ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics
Capacity group Business Economics
Master Thesis Finance 2021

Stock Markets and COVID-19 Relief Measures: Does Size Matter?

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Date final version: 08 - 07 - 2021

Abstract

Huge falls have been documented in the value of stock markets as the number of COVID-19 cases grew in the first months of the crisis and lockdown measures were implemented by countries. As a result policy makers started drafting economic policy measures which match the unparalleled and abrupt nature of the crisis. In this paper it is researched whether the announcement of European Union and Country specific economic policy measures have had a dissimilar effect on the share prices of small and large companies. The analyses performed are an event study, regression analysis and difference-in-difference analysis with the Cumulative Abnormal Returns (CAR) as the dependent variable for the separate event reaction and Average Cumulative Abnormal Returns (ACAR) as the dependent variable for the aggregated event effect, a size dummy variable and several control variables. To find the optimal size dummy for each country a machine learning tool with a Random Forest algorithm is applied. It is found that the stock prices of smaller firms indeed react less positively to most economic policy measures in response to the COVID-19 pandemic.

Keywords: COVID-19, Economic policy measures, Firm size, Event study, Regression analysis, Difference-in-differences analysis, Machine learning.

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1. Introduction

The still ongoing COVID-19 pandemic has had a drastic impact on the whole world and it is not sure when this pandemic will be over and normal life can continue once again.
The internet is full of statements that the situation is worsening in many countries, for example in the Netherlands. There is a rise in the amount of affected people and also the amount of people who could not fight back anymore and passed away (RIVM, 2021).
It is beyond comprehension how many victims suffer from this pandemic physically and mentally, but also the strong economies have experienced the consequences of the pandemic.

Huge falls have been documented in the value of stock markets as the number of Covid-19 cases grew in the first months of the crisis and lockdown measures were implemented by countries (Jones, 2021). Value declines for some indices were even up to forty percent as can be seen in Figure 1 in the Appendix section 7.1. However, with the announcement of numerous support packages and monetary policy measures, stock prices got a boost in their values (Cox et al., 2020).

The news is overflowing with information about the need of financial support for local and small companies, because these companies are especially struggling in such times of unrest (Goodhart, Tsomocos, & Wang, 2020). There is also an added focus on immensely advancing support for small companies due to the intensive anatomy of the COVID-19 crisis' impact on households, physical distancing and the subsequent decline in consumer spending in particular, (Kreiser, 2020).

When looking at the financials of small firms, there are unprecedented disruptions of up to 40% drop in weekly revenues, expenses, and consumption in the early phases of the pandemic. The majority of this decline was due to nationwide factors and that local infections and state-level policies like shelter in place orders and NPI strictness had only moderate additional direct effects on business outcomes and owners' consumption (Kim, Parker, & Schoar, 2020).

Therefore this research will look at the economic impact of COVID-19 on financial markets. To be more specific, this research will try to assess whether small firms are hit harder by the COVID-19 pandemic than larger firms and will quantify this effect by looking at various financial outcomes, such as share prices. This is important to research, because small firms are needed to have a healthy market economy and they make up of 99% of the total number of businesses that operate in the European Union (EU). These small enterprises,

where small is defined as fewer than 250 persons employed, contribute to even about 56% of the total turnover in the EU (Eurostat, 2020). There are other benefits that come with the small business aside from the contribution to the general economic wellbeing.
Small businesses also contribute to growth and vitality in specific areas of economic and socioeconomic development. They create jobs, stimulate innovation and provide opportunities for many people, including women and minorities, to achieve financial success and independence ("The Importance of Small Business to the U.S. Economy," n.d.).

For this research there will be made use of listed firms on stock exchanges, but the distinction between small and big firms will not be based on a general size of persons employed or a specific amount of assets within a firm. The determination for small will be based on a machine learning tool, which will find the best possible cutoff for relative small and large firms based on an algorithm of total assets within each firm that will be applied to an extensive dataset. Because the distribution of these total assets of firms differ between countries, this cutoff point could also differ between countries. A further explanation of how this machine learning tool works and the benefit of this method compared to a general cutoff, can be found in the methodology section in Chapter 4.

This has brought us to the following research question:

How do the stock prices of smaller listed firms react to policy responses regarding the COVID-19 crisis? Is this reaction different from those of larger listed firms?

This paper is related to an earlier written group paper in the Money, Credit and Banking Seminar at the Erasmus University (Boom, Hu, Driesse, & Mourik, 2020).
In that paper the focus was on the US market, because of its huge value and the massive support packages that were introduced. When making use of the Russell 3000 as the index of interest, we came to the conclusion that smaller listed firms in the US reacted less positively to the measures introduced by the government. It was interesting to discover that some measures which were intended to help the smaller firms ended up helping bigger firms and therefore did not fully serve their purpose.

Because of that interesting result this research paper will analyze whether the policy responses regarding the COVID-19 crises are different between countries for these firms of heterogeneous size, or show similarities. The findings of this research could help advise the government which package of suggested methods will work more of less effectively for a specific firm size. The different financial markets where will be looked into are the total

market index in the Netherlands, France, Germany and Italy. To make a better comparison between the different countries, there will be made use of support packages introduced and implemented by the European Union (EU) to see whether countries react differently to the same introduced measures. There will also be made use of country specific (CO) policy measures, which have the same intention and type of support as the chosen measures from the EU, but are smaller in size and are only implemented in a specific country. The United Kingdom is deliberately excluded from this research, because Brexit was also ongoing during the pandemic and therefore could affect the result of this research.

Research into the COVID-19 virus is socially relevant because it currently plays a major role in both society and the economy as a whole and will possibly remain to do so for the time being. With the results of this research policymakers can see whether the implemented policy measures, on average, benefit the larger companies rather than the small ones or serve their purpose by mostly supporting the smaller firms. It can also give insights about which firm characteristics contribute to a reduced positive effect of the implemented policy. Based on that, policymakers can make adjustments to the policy and if needed come up with other policy measures that will then benefit the smaller companies more, as was originally the intention of the measures currently in place.

Furthermore, it is scientifically relevant, because prior research into this COVID-19 virus and its economic consequences has showed that smaller companies were hit harder during the still ongoing crisis (Gu et al., 2020). Even though, the disproportionate effect of the implemented policy responses on the small firms compared to large firms remains less present in the literature.

The literature describes various grounds that could contribute to a different reaction of small and large firms to the implemented economic policy measures. For example, asymmetric information and mostly adverse selection ensures investment problems for mostly young, high-growth firms (Morellec & Schürhoff, 2011). Furthermore, small firms tend to have less access to external finance. This in combination with the fact that these businesses lack the amount of cash reserves to survive a long disruption in full employment, could lead to a less positive reaction as a consequence of the COVID-19 crisis (Beck and Demirguc-Kunt, 2006). Also the amount of collateral could influence the reaction of the different firms. Firms with a higher value of assets are more likely to access external sources compared to the rest of firms. The main reasons for rejecting small firm credit applications by banks are the firm's low turnover and a lack of collateral. These are all short explanations of

contribution to a different reaction depending on the size of the firm. A more comprehensive explanation can be found in the literature section in Chapter 2.

To assess whether the market reacts differently for smaller and larger firms to the announcement of the economic policy measures, an event study will be performed. The event study is used to estimate the announcement effect of the support measures on the Dutch, France, German and Italian stock market, since these countries are members of the EU and have the most reported Covid-19 sick cases and/or deaths. In addition, this question will be answered by the use of a difference-in-differences analysis. The main reason for using a second research method in addition to the regression analysis in the event study is to optimize the validity and reliability of the study. Namely, if both research methods give a similar result, this contributes to a higher validity and reliability of the research being conducted. Another reason for using a second research method is to address the econometric concerns that could arise when performing a regression analysis. When determining the event date it could be possible the chosen event date is not exact the same date as when the information leaked to the market and was immediately incorporated in the market.

Before these two methods can be used, the classification between small and respectively large needs to be made. To make this classification as accurate and non-arbitrary as possible, a machine learning tool will be used. Within this tool the Random Forest classification algorithm will be used, which gives that splitting the data for the highest accuracy for each country is at the 11^{th} cut for the Netherlands, the 8^{th} cut for France, the 15^{th} cut for Germany, and lastly the 7^{th} cut for Italy. Where there are 20 cuts tested, each consisting an interval of 5 percentage points.

After establishing these cuts, the event study can be performed. For each country there are four event dates on which national policy measures were introduced, including monetary policy responses and policy measures taken by the ECB for the whole EU. These four event dates consist of two country specific event dates and two event dates that correspond to policy measures taken by the ECB for the whole EU.

These dates of interest are March 13, March 17, March 19 and April 23 for the Netherlands. For Germany the event dates are March 13, March 23, March 25 and April 23. Furthermore, France has as event dates March 11, March 13, March 23 and April 23. Lastly, Italy has the event dates March 13, March 17, April 9 and April 23.
On these dates important fiscal and monetary policy decisions were announced and implemented.

Because of the severity and swiftness with which financial markets were hit during the COVID-19 pandemic, central banks and governments announced a bunch of measures in a very short time period. As described above and can be seen in the data section in Chapter 3, the event dates for each country lie close to each other, which causes a tricky identification problem that the announcement effect of the economic policy and support packages measures is hard to allocate to a specific event date. Namely, the event period for each date does not represent a fully clean reaction to that specific event. Therefore the effect of the announcement of monetary policy and government support packages will also be aggregated to disentangle this identification problem. When having the focus on the two months with the most intense supporting packages, the intention is to avoid the longer term-effects of the implemented support packages.

It is found that for most economic implemented policy measures large firms have higher abnormal returns relative to smaller firms in response to COVID-19. This is in line with the hypothesis that stock prices of smaller firms react less positively to policy measures taken during this period. However, not all size coefficients are significant so no decisive conclusions can be drawn.

