOXX Europe 600. More specifically, during the fever period the market declined 39.05% more than expected, and during the entire negative window the market declined 38.25% more than expected. The real significant recovery was only seen after the announcement of the asset purchase program at the end of October 2020 in which the market grew 6.438% more than expected, indicating that the aftermath of the initial COVID-19 spike could be seen for a long period of time withing European firms' share prices. Expectedly, these results were comparable to results found on the U.S. stock market, as COVID-19 was announced to be a major global pandemic by the World Health Organization. For this reason it can be concluded that not only U.S. firms experienced large negative returns following the announcement of the COVID-19 outbreak, but also European firms experienced a large decline in share prices. A multitude of reasons for this phenomenon were discussed in this thesis, overall it seems to be majorly caused by panic caused by the media and restrictions taken by the government that caused panic amongst investors resulting in a shift of supply and demand in the stock market.

The regression analyses addressed the research question of this paper which reads: *“What were the effects of company specific factors such as financial ratios, industry, and country on share price reactions during the COVID-19 market crash on firms listed on the STOXX Europe 600?”*.

In order to address this question, regression analyses were conducted in order to investigate the effect of certain factors on cumulative abnormal returns. In order to both look at the effect of beta and to look at the robustness of the initial regressions, other regressions were carried out with cumulative returns as the dependent variable. The variables that were derived from multiple papers and used in this thesis as independent variables were: book-to-market value of equity, beta, leverage, liquidity, industry of operation, and country of

operation. Overall, the most promising factor in explaining the cross-section of returns was beta. Beta was significant in almost all regressions and indicates how risky a company is. Basically, the results indicated that riskier companies experienced more negative returns during the COVID-19 market downturn, and more positive returns during the COVID-19 market recovery. However, when controlling for both company and industry, beta only negatively influenced returns during the event window. This indicates that during the entire pandemic, higher beta translated into lower returns. The second most promising factor in trying to explain cross-section variation in returns was the book-to-market ratio, which was significantly negative in almost all event windows. This indicates that during both the market downturn and market recovery, investors preferred companies with lower book-to-market values of equity. Besides book-to-market ratio, leverage was significant in the two negative event windows that were also found significant in the event studies. The reason for this can be speculated to be that investors try to allocate their funds towards lowly levered companies in order to reduce the risk of bankruptcy. Interestingly enough, both size and liquidity were only significant in one event window. For this reason it can be concluded that size and liquidity weren't really strong determinants of cross-section variation of stock returns during the entire event window. Some country and industry coefficients were found to be significantly different from zero indicating that some countries and industries experienced either larger or smaller returns than others during the entire event window. This is not surprising as there wasn't a global strategy in fighting the COVID-19 pandemic but rather country- and industry-specific measures were taken during the crisis. Especially the energy and real estate industries performed worse than other industries whilst the information technology and health care industry performed well compared to other industries. So as a concluding remark to the earlier mentioned research question, during the COVID-19 market crash, leverage, liquidity, book-to-market value of equity, beta, industry of operation, and country of operation all played a role in explaining cross-section variation in stock returns. However the extent to which certain variables explained this variation differs. Beta seems to be most important followed by book-to-market ratio followed by leverage followed equally by liquidity and size. Besides those variables, the control variables industry of operation and country of operation seemed to also partially explain the variation in cross-sectional returns during the pandemic.

5.2 Discussion

The results of the event study are consistent with previous research conducted by Ramelli and Wagner (2020). The results of the regression analysis, in that the impact of the factors on both

cumulative abnormal returns and cumulative returns, are consistent with well-established literature written by Fama and French (1992).

This thesis however does have a couple of limitations. First of all, since a market index is used containing companies from a variety of different countries, some companies missed certain days and had to be removed from the analysis which then had to be removed for the other companies too in order to keep the weight of all companies equal. Secondly, at the time of writing the COVID-19 pandemic is still active and thus the possibility of investigating more time frames later on during the crisis wasn't possible.

The relevance of the paper is clear in that it shows which factors drive cumulative abnormal returns and cumulative returns during highly volatile periods. This information can be used by investors that want to mitigate the risk of losing money during market crashes by for instance investing in low beta, low book-to-market value of equity, low leverage, highly liquid small corporations.

Recommendations for further research concern adding more event windows in the event study and adding more factors in the regression analyses. Besides that, it might be a better idea to investigate markets as a whole rather than indices that combine a variety of companies that are all originally listed on country-specific indices due to the potential differences in trading days. At last, using confirmed cases in various analyses per country could add on to the results and possibly emphasize the effects of human disease on stock returns.

6. Bibliography

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