After the event study, the difference-in-differences analysis will follow with control variables to ensure that the common trend assumption holds conditionally. The results from the difference-in-differences analysis confirm that large firms indeed have higher abnormal returns than small firms after the event for the countries France and Italy. However, the treatment effect is negative for Germany and the Netherlands which contradicts the hypothesis. Keep in mind that none of the regressions from the difference-in-differences analysis shows a significant treatment effect.

This research will be build up in the following order: in Chapter 2 some relevant literature will be presented to provide background information to the research question. Also the main hypothesis will be discussed in this chapter. In Chapter 3 the origin of the data will be discussed with an explanation and hypothesis about the sign effect of the control variables. Afterwards, the methodology will be explained in the fourth chapter, followed by the results in Chapter 5. Lastly, the conclusion and discussion can be found in Chapter 6.

2. Literature review and hypotheses

This global COVID-19 pandemic has a major impact on the economy. To protect the health of the population, governments have taken strict measures to ensure containment of the virus in their country. Some of these implemented measures are closures from non-essential businesses, event cancellations and work-from-home policies (Price Waterhouse Coopers, 2020).

Even though these stringent containment measures were effective in containing the spread of the coronavirus disease and limiting fatalities, the Great Lockdown measures resulted in large short-term economic losses and a decline in global economic activity not seen since the Great Depression (Deb et al., 2020). Therefore the governments and central banks have to take action to limit the economic damage of these measures.

For example, the Fed has taken many measures, including implementing near-zero interest rates, (mass) purchasing securities, expanding repo operations, encouraging banks to lend, supporting loans and much more to support the U.S. economy (Cheng, 2020).
The effects of such measures on financial markets are not yet universally clear, but many earlier as well as recent papers on this matter have been published. For example Lee & Whitford (2009) looked at implemented policy measures at 212 countries from 1996 until 2006.

More recent work assessed the effectiveness of non-pharmaceutical interventions (NPIs) to contain the spread of the COVID-19. Haug et al. (2020) quantified the impact of 6,068 hierarchically coded NPIs implemented in 79 territories on the effective reproduction number, Rt, of COVID-19. They found that a combination of NPIs is necessary to curb the spread of the virus. Less disruptive and costly NPIs can be as effective as more intrusive, drastic, ones (for example, a national lockdown). Unfortunately, no clear combination of NPIs is found that works for every country and that is what makes it hard for policymakers to construct their policies, there is no clear handbook to follow.

Even though there have been several papers on the effectiveness of policies within a pandemic as well as without the presence of such an impacting pandemic, the effect of policy responses on the small-large firm divide is less present in the existing literature.
This increases the relevance of this research. To assess whether smaller firms are disproportionally affected, the stated hypotheses are based on previous literature papers.

2.1 External finance

According to Sandilands (2017) small businesses are often hit harder than bigger businesses during an economic recession. This is in line with the findings of Gu et al. (2020) who find that smaller firms experienced an additional 30% decline in their business activity during the Covid-19 crisis compared to large-sized firms.

This is because of the greater impact of reduced cash flow and reduces availability of credit. Even if their financial performance is the same, small and young firms find it more difficult to obtain bank credit compared to other firms (Bougheas, Mizen, & Yalcin, 2006). This is supported by SMEs tendency to report more frequently that they were financially constrained than large companies (Bańkowska, 2020).

Beck and Demirguc-Kunt (2006) found that smaller firms tend to have less access to external finance. This lack of access becomes mostly apparent during times with credit crunches (Wehinger, 2014). Also the credit sources are exhausted more rapidly for small firms than for large companies in times of crisis (ECB, 2013).

Moreover, the additional credit that U.S. banks had available due to the monetary stimulus of the Fed (in response to the COVID-19 crisis) mostly ended up at large firms rather than small ones since large firms were much more affected by the crisis than small firms according to the statistics in the report data (Li, Strahan and Zhang, 2020).

The impact of cash flow volatility on a firm's cash holdings depends on its financial constraints. A financially constrained firm increases its cash holdings in response to an increase in cash flow volatility (Han & Qiu, 2007). Also these businesses lack the amount of cash reserves to survive a long disruption in full employment.

Firm size thus plays an important role in understanding financing patterns. Small firms use less external finance, especially bank finance. But small firms also benefit the most from better protection of property rights in terms of accessing formal sources of external finance, particularly bank finance (Beck, Demirguc-Kunt & Maksimovic, 2008).

Because of this external finance channel it is expected that the results in the research will show that small firms react less positive than large firms to the announcement measures implemented by the governments and the European Union.

2.2 Competition

A disadvantage of small and medium-sized enterprises is that they are characterized by higher company-specific risk factors in comparison to large firms, such as the dependence of a certain customer concentration on a limited spread of activities. These company specific risk factors are fueled by competition (Savaram, 2019).

On the one hand this competition stimulates firms to be more innovative and it enables them to stay away from committing mistakes. According to Desmet & Parente (2010), this competition enhances the productivity of the firms within the market. However, firm size is shown to be essential for innovation, where larger firms find it more profitable to adopt advanced technologies than smaller firms. On the other hand, competition could put the small firm out of business. Therefore banks will be a bit more reluctant to finance acquisitions and investments (Investopedia, 2021).

Fueled by the competition literature it is expected that small firms react disproportionate to the implemented economic policy measures in comparison to larger firms.

2.3 Asymmetric information

The market for investment finance suffers from asymmetric information. Firms have an incentive to present lenders with an optimistic assessment of their financial condition and the prospective returns from their new investments. Firms also may be reluctant to reveal proprietary information lest they compromise their competitive advantages. Even if lenders do receive good information, it may be costly for them to evaluate it as outsiders to the firm (Fazzari & Athey, 1987).

It appears that the relationship between the bank officer and the manager of a small firm is characterized by asymmetric information. This leads to a risk for an incorrect allocation of loans. When looking into European technology-based small firm (TBSFs) for example, they finance new investments by relying primarily on internal funds, due to capital market failures induced by asymmetric information. Even so, European attempts to provide easier access by TBSFs to public equity, following the EASDAQ model, have failed: the so-called New Markets inaugurated in the 1990s collapsed after the Internet bubble, lacking liquidity and transparency (Revest & Sapio, 2010).

Morellec & Schürhoff (2011) find in their research that these adverse selection problems are more severe for young, high-growth firms, and that these firms will invest sooner so that their investment projects will have a greater likelihood of turning out poorly. This probability is found to be negatively related to the size of abnormal announcement returns at the time of investment. Therefore it is expected that due to asymmetric information small firms react less positive than large firms to the announcement measures implemented by the governments and the European Union.

2.4 Collateral

Krasniqi (2010) describes in his research the results of a survey that shows that not all firms receive credit they apply for, suggesting a slight excess of demand over supply of credit. Firms with high value of assets are more likely to access external sources compared to the rest of firms. The main reasons for rejecting small firm credit applications by banks are the firm's low turnover and a lack of collateral. This is due to the fact that banks prefer more to secure themselves from likely opportunistic behaviour of potentially "bad borrowers" with use of collateral. Econometric results are in line with theoretical and empirical arguments that systematic use of collateral can mitigate the adverse selection by banks in choosing whom to allocate the credit.

This effect of collateral on credit is also documented by Bougheas et al. (2006) whose results show that smaller, more risky and younger firms are more affected by monetary tightening than larger, secure, or older firms. The role of asset size and especially tangible assets that can be used as collateral is strongly emphasized.

Furthermore, in the collateral-constrained economy, agents may value the collateralizability of an asset so highly that it has a positive equilibrium price even if it never pays dividends (Brumm, Grill, Kubler, & Schmedders, 2015).

Because smaller sized firms have less collateral on their balance sheets, this contributes to the expectation that small firms react less positive to the implementation of the supporting packages than large firms.

2.5 Main hypothesis

According to Bankowska (2020) previous asset purchasing packages implemented by the ECB have had a limited effect on small and medium sized companies and monetary transmission during the OMT. The asset purchasing programs that followed had a negative impact on financing conditions for smaller companies as well.

Macchiarelli et al (2017) documented for example that the effect of the Corporate Sector Purchasing Program on SMEs has been minimal, as these companies only make up a modest fraction of the euroarea bond market. Thus, smaller companies cannot directly benefit from such monetary tools, because their debt is often not purchased in the context of these programs.

The overall literature indicates thus that policy responses tend to be more favorable for larger firms in comparison to smaller firms. Based on this information which is presented above, the main hypothesis is formed as follows:

Smaller firms are hit worse by the COVID-19 crisis than larger firms.

Acharya and Steffen (2020) found that the stock market renumerated firms with access to liquidity before and after interventions by the Federal Reserve. Therefore the liquidity channel could contribute to the worse stock returns for smaller firms. Because the literature has indicated that smaller companies may benefit less from monetary policy tools, such measures and programs likely provide more liquidity to large firms than small firms.

However, during the pandemic, small and medium sized companies are an important pillar of monetary and fiscal policies in contrast to the standard context. So has the Federal Reserve implemented a Main Street Business Lending Program, which supports eligible small and medium-sized businesses. The Federal Reserve significantly lowered the bar for access to this small-business lending program (Politi & Smith, 2020).
Furthermore has the CARES Act ensured that small companies can now be provided with low-interest loans, can get advance payments which do not need to be repaid and can apply for the Payment Protection Program (Dilger et al., 2020).

3. Data

3.1 Stock market data

To answer the research question, there will be made use of publicly traded firms in the Netherlands, France, Germany and Italy. The selection criteria used in arriving at these countries as countries of interest are being a member of the EU and having the most reported Covid-19 sick cases and/or deaths. Consequently, France, Germany and Italy have the most reported deaths and the Netherlands was chosen because that is the country where this report is written from (ECDC, 2021).

The stock markets chosen for this research are the total stock markets in the Netherlands, France, Germany and Italy. This is because of the large scope of these indexes and the fact that they are total market indices, which include both much smaller firms and large firms.

Stock price data will be used to answer the research question because of its broad availability. The current market's state is representative because of the yearly refreshing of the data. Data on the total market stock returns is obtained from Thomson Reuters Datastream/Eikon service.

3.2 Event dates

The event dates used in this research will be the dates on which economic COVID-19 policy measures were announced by the different nations. The focus will lie on both national policy measures including monetary policy responses and policy measures taken by the ECB for the whole EU. These policy measures taken by the ECB for all the countries of interest will be used to get a better comparison between the different nations. Furthermore, the effects of monetary and fiscal measures are hard to disentangle since several actions were taken at the same time in several countries. Therefore there will not lay a focus on specific policy measures, but the policy measures will be seen as a package of multiple actions within it.

An overview of all the measures taken by each governmental head and their accompanied announcement dates can be found in news articles and on official government websites. The criteria used for the event dates in this research is twofold. The first criterium is that the announced measure was the first of its kind in each country and therefore has the highest value of support packages of that type of policy measures. The second criterium is that the policy measure also has the focus on supporting small businesses. The second

criterium is to see whether the intended goals, namely supporting small companies, are reached, or that the money mainly ended up at the larger firms instead.

The chosen event dates for each country will be discussed in the following subsections in the data part. It has been verified that there were no other major events in the economic or political sphere during this study period that could influence the responses of the chosen events in a country. An overview table for the event dates for each country can be found in the Appendix section 7.2 in Table 1, Table 2, Table 3 and Table 4.

Because of the severity and swiftness with which financial markets were hit during the COVID-19 pandemic, central banks and governments announced a bunch of measures in a very short time period. As can be seen in the following section, the event dates for each country lie close to each other, which causes a tricky identification problem that the announcement effect of the economic policy and support packages measures is hard to allocate to a specific event date. Namely, the event period for each date does not represent a fully clean reaction to that specific event. Therefore the effect of the announcement of monetary policy and government support packages will also be aggregated to disentangle this identification problem. When having the focus on the two months with the most intense supporting packages, the intention is to avoid the longer term-effects of the implemented support packages.

In the first instance, the Abnormal Returns (AR) will be aggregated to get the Cumulative Abnormal Returns (CAR) for each firm for each event separately and thereafter these CARs will be averaged over the two types of events within each country to get the Average Cumulative Abnormal Returns (ACAR) for each firm within each country. There will be two ACARs for each country, one for the two EU measures and another for the two country specific measures to see whether there is a varying reaction towards the implemented policy measures on country and EU level. Furthermore, there are four CARs for each country of which two are for EU policy measures and two for country specific policy measures.

The drawback of aggregating two events within a type of measures is that the separate effects could cancel each other out and no direct results will be found. Therefore the research methods will be performed on both the separate as the aggregated effects of the event dates to control for the tricky identification problem as well as to avoid the information loss when only looking at the aggregating effect. Eventually, conclusions can be made on both the average effect as the event specific effect of the economic implemented policy measures for each country.

In the Appendix section 7.1 the most familiar stock index prices for each country are depicted for the period March and April 2020 with the event dates marked by grey dots. Figure 3 reflects the AEX for the Netherlands. Furthermore Figure 4 is for the CAC in France. Thirdly, Figure 5 pictures the DAX from Germany and lastly Figure 6 is for the FTSE in Italy.

3.2.1 Event dates the Netherlands, France, Germany and Italy (EU-level)

The initial fiscal response to the Coronavirus will come from Member States' national budgets at March 13, 2020. To bring immediate relief to hard-hit SMEs, the EU budget will deploy its existing instruments to support these companies with liquidity, complementing measures taken at national level. In the coming weeks, €1 billion will be redirected from the EU budget as a guarantee to the European Investment Fund to incentivize banks to provide liquidity to SMEs and midcaps. This will help at least 100,000 European SMEs and small mid-caps with about 8 billion euro of financing (Mamer et al., 2020).

Furthermore, the EU leaders committed to establishing an EU recovery fund aimed at mitigating the effects of the crisis on April 23, 2020, to support EU citizens, businesses and countries in the recovery from the economic downturn caused by the COVID-19 pandemic ("COVID-19 coronavirus pandemic: the EU's response," 2021).

Because these implemented measures by the EU affect all member states, these two dates will be used as event dates for the Netherlands, France, Germany and Italy.

3.2.2 Event dates the Netherlands (Country level)

On March 17, 2020, the Dutch government announced a package of economic measures designed to protect people's jobs and livelihoods and to minimize the impact on self-employed people, small and medium-sized enterprises and major companies (EY, 2020).

For example, companies will have up to 90% of their wage bill paid by the state and emergency support funds will be set up for self-employed workers and businesses that are forced to close (Darroch, 2020).

Another measure that was introduced on this date, is an extension of the Business loan guarantee scheme (*Garantie Ondernemingsfinanciering, GO*) scheme. Initially, the GO scheme makes it easier for large and medium-sized companies in the Netherlands to borrow substantial amounts of money. Capital providers receive a 50% guarantee from the government. Due to the COVID-19 crisis the GO scheme has been extended to help businesses deal with the crisis. The amount for which the government stands as guarantor has

been increased to €150 million. Furthermore, the maximum guarantee percentage has been increased from 50% to 80% for large companies (public limited companies, nv) and to 90% for SMEs. The GO guarantee ceiling has been raised to €10 billion (Netherlands Enterprise Agency, RVO, 2020). This GO scheme makes it thus easier for SMEs as well as for medium-sized and large companies to obtain bank loans and bank guarantees by means of a 50% guarantee from the Ministry of Economic Affairs. The GO scheme applied to financing starting at €1.5 million with a maximum of €50 million per company. The ceiling is since March 17 increased to €150 million per company. In addition, the total budget made available by the Ministry for this purpose has been increased from €400 million to €1.5 billion (Price Waterhouse Coopers, 2020).

Furthermore, on March 19, 2020, an arrangement was made, called the Direct compensation for entrepreneurs in affected sectors (TOGS in Dutch). This is an arrangement for entrepreneurs who are affected by Dutch government measures taken to reduce the spread of the corona crisis. Under this arrangement entrepreneurs can receive a one-off compensation (Simmons & Simmons, 2020).

3.2.3 Event dates France (Country level)

On March 11, 2020, the French Economy and Finance Minister offered immediate measures to support businesses, such as eased credit terms from the state investment bank, postponements of social and tax payment deadlines and partial unemployment benefits (Institut Français des Droits et Libertés, 2020).

The French State announced to grant guarantees on March 23, 2020, to be managed by the Bpifrance Financement investment bank on behalf of and under the control of the State in order to cover the reimbursement of the principal, interest and incidental amounts of eligible loans. The funds available for providing such guarantees amount to €300 billion (each a "State Guarantee") (White & Case, 2020).

3.2.4 Event dates Germany (Country level)

The German Federal government is taking decisive action at March 23, 2020, to combat the fallout from the coronavirus pandemic, in terms of the challenges it poses both to health and to the economy with a supplementary budget. From this additional budget €50 billion will be used to support small businesses and self-employed persons (Federal Ministry of Finance, 2020).

Subsequently Germany's lower house of parliament has approved a €750 billion ($814 billion) aid package on March 25, 2020 to cushion the economy from the direct impact of the coronavirus outbreak (Deutsche Welle, 2020).

3.2.5 Event dates Italy (Country level)

The Italian government' has initiated a 25-billion-euro 'Cure Italy' decree on March 17, 2020, to stem the economic impact of the coronavirus on households and businesses and bolster the hard-pressed health system. This decree acts in five areas: measures to boost the health service; measures to support employment; measures to sustain liquidity through the banking system: fiscal measures to support households and businesses; and further measures including deferring tax and mortgage payments and helping parents with young children at home with a 600-euro bonus for paying babysitters (Ansa, 2020).

On April 9, 2020, the Council of Minister as approved the "restore liquidity" decree to support firms, craftsmen and self-employed. It contains measures aimed at relieving enterprises from certain procedures or obligations that could trigger adverse effects due to the COVID-19 pandemic and the associated restrictions.

The Guarantee Fund for SMEs has been converted into a tool capable of covering up to 100 billion of euros of liquidity, enhancing the financial allocation and extending it to enterprises with up to 499 employees (Wilkinson, 2020).

3.3 Variable introduction

The variable of interest which tests the size effect, will be represented by the proxy total assets of the firms, following the practice of Acharya and Steffen (2020).

Aside from the stock prices returns, the analyses will also include an industry variable and several firm specific variables as control variables to explain the disparity of the abnormal returns and to control for biased results. Some of these optional control variables are the *Return On Invested Capital* (*ROIC*), *Net Debt, Debt-to-Equity Ratio, EBIT, Market-to-Book Ratio, Interest Coverage Ratio, Quick Ratio* and *Return on Equity (ROE).*

The data for the firm specific variables in this research will be obtained from the Thomson Reuters Datastream/Eikon service provided by the Erasmus University and the WRDS database. The variables which are included in the research are measures yearly. The datasets will be merged using the companies' unique ISIN identifiers. As additional variables the average daily amount of new deaths (*Deaths per Million*), the average daily amount of new confirmed sick cases (*Sick per Million*), the *Reproduction Rate* and also the

GDP per capita of each country will be used as control variables to solve the endogeneity problem that the size of introduced measures depends on size of the crisis or the size of the country. An overview and brief description of the important variables can be found in Table 5 in the Appendix section 7.3.

To give a visual idea about the size of the firms within each country, a density plot of total assets of all firms included in the sample of each country is made. These can be found in the Appendix section 7.6 where Figure 7 represents the sample of the Netherlands, Figure 8 depicts the France sample, Figure 9 the Germain sample and lastly Figure 10 shows the Italian sample. These figures indicate that firms with a total asset value up till 20 million are well presented in the data sample and only a few outliers are bigger than this value

To improve the readability of these plot, firms with total assets above 100 million euro are removed from the density plot. Please note that this is only done for making these plots readable, in further analyses all firms will be used. These kernel density plots will give an indication of the best possible cut for the Size dummy, which is expected to be at fifty percent of the firms denoted by the vertical dotted line in each plot.

3.4 Control variables hypotheses

In this part of the data section the importance of the control variables will be discussed.
It will explain which variables will be used in the analyses and why these are relevant to be included. A broader explanation of the calculations behind the variables and what they denote can be found in Table 5 in the Appendix section 7.3.

3.4.1 Industry Category

The first variable to be discussed is *Industry Category* which describes the industry a firm mainly operates in. If a firm operates in multiple industries, the industry the firm makes the most earnings in is the denoted industry. The performance of firms differs across industries and therefore there is no general expectation of how firms in an industry react to the implemented policy measures. This difference in performance between industries makes the industry variable an interesting and valuable variable to include in the analysis.

When looking at the long-term abnormal returns across industries there are a number of industries such as petroleum and natural gas, insurance and machinery, which experienced significantly positive abnormal performance several years ago. Others like business services and medical equipment have demonstrated significantly negative long-term returns (Yaghoubi, Locke, & Gibb, 2012).

The difference in current performance between industries used in this research can be seen in Figure 2 in the Appendix. Assuming that the trend in performance has continued in confluence with the numbers in Figure 2 you would expect to see *a positive* coefficient in the regression analysis for Health Care (1), Financials (2), Consumer Discretionary (3), Industrials (4), Technology (7), Basic Materials (8), Consumer Staples (9) and Telecommunication (11). A *negative* coefficient is expected for the Energy sector (10). For the Utilities (5) and Real Estate (6) there is no information based expectation for the sign of the coefficient.

The numbers between brackets after each industry correspond to the numbers denoted for each industry in the variable description in Table 5 in the Appendix section 7.3.
The *Industry Category* variable will be used in the analyses as industry effect and will not be shown in the regression tables.

3.4.2 Return On Equity (ROE)

The borrower balance sheet channel comes from the inability of lenders to assess fully borrowers' risks and solvency, to monitor fully their investments, and/or to enforce fully their repayment of debt. This leads lenders to require collateral for borrowing, which means that a borrower's equity position influences their access to credit. The external finance premium arises from the fact that borrowers have an incentive to take on greater amounts of risk than are in lenders' interest, and lenders have limited means to restrict the amounts of risk that borrowers take on. The greater the net worth of the borrower the lower is the premium required by the lender. This means that any shock that affects net worth will affect the borrower's cost of financing, which via interest rate channels will then affect the volume of expenditures that borrowers ultimately desire to undertake and thereby aggregate demand (Basel Comittee, 2011).

Based on this the expectation is that firms with a low *ROE* would react more *positively* to the economic implemented policy measures in comparison to firms with a higher *ROE*. The subsidy for firms with a lower *ROE* is expected to have more added value than for firms that already have a stable *ROE* in terms of external finance coming available for the firms with a lower *ROE* and lower external financial premia to be paid.

3.4.3 Market-to-Book ratio (M/B)

Dhatt, Kim, & Mukherji (1999) investigate potential explanatory factors for monthly stock returns in Korea during 1982–1992. They find that Korean investors generally earned higher returns on value stocks, represented by high book-to-market ratios. This explanatory factor generally has the greatest predictive power for stock returns.

Fama and French (1992) simply argues that the high book-to-market stocks earn a high return since they carry a higher risk due to the usual financial distress of the high book-to-market firms. The results showed that book-to-market ratio is an important firm-level predictor for return in all countries and in almost all categories and therefore valuable to be included in the analysis (Cakici & Topyan, 2014).

Furthermore, it is interesting to look at the perspective of the asset prices and wealth channel which affects consumption and investment. Higher asset prices increase the equity (collateral) of an asset that is available for banks to lend against. This can make it easier for businesses to borrow. (Reserve Bank of Australia, z.d.). Based on this channel you would expect that firms with a lower *Market-to-Book Ratio* react more positively to support by the EU or the country because it now becomes easier for them to borrow for investments that would otherwise be forgone.

In line with these finding the expectation is that firms with a higher market to book ratio exhibit less positive cumulative abnormal returns and therefore a *negative* coefficient will be found for the *Market-to-Book Ratio*.

3.4.4 Age

When looking at small firms it could be hard to disentangle the interlinkage between age and size, but this is important in understanding where contributions to net employment growth originate. Because young firms make up a considerable proportion of all small firms but older firms tend to be more evenly distributed across different size classes, much of the effect of firm age may have been underplayed and attributed instead to the effect of size. Younger firms are considerably less likely to stay in the same size class from year to year compared to the larger firms, demonstrating a greater dynamism amongst younger firms regardless of their size category (Lawless, 2013). Therefore small firms can be disentangled from young firms with the addition of a control variable for age.

When looking at the relationship between age and performance, age influences performance and not vice versa, probably through intermediating mechanisms such as routinization, accumulated reputation and organizational rigidity. The results suggest that

young firms tend to privilege short-termism and value preservation rather than long-term risky innovation strategies which leads to a less positive reaction by the market in general (Coad, Holm, Krafft, & Quatraro, 2017).

According to Baker and Wurgler (2002), whereas young firms actively maintain a target cash ratio, which is largely determined by the precautionary savings motive and exploits high market valuations to raise cash, older firms adjust their cash ratios much more slowly, with significantly less regard for the precautionary savings motive. Older firms allow their cash balances to fluctuate with transitory financing deficits and surpluses, because these mature firms have a better access to financial market. Younger firms, however, which are strongly sensitive to asymmetric information and more financial constraint problems, typically hold higher stocks of cash (La Rocca et al., 2018). Based on the financial constrains problem the expectation is that younger firms react more positively to the implemented policy measures than older firms since the older firms are less financial constraint and are less in need of financial support.

Finally, even though young firms in general are given a less positive reaction by the market, the expectation is that based on financial constraints for younger firms, a *negative* coefficient will be found for the *Age* variable.

3.4.5 Return On Invested Capital (ROIC)

The *Return On Invested Capital (ROIC)* in a business attempts to measure the return earned on capital invested in an investment. There are several reasons why the *ROIC* is an important factor. The first reason is to explain the shareholder wealth creation of growth. Second, the compounding effect of high *ROIC* companies generates strong longer term shareholder value, which is why they trade at higher valuations. Third, it explains the quality of the management team and firm operations. The *ROIC* explains how good the management team is in effectively spending its money in profitable investments to increase shareholder wealth. A higher *ROIC* is received positively by the market (Delaet, 2020).

Therefore the expectation is that firms with a lower *ROIC* react more positively to the economic implemented policy measures, since they were perceived negatively by the market before and will possible show a greater boost in performance after the subsidy comes in. Concluding, a *negative* coefficient is expected to be found for the *ROIC* variable.

3.4.6 Debt-to-Equity ratio (D/E) and Net Debt

The Capital structure theory indicates that the financing risk imposed by leverage should be rewarded with higher returns. In contrast the results from Adami, Muradoglu, & Sivaprasad (2010) indicate that returns have a negative relation with leverage in the CAPM, Fama-French and Fama-French plus Carhart models. They find as result that returns decrease in leverage levels.

Sivaprasad & Muradoglu (2009) integrate the Miller-Modigliani framework (1958) into an investment approach by estimating abnormal returns on leverage portfolios in the time-series for different risk classes. For most risk classes they find that abnormal returns decline in firm leverage.

However, as a result of taking on debt, a company makes the promise to repay the loan and incurs the cost of interest. The higher the financial leverage, the higher the cost of interest is. In times of unrest during the Covid-19 crisis for example the Dutch Tax and Customs Administration has taken measures to help entrepreneurs with payment difficulties due to the corona crisis and to prevent additional costs. These measures were tax payment extension and a decrease of tax collection interest and tax interest rates which are incorporated in the measure package from the chosen event dates (Netherlands Chamber of Commerce, KVK, 2021). Based on these measures you would expect that firms with a higher *Debt-to-Equity Ratio* or a higher *Net Debt* level will react more positively to the economic implemented policy measures. These measures are currently reducing the burden of debt and some companies can now continue to exist when they would otherwise go bankrupt due to the interest payments combined with the additional debt created by the crisis.

So, in general the reaction towards debt is negative according to Adam et al. (2010) and Sivaprasad & Muradoglu (2009). However based on the capital structure theory and specific implemented policy measures the definitive expectation is a *positive* coefficient for the *Debt-to-Equity Ratio* and *Net Debt*.

3.4.7 Earnings Before Interest and Taxes (EBIT)

According to the results of the research, in Arak Petrochemical Company, the *Earnings Before Interest and Taxes (EBIT)* has a positive and significant relationship with a company's stock return (Masihabadi, Taghavi Moghaddam, Shams Kulukhi, & Rahmani, 2015). Based on this finding a *positive coefficient* is expected for the *EBIT* variable in the analysis.

Furthermore, *EBIT* is an essential measurement of a company's performance. It isolates the operating performance by excluding the impact of financing, taxes, and accounting practices, which are mostly outside of management's control. Buyers, investors, and valuation advisors use *EBIT* as a metric to evaluate the performance of a firm versus its peers (Jasmund, n.d.). Firms with a lower *EBIT* would react more positively to the introduced policy measures than firms with a higher *EBIT*. This is because firms with a high *EBIT* already have a good performance based on this metric and are in less need of the financial support. Firms with a low *EBIT*, on the other hand, were perceived to have a lower performance and were therefore less interesting in the eyes of buyers and investors before the financial support came in. Based on this reasoning a *negative* coefficient is expected for the *EBIT* variable.

3.4.8 Interest Coverage Ratio and Quick Ratio

The *Interest Coverage Ratio* is used to measure how easily a firm can pay the interest due on outstanding debt. The *Interest Coverage Ratio* is calculated by dividing a company's earnings before interest and taxes (*EBIT*) by its interest expense during a given period. A higher coverage ratio is better, although the ideal ratio may vary by industry (Hayes, 2021).

The *Quick Ratio* is an indicator of a company's short-term liquidity position and measures a company's ability to meet its short-term obligations with its most liquid assets. The higher the ratio result, the better a company's liquidity and financial health; the lower the ratio, the more likely the company will struggle with paying debts (Seth, 2021)

Sincharoonsak (2018) performed a research aiming to examine the impact of the disclosure in the annual report with regards to the abnormal returns and the cumulative abnormal returns of the companies listed in the Stock Exchange of Thailand. He made use of a Chow test and a multiple regression analysis and found a positive significant coefficient at the one percent level for the *Interest Coverage Ratio* with abnormal returns as variable of interest. In the same analysis the *Quick Ratio* was used as an explanatory variable with as a result a positive significant coefficient at the one percent level.

However, when looking more closely at the effect of the introduced economic policy measures you would expect that firms with a lower *Interest Coverage Ratio* react more positively to the policy measures than firms with a higher *Interest Coverage Ratio*. This is because firms with a higher *Interest Coverage Ratio* are already able to pay their interest due on the outstanding debt whereas firms with a lower *Interest Coverage Ratio* had a harder time

paying the interest. The subsidies make it easier for the firms to pay the interest due and therefore a *negative* coefficient is expected to be found for the *Interest Coverage* variable.

When looking at the *Quick Ratio*, the higher the ratio result, the better a company's liquidity and financial health; the lower the ratio, the more likely the company will struggle with paying debts. Therefore you would expect firms with a lower *Quick Ratio* to react more positively to the policy measures since these measures reduce this struggle with paying debts. Firms with a higher *Quick Ratio* are already financial healthier and are not as much in need of the subsidies as firms with a lower *Quick Ratio*. Based on this a *negative* coefficient is expected to be found for the *Quick Ratio* variable.

3.4.9 Control variables for policy measures size

The implemented policy measures in each country differ in various aspects. Each country deals with the corona crisis in a way they believe is the best possible manner to handle this event. However, take aside the type of measures that are implemented in each country, also the amount of cash used in the implemented policy measures differs. For example Germany's lower house of parliament has approved a €750 billion ($814 billion) aid package on March 25, 2020 to cushion the economy from the direct impact of the coronavirus outbreak (Deutsche Welle, 2020). By contrast the Guarantee Fund for SMEs has been converted into a tool capable of covering up to 100 billion of euros of liquidity, enhancing the financial allocation and extending it to enterprises with up to 499 employees in Italy (Wilkinson, 2020).

The governments pursue their policy measures mostly based on new developments during the COVID-19 crisis of new sick cases and deaths, but also the *Reproduction Rate* is taken under consideration (Rijksoverheid, 2021). To control for the differences in the volume of the implemented economic policy measures these variables related to the development of the crisis will be added to the analysis. The variables in the research are the daily amount of new deaths per one million citizens due to the COVID-19 virus, the amount of daily new sick cases per one million citizens and the *Reproduction Rate*. The new daily deaths and sick cases will be averaged over the total event period for the regression analysis. Lastly, the *BBP per capita* will be added to the regressions since countries with a higher BBP per capita are expected to receive more financial support both from the ECB and within the country itself.

The expectation is that the higher the values of each of these four variables, the higher the need for financial aid and the more positive the reaction towards the implemented policy measures. Therefore a *positive* coefficient is to be expected for these variables in the analysis.

3.5 Descriptive statistics

The descriptive statistics for all obtained variables can be found in section 7.4 in the Appendix for the variables included in the regression analysis and in section 7.5 in the Appendix for the variables that are included in the difference-in-differences analysis.

When looking at the summary statistics in section 7.4 in the Appendix the full sample covers 111 firms for the Netherlands, 247 firms for Germany, 248 for France and lastly 157 firms for Italy. To avoid outliers that are created by near-zero denominators, the ratios in the data are Winsorized at the 1 percent level. This means that the *Debt-to-Equity Ratio, Market-to-Book Ratio, Interest Coverage Ratio, ROIC, ROE* and *Quick Ratio* enter regressions as Winsorized variables. The descriptive statistics illustrate the effect of the Winsorization accurately. The maximum value for the *Interest Coverage Ratio* for France for example changed from around -5843 to -574. The maximum value for the *Market-to-Book Ratio* for the Netherlands also changed from 446 to 34 after Winsorizing. These changes indicate that there were large suspect outliers in the not Winsorized ratios.

Within the difference-in-differences analysis the same amount of firms is included as in the regression analysis. For the Netherlands there are 5290 observations in the full sample, for France there are 12400 observations, for Germany there are 12350 observations and lastly Italy has 7850 observations included in the full sample. This can be found in the tables for the full sample in Appendix section 7.5. When looking at the corona specific control variables *Sick per Million, Deaths per Million* and *Reproduction Rate*, it stands out that the interval between minimum and maximum is relative wide for the variables *Sick per Million* and *Deaths per Million*. For example for the Netherlands the variable *Sick per Million* has a minimum value of 0 and a maximum value of 65622 where the mean is 30920. Lastly, when comparing the four countries the maximum values for *Sick per Million* and *Deaths per Million* are the highest for Italy.

In addition to the summary statistics for the full sample, there are also summary statistics for the split sample as well. Detailed information about how this cut between small and larger firms is made using machine learning tools can be found in the Methodology Section in Chapter 4. The descriptive statistics for total assets confirm that within the indexes used the firms range from small to relative large in each country. When looking at Germany for example the smallest firm has €1165 in total assets, while the largest firm has €1.29e+09 in total assets.

This indicates that the indexes used in these research will be able to correctly address the stated research question.

How do the stock prices of smaller listed firms react to policy responses regarding the COVID-19 crisis? Is this reaction different from those of larger listed firms?

When looking at the statistics for small and large companies separately in the Appendix section 7.4, one can see that the cut for the samples is different between countries and not equal to fifty-fifty for any country. When looking at the Netherlands, 56 firms are qualified as small firms and 59 are large firms. For France there are 100 firms in the small sample and 148 firms in the large sample. Furthermore for Germany the small sample consists of 105 firms and the large sample of 63 firms. Lastly the sample for Italy is split in 55 firms which are distributed to the small sample and 102 firms are in the large sample.

It is also relevant to note that the statistics show several differences between firm characteristics between small and large firms. Small firms of course have less *Total Assets* than larger firms, but also a higher mean *Quick Ratio* for the Netherlands, Germany and France can be found for small firms. This is not the case for Italy but the value for the smaller firms is not that different for the larger firms in the Italian sample. Small firms also have a higher Winsorized mean *Interest Coverage Ratio* than larger firms, this is found for each country in the research. Furthermore, the median small company has a higher *Market-to-Book Ratio* than large firms for each country. Lastly the *Net Debt* value is higher for the larger firms than the smaller firms within each country.

4. Methodology

The research question will be tested by two different research methods. First with an event study accompanied by a regression analysis. Secondly with a difference-in-differences method. Beforehand, the cutoff point between small and large firms will be determined by a machine learning tool and this distinction will be used within the two research methods.

4.1 Event Study

First, an event study will be performed on the stocks that are included in the total market index in the Netherlands, the total market index in France, the total market index in Germany and lastly the total market index in Italy. The firms that are in the total market index in a country during the whole sample period, so from the start of the estimation period until the last event date, will be included in the data, others will be excluded from the sample.

The event study method will be used for each country separately. As events there will be made use of the dates on which policy measures regarding the COVID-19 pandemic are announced. Information about these policy measures can be found in the data section in Chapter 3.

To start the event study, the normal returns will be calculated using the market model. Then the abnormal returns will be calculated by the difference between the actual returns and the normal returns:

$$AR_{it} = R_{it} - \widehat{a_\iota} - \widehat{\beta_\iota} R_{mt}$$

where R_{it} is equal to the realized return of stock i on day t of the event period; $\widehat{a_i}$ and $\widehat{\beta_i}$ are OLS estimates of the regression coefficients estimated in the estimation window; and R_{mt} is the return of each index on day t of the event period.

The estimation window that will be used consists of the interval [-450, -200], which consists of 250 trading days. The estimation window ends well before the first COVID-19 case was found, to prevent this from contaminating the sample. The abnormal returns for each event will be calculated on the interval [-10, 10]. After this a trade-off needs to be made between using a smaller estimation window versus a larger estimation window. A larger window can take into account that there may be some information leakages, but a smaller window allows to obtain cleaner results of the announcement effect, as there is a smaller chance that the analysis will be contaminated with other news.

Within the chosen estimation window the Abnormal Returns (AR) will be summed up to get the Cumulative Abnormal Returns (CAR) firm for each event separately. Furthermore the CARs are averaged over the event dates for each type of event for each country to get the Average Cumulative Abnormal Return (ACAR). Eventually there will be two ACARs of interest for each country. One ACAR value is calculated by averaging the Cumulative Abnormal Returns for the two implemented EU measures. This ACAR gives a better basis for comparing the results from the different countries. The other ACAR value is determined by taking the average Cumulative Abnormal Returns for the two implemented country specific measures. Because these country specific measures are comparable between countries but differ in specifics, the ACAR values for each country will not be used to make a direct comparison between countries, but will be used to make a comparison within countries between the reaction towards the EU measures in contrast to the country specific measures. Furthermore, there are four CARs for each country of which two are for EU policy measures and two for country specific policy measures.

The drawback of aggregating two events within a type of measure is that the separate effects could cancel each other out and no results will be found. Therefore the research methods will be performed on both the separate as the aggregated effects of the event dates to control for the tricky identification problem as well as to avoid the information loss when only looking at the aggregated effect. Eventually, conclusions can be made on both the average effect as the event specific effect of the economic implemented policy measures for each country.

Following, a t-test will be used as parametric test to test the statistical significance of the implemented policy measures on the stock returns. This will be done on the [-1,2] and [-1,1] estimation windows to see which window is the most interesting to use in the research. In combination with the knowledge that you want to avoid overlap between two events, the best possible estimation window will be chosen. Other parametric tests can be used to check the robustness of the results.

Lastly, the estimation window [-7,0] will be added to the analysis to check for possible leakages and confounding events before the official announcement moments denoted by the event dates in the data chapter.

4.2 Machine Learning tool

Many academic literature employs general thresholds for small and large size firms. In this research a support vector machine will be used to test which size threshold fits the data best and therefore leads to the best results possible (Guenther & Schonlau, 2016). The level of this threshold could differ between the countries so that the size small or large is relative and gives a better representation of the data of the firms in each country. Therefore it allows to draw more meaningful conclusions than with a general threshold. Other benefits that a machine learning tool has in comparison to a general threshold is that it identifies possible hidden patterns in the data, creates a robust system and increases the adaptability to changes (Taranenko, 2021).

A Random Forest (RF) classification algorithm will be used to determine the size threshold. As mentioned in the data section, the variable total assets will be used as proxy for size, in line with Archarya and Steffen (2020). This algorithm will be trained on 50% of the data, which is called the inside sample, and it will be tested on the other 50%, the outside sample. All observations will be randomly assigned to one of the two groups.

The choice to use a fifty-fifty split between the training data and test data allows that the training data can be used as test data in a second run and, as well as that the test data can be used again as training data. This type of split optimizes the data usage relative to another split in the data. Moreover, for economic inference both test data and training data are important, this is another reason why the training data is not increased above fifty percent of the data like the standard method when machine learning is used for forecasting.

Furthermore the accuracy of predictions of this support vector machine will be tested at different cuts in the data. A comparison will be made of the accuracy of these predictions on the test data at different cuts in the dataset. The cuts will be at fixed intervals of five percentage points from 5% until 95%.

The accuracy is measured using the following function:

$$RF\ accuracy = \frac{\left(\frac{TP + TN}{TP + TN + FP + FN}\right) - x}{1 - x}$$

In this equation, TP are the true positives, TN are the true negatives, FP are the false positives, FN are the false negatives and x will contain a different value of Z at each cutoff.

Z = [0.95 0.9 0.85 0.8 0.75 0.7 0.65 0.6 0.55 0.5 0.55 0.6 0.65 0.7 0.75 0.8 0.85 0.9 0.95]

The variable RF accuracy will be positive if the algorithm cut predictions are more accurate than a solely trivial prediction. If for example a cut at 70% is correct in 70% of cases the variable RF accuracy will be 0. It is positive when it is correct in more than 70% of cases and negative if it is correct less than 70% of cases. It is modelled this way, since it can apply the strategy to predict only zeroes, if $x > 0.5$, and mechanically be correct 70% of the time. The algorithm needs to deviate from this strategy by predicting a 1 in some cases. If these deviations to the "only zeroes" strategy will improve its accuracy the outcome of this formula will be positive.

It is also valuable to check whether its accuracy improves if other control variables such as *industry Category*, *Debt-to-Equity Ratio* or *Age* are added to the machine learning tool.

Lastly, it could be interesting to see how much each variable used in the model contributes to the model and also to check what might be relevant control variables in the regression analysis. These contributions are ranked and show how much each variable contributes to an accurate size cut, not necessarily to how this size cut relates to our abnormal returns. This is important to keep in mind when interpreting these results. The results are reported in section 7.9 in the Appendix.

4.3 Regression Analysis

After performing the event study, several regressions will be conducted to determine the size effect on the (Average) Cumulative Abnormal Returns. The variable of interest in these regressions is the size dummy. Other variables, as mentioned in the data section, will be used as control variables in these regressions. An overview of these variables can be found in Table 5 in the Appendix section 7.3. The final regression to draw conclusions from will be chosen depending on the lowest Bayesian Information Criterion (BIC) value. Therefore, the regression shown in this section could differ from the final regression in the results section.

There will be two types of regressions, one without a liquidity variable, and another one with the same variables of interest used in the first regression with an addition of a liquidity variable. This is done to test the effect of the additional liquidity channel. *The Quick Ratio* is an indicator of a company's short-term liquidity position and measures a company's ability to meet its short-term obligations with its most liquid assets. The higher the ratio result, the better a company's liquidity and financial health; the lower the ratio, the more likely the company will struggle with paying debts (Seth, 2021). This variable is therefore useful to be used as proxy for liquidity is the *Quick Ratio* of the firm.

The regressions will be performed on both the separate as the aggregated effects of the event dates to control for the tricky identification problem as well as to avoid the information loss when only looking at the aggregating effect.

So first the separate effects of the events will be tested. Two times the EU policy measures (CAR EU) and two times the Country measures in each country (CAR CO) both on the interval [-1,2] or [-1,1] for the event period and [-7,0] to check for possible leakages and confounding events before the official announcement moments. The event period will be based on the t-statistics.

Thereafter the aggregated effects will be tested. One time for the averaged EU policy measures (ACAR EU), one for the averaged country specific policy measures (ACAR CO) both on the interval [-1,2] or [-1,1] for the event period and [-7,0].

The first regression will look like the following. However, the coefficients of this first regression will not be shown in tables, only the interesting differences compared to the second regression will be discussed in the results section.

$$(A)CAR_{it} = \propto_i + \beta_1 Size\_Treatment_i + \beta_2 IndustryCategory_i + \beta_3 ROIC_i + \beta_4 NetDebt_i + \beta_5 DE_i + \beta_6 MB_i + \beta_7 EBIT_i + \beta_8 InterestCoverage_i + \beta_9 Age_i + \beta_{10} ROE_i + \beta_{11} GDP + \beta_{12} DeathsCovid19 + \beta_{13} SickCasesCovid19 + \varepsilon_{it}$$

The second regression with the addition of *Quick Ratio* of the firm, to test the effect of the liquidity channel and see whether the other coefficients where upwards or downwards biased, is represented by the following formula.

$$(A)CAR_{it} = \propto_i + \beta_1 Size\_Treatment_i + \beta_2 IndustryCategory_i + \beta_3 ROIC_i + \beta_4 NetDebt_i + \beta_5 DE_i + \beta_6 MB_i + \beta_7 EBIT_i + \beta_8 InterestCoverage_i + \beta_9 Quick\ Ratio_i + \beta_{10} Age_i + \beta_{11} ROE_i + \beta_{12} GDP + \beta_{13} DeathsCovid19 + \beta_{14} SickCasesCovid19 + \varepsilon_{it}$$

In both regressions, *Size_Treatment* is a dummy variable that equals 0 if a firm is small and 1 if it is large based on the random forest analysis. The subscript i refers to the i^{th} firm in the data and the subscript t stands for the time dimension. *GDP, DeathsCovid19* and *SickCasesCovid19* are constant values which are equal for each firm and over the time period have no subscript i or t. Since the variables *Size Treatment, Industry Category, ROIC, Net Debt, Debt-to-Equity Ratio, Market-to-Book Ratio, EBIT, Interest Coverage Ratio, Quick*

Ratio, Age and *ROE* are yearly variables and do not differ in value during the event period, the subscript t is not included for these variables.

A comprehensive explanation for the expected effects of the variables on the (A)CAR can be found in Chapter 3 the data section, but a short summary will follow hereafter.

Firms with a higher amount of *Total Assets* are expected to show higher returns, therefore the dummy variable *Size_Treatment* is expected to have a higher value for larger firms (value 1) than for smaller firms (value 0). There is no unanimous expectation for the *Industry Category* variable since some industries perform better than others so the values for the coefficients of this variable can be both *positive* and *negative*. Furthermore, a *negative* coefficient is expected for *ROIC, ROE, Market-to-Book Ratio, EBIT, Age, Interest Coverage Ratio* and lastly *Quick Ratio*. This is because firms with a lower value for these coefficients are expected to profit more from the economic implemented policy measures than firms with a higher value. The coefficient for the variables *Net Debt* and *Debt-to-Equity Ratio* are expected to be *positive* since firms with a higher value for these firms profit the most from the implemented policy measures which are also intended to reduce the debt burden in a firm. Lastly for the variables *GDP*, *Deaths COVID-19* and Sick *cases COVID-19* the expectation is that the higher the values of each of these three variables, the higher the need for financial aid and therefore a *positive* coefficient is to be expected for these variables in the regression analysis.

Furthermore, the ratios in the regressions, *Debt-to-Equity Ratio, Market-to-Book Ratio, ROE, ROIC, Interest Coverage ratio* and lastly *Quick Ratio* are Winsorized at the one percent level at both sides to remove outliers.

To be able to interpret the results with more certainty, several extra test will be performed. First, the normality of residuals will be verified. These results show no indications of non-normality and therefore it can be concluded that the residuals are close to a normal distribution. The figures showing the normality of residuals can be found in the Appendix in section 7.7.

Second, a test will performed to check for multicollinearity. High multicollinearity will cause inflated variances and standard errors of the coefficients and you therefore want to avoid it (Stock & Watson, 2012). To test for multicollinearity in the model, the variance inflation factor (VIF) will be calculated for the independent variables and also the correlation matrix of the variables will be verified. The VIFs of the variables in the model and the correlations between the variables in the regression analysis can be found in section 7.7 in the

Appendix. These results indicate that there is no cause for concern in the area of multicollinearity.

Lastly, there will be tested whether the variance of the residuals is constant, to avoid heteroscedastic variance of the residuals in the model. The Breusch-Pagan test will be used to test for heteroskedasticity and finds that the null hypothesis of homoscedastic variance of the residuals cannot be rejected. Therefore, the conclusion can be made that heteroskedasticity will not form a problem in the model.

4.4 Difference-in-differences Analysis

After performing the regression analysis, as a second method a difference-in-differences analysis will be performed to look into the COVID-19 pandemic more closely. Namely, if both research methods give a similar result, this contributes to a higher validity and reliability of the research being conducted. Another reason for using a second research method is to address the econometric concerns that could arise when performing a regression analysis. When determining an event date it could be possible the chosen event date is not exact the same date as when the information leaked to the market and was immediately incorporated in the market, which is a drawback of a regression analysis.

Before the analysis will be performed, the parallel trend assumption will be tested for each country which is a underlying condition to perform a difference-in-differences analysis. This assumption is tested on daily as well as weekly returns to check whether the use of time period matters for the acceptance of the difference-in-differences method. The sample period is ten business days before the first event till ten business days after the last event. Since there are four weekend days within the period of 10 business days the event date which marks *Post* in the figures will be number 15 in the daily figures and week 3 in the weekly figures.

After this, a difference-in-differences regression will be conducted of firm-level daily abnormal returns. A firm-date panel dataset of daily abnormal returns will be constructed for this analysis. Because you need panel data in a difference-in-differences analysis the abnormal returns (AR) will be used instead of the Average Cumulative Abnormal Returns (ACAR). March 13 will be used as the policy time variable for the Netherlands, Germany and Italy which marks the first event of the aggregate policy measures implemented by the EU and the start date of assertive fiscal and monetary policy for each country. Since France has the first country specific implemented policy measure at March 11, that will be the policy time variable for France. To control for firm-specific unobservable effects the standard errors will be clustered at the firm level.

The following regression will be performed:

$$AR_{it} = \beta_0 + \beta_1 Size\_Treatment_i + \beta_2 Post_t + \beta_3 Size\_Treatment_i \times Post_t + X_{it} + \varepsilon_{it}$$

The dummy $Size\_Treatment_i$ is the same variable as in the regression analysis. This dummy equals 0 if a firm is classified as a small firm and 1 if the firm is classified as large according to the machine learning tool. The dummy $Post_t$ will equal one starting at March 11 for France and March 13 for the other countries until several weeks later, and zero before this period, implying that it will capture not only the start of more fiscal and monetary policy but also the subsequently announced measures after the first measures. Furthermore, X_{it} is a vector of variables that controls for possible common trend violations. These variables are *Industry Category, ROIC, ROE, Interest Coverage, Net Debt, Debt-to-Equity Ratio, Market-to-Book Ratio, EBIT, Quick Ratio, Age, Deaths per Millions, Sick per Million* and lasty *Reproduction Rate*. However, the lowest BIC value will determine whether all of these above variables are used in the final difference-in-difference analysis or some are left out. The final analysis can be found in the results section.

A comprehensive explanation for the expected effects of these variables on the AR can be found in Chapter 3 the data section, but a short summary will follow hereafter.

Firms with a higher amount of *Total Assets* are expected to show higher returns, therefore the dummy variable *Size_Treatment* is expected to show a positive coefficient.. Furthermore, a *negative* coefficient is expected for *ROIC, ROE, Market-to-Book Ratio, EBIT, Age, Interest Coverage Ratio* and lastly *Quick Ratio*. This is because firms with a lower value for these coefficients are expected to profit more from the economic implemented policy measures than firms with a higher value. The coefficient for the variables *Net Debt* and *Debt-to-Equity Ratio* are expected to be *positive* since firms with a higher value for these firms profit the most from the implemented policy measures which are also intended to reduce the debt burden in a firm. Lastly for the variables *Deaths per Million, Sick per Million* and *Reproduction Rate* the expectation is that the higher the values of each of these three variables, the higher the need for financial aid and therefore a *positive* coefficient is to be expected for these variables in the regression analysis.

Furthermore, the ratios *Debt-to-Equity Ratio, Market-to-Book Ratio, ROE, ROIC, Interest Coverage ratio* and lastly *Quick Ratio* are Winsorized at the one percent level at both sides to remove outliers.

The coefficient on the interaction term, β_3, captures the causal effect of size treatment on stock performance during the response to the shock. The subscript i refers to the i^{th} firm in the data and the subscript t is used to emphasize that data are time series.

Industry fixed effects will also be included to control for differences in the external financing needs across industries, which is in line with Rajan and Zingales (1998) external finance dependence theory.

The difference-in-differences regression will also make use of firm and day fixed effects to account for other unobservable effects, and cluster the standard errors on a firm and day basis.

For the Netherlands and France two business days are missing from the post treatment period. Since this missing data is random and the data would be much less when deleting the values starting at the first missing date, the choice was made to preserve all the data and suffice with the few missing values.

Also for the difference-in-differences analysis various diagnostic tests will be performed to be able to interpret the results with more certainty. First, the normality of residuals will be verified which show no indications of non-normality. Second, the variance inflation factor (VIF) is calculated to check for multicollinearity. These results indicate that there is no cause for concern in the area of multicollinearity. Lastly, there will be tested whether the variance of the residuals is constant, to avoid heteroscedastic variance of the residuals in the model. The conclusion can be made that heteroskedasticity will not form a problem in the model. The diagnostics tests from the normality of residuals and the VIF can be found in Appendix section 7.8.

5. Results

5.1 Abnormal returns

5.1.1 The Netherlands

First, for the event study for the Netherlands the Average Cumulative Abnormal Returns are calculated over the interval [-1,2]. The value of the average abnormal returns for all firms for the EU policy measures is -0.93% and -0.15% for the country specific policy measures.

To test the statistical significance of these values a standard t-test is used. The corresponding t-statistic for the interval [-1,2] for the EU policy measures is equal to -5.0505 with 110 degrees of freedom and a p-value of 0.0000. The t-statistic for the country specific policy measures is -6.2482 with 110 degrees of freedom and a p-value of 0.0000. This shows that ACAR is significantly different from zero at the 1% level.

To check for possible leakages and confounding events before the official announcement moments also the ACAR are calculated over an event window of [-7,0]. The average value for the EU policy measures is equal to -0.97% and for the country specific measures it is -0.60%.

The t-statistics are also calculated for the ACARs over the event window of [-7,0]. The t-statistic for the EU policy measures is equal to -4.6717 with 110 degrees of freedom and a p-value of 0.0000. For the country specific policy measures the t-value is equal to -6.5410 with 110 degrees of freedom and a p-value of 0.0000. This shows that the ACAR is significantly different from zero at the 1% level. However, these values indicate that the information already came to the market before the event date so there has been information leakage.

5.1.2 France

Furthermore, for France the Average Cumulative Abnormal Returns are calculated over the interval [-1,2]. For the EU policy measures the value of the average abnormal returns for all firms is equal to -2.87% whereas it is -1.74% for the country specific policy measures.

To test the statistical significance of these values a standard t-test is used. The corresponding t-statistic for the interval [-1,2] for the EU policy measures is equal to -5.8975 with 241 degrees of freedom and a p-value of 0.0000. The t-statistic for the country specific policy measures is -4.3630 with 241 degrees of freedom and a p-value of 0.0000. This shows that the ACAR is significantly different from zero at the 1% level.

To check for possible leakages and confounding events before the official announcement moments also the ACARs are calculated over an event window of [-7,0]. The average value for the EU policy measures is equal to -0.82% and for the country specific measures it is -2.12%.

The t-statistics are also calculated for the ACARs over the event window of [-7,0]. The t-statistic for the EU policy measures is equal to -1.4581 with 241 degrees of freedom and a p-value of 0.0731. The t-statistic for the country specific policy measures is equal to -3.5814 with 241 degrees of freedom and a p-value of 0.0002. This shows that the ACAR is significantly different from zero at the 10% level for the EU policy measures and at the 1% level for the country specific measures. However, these values indicate that the information already came to the market before the event date so there has been information leakage.

5.1.3 Germany

Also for Germany the Average Cumulative Abnormal Returns are calculated over the interval [-1,2]. The value of the ACAR for all firms for the EU policy measures is equal to -0.307% whereas the value is equal to 0.44% for the country specific policy measures.

To test the statistical significance of these value a standard t-test is used. The corresponding t-statistic for the interval [-1,2] for the EU policy measures is equal to -0.6207 with 235 degrees of freedom and a p-value of 0.2677. The t-statistic for the country specific policy measures is -0.8788 with 235 degrees of freedom and a p-value of 0.1902. This shows that the ACAR is not significantly different from zero at the 1% level.

To check for possible leakages and confounding events before the official announcement moments also the ACARs are calculated over an event window of [-7,0]. The average value for this window for the EU policy measures is equal to -1.82% and for the country specific measures it is -2.49%.

The t-statistics are also calculated for the ACARs over the event window of [-7,0]. The t-statistic for the EU policy measures is equal to -3.1403 with 235 degrees of freedom and a p-value of 0.0010. The t-statistic for the country specific policy measures is equal to -3.9224 with 235 degrees of freedom and a p-value of 0.0001. This shows that the ACAR is significantly different from zero at the 1% level. However, these values indicate that the information already came to the market before the event date so there has been information leakage. This could be why the ACAR on the interval [-1,2] do not differ significantly from zero.

5.1.4 Italy

Lastly, for Italy the Average Cumulative Abnormal Returns are calculated over the interval [-1,2]. For the EU policy measures the value of the average abnormal returns for all firms is equal to -0.93% whereas the value is equal to -0.15% for the country specific policy measures.

To test the statistical significance of these value a standard t-test is used. The corresponding t-statistic for the interval [-1,2] for the EU policy measures is equal to -1.8315 with 144 degrees of freedom and a p-value of 0.0345. The t-statistic for the country specific policy measures is equal to -0.3189 with 144 degrees of freedom and a p-value of 0.3751. This shows that the ACAR is only significantly different from zero for the EU policy measures at the 5% level.

To check for possible leakages and confounding events before the official announcement moments also the ACARs are calculated over an event window of [-7,0]. The average value for this window for the EU policy measures is equal to -0.97% and for the country specific measures it is -0.60%.

The t-statistics are also calculated for the ACARs over the event window of [-7,0]. The t-statistic for the EU policy measures is equal to -1.5448 with 144 degrees of freedom and a p-value of 0.0623. The t-statistic for the country specific policy measures is equal to -0.9188 with 144 degrees of freedom and a p-value of 0.1799. This shows that the ACAR is significantly different from zero at the 10% level for the EU policy measures and not significantly different form zero for the country specific measures.

However, these values indicate that the information already came to the market before the event date so there has been information leakage.

After calculating the Average Cumulative Abnormal Returns and performing the statistics for the abnormal return, they can be used for the rest of the analysis in this paper. Before the first analysis will be performed, a determination will be made of how to split the dataset in large and small firms with the Random Forest algorithm.

5.2 Random Forest algorithm

The determination where to split the data for each country is based on the RF classification algorithm. A detailed explanation about this method can be found in the methodology section in Chapter 4.

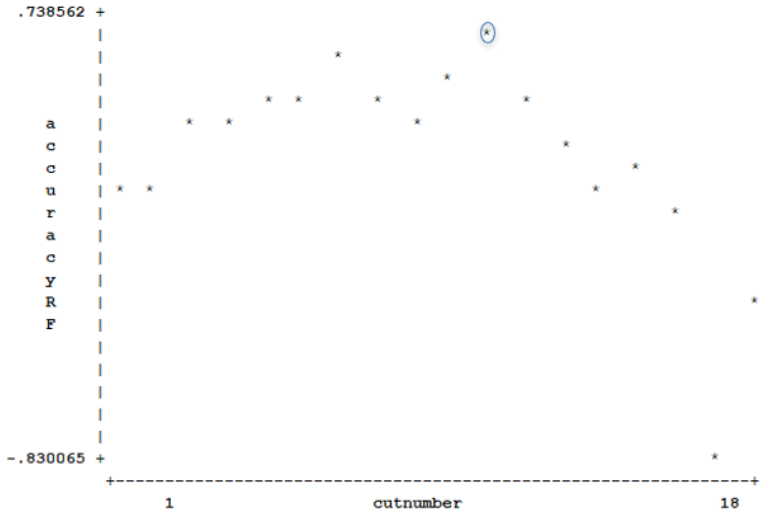
Furthermore, the relative importance of each variable used in the RF classification is depicted. The higher the relative importance of the variable the more relevant when deciding which firms are small and large. However, it is important to note that these results entail how variables contribute to an accurate size cut, not necessarily to how this size cut relates to the abnormal returns.

5.2.1 The Netherlands

As indicated in Figure 31, cut number 11 yields the highest accuracy of the predictions of the RF model. This cut is depicted by the blue circle. Cut number 11, almost in the middle of the dataset, will be used as cut for the analysis. The dummy variable *Size Treatment* will therefore equal 1 for the largest 45 percent of firms and 0 for the smallest 55 percent of firms. This cut implies that a firm with total assets of less than €1,303,541 will be classified as small in the sample. This is almost in line with what was expected to be the optimal cut based on the density plot depicted in Figure 7 in the Appendix section 7.6.

Figure 31

The accuracy of the random forest algorithm for the Netherlands.



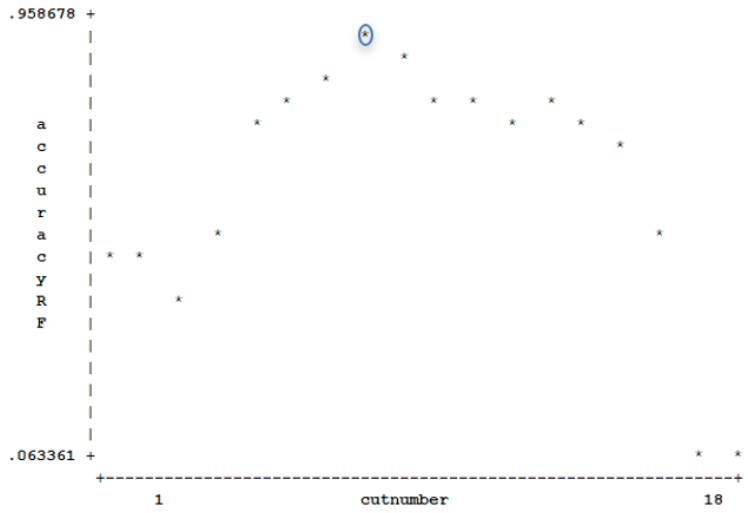
The relative importance of each individual variable in the RF model is depicted in Figure 32 in the Appendix section 7.9. The obtained results indicate that *ACAR* is the median variable and that *EBIT* is the most important variable that enters the model. The variable that reflect a firm's debt level, *Net Debt*, also contribute substantially to the model.

5.2.2 France

As indicated in Figure 33, cut number 8 yields the highest accuracy of the predictions of the RF model. This cut is denoted by the blue circle. Cut number 8 will therefore be used as cut for the analysis. The dummy variable *Size Treatment* will equal 1 for the largest 60 percent of firms and 0 for the smallest 40 percent of firms. This cut implies that a firm with total assets of less than €1.572.488 will be classified as small in the sample. This is a lower cutoff point than what was expected to be the optimal cut based on the density plot depicted in Figure 8 in the Appendix section 7.6.

Figure 33

The accuracy of the random forest algorithm for France.



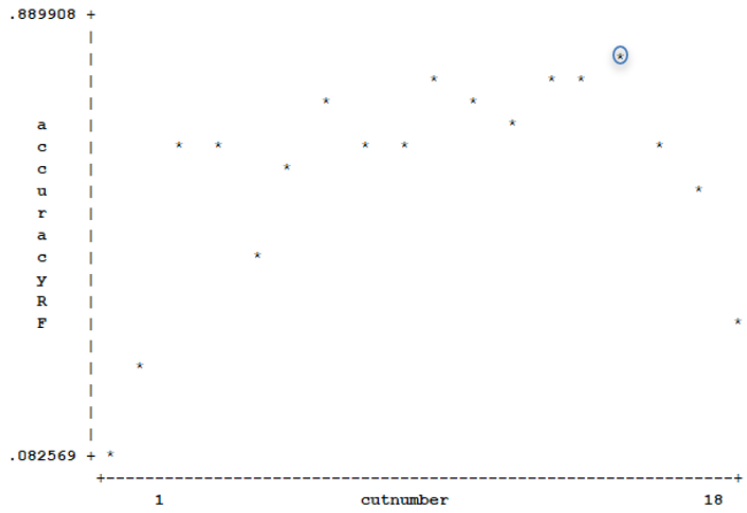
The relative importance of each individual variable in the RF model is depicted in Figure 34 in the Appendix section 7.9. The obtained results indicate that *ACAR* is almost the least important variable and that *EBIT* is the most important variable that enters the model.
The variable *Net Debt* also contribute substantially to the model.

5.2.3 Germany

When looking at Figure 35, cut number 15 yields the highest accuracy of the predictions of the RF model. This cut is denoted by the blue circle. Cut number 15 will therefore be used as cut for the analysis. The dummy variable *Size Treatment* will equal 1 for the largest 25% percent of firms and 0 for the smallest 75 percent of firms. This cut implies that a firm with total assets of less than €9.017.883 will be classified as small in the sample. This is a higher cutoff point than what was expected to be the optimal cut based on the density plot depicted in Figure 9 in the Appendix section 7.6.

Figure 35

The accuracy of the random forest algorithm for Germany



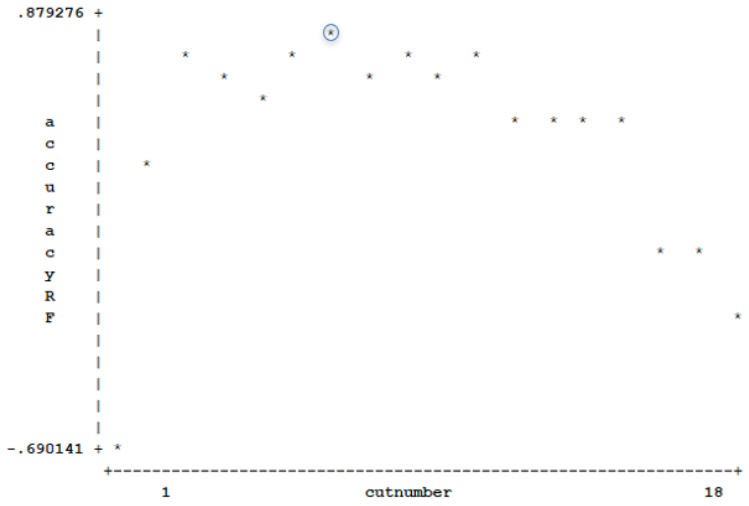
The relative importance of each individual variable in the RF model is depicted in Figure 36 in the Appendix section 7.9. The results indicate that *ACAR* is the median important variable and that *EBIT* contributes the most to the model together with *Net Debt*.

5.2.4 Italy

Lastly, the cut for Italy needs to be decided. When looking at Figure 37, cut number 7 yields the highest accuracy of the predictions of the RF model, denoted by the blue circle.
Cut number 7 will therefore be used as cut for the analysis. The dummy variable *Size Treatment* will equal 1 for the largest 65% percent of firms and 0 for the smallest 35 percent of firms. This cut implies that a firm with total assets of less than €856.485 will be classified as small in the sample. This is a lower cutoff point than what was expected to be the optimal cut based on the density plot depicted in Figure 10 in the Appendix section 7.6.

Figure 37

The accuracy of the random forest algorithm for Italy



The relative importance of each individual variable in the RF model is depicted in Figure 38 in the Appendix section 7.9. The obtained results indicate that *ACAR* is almost the least important variable and that *EBIT* is the most important variable that enters the model.
The variable *Net Debt* also contribute substantially to the model.

5.3 Regression analysis

After the determination of the size cuts for each country, the regression analyses are performed. The lowest BIC value is used to determine which regression model with which variables would fit the data best. Even though the variables *ROE* and *Interest Coverage* are interesting variables to examine, according to the BIC value, the models without these two variables were more appropriate and therefore these variables are left out the intended model represented in the Methodology section.

In addition to the size dummy and industry fixed effects, performed by the variable *Industry Category*, also several yearly measured control variables were added to the regression. These variables are: *ROIC, Net Debt, Debt-to-Equity Ratio, Market-to-Book Ratio, EBIT, Quick Ratio, Age, GDP, Deaths per Million and Sick per Million.*

Two regression analyses will be compared, one without the liquidity variable *Quick Ratio* and one with this variable, to test the effect of the liquidity channel.

The first definitive regression model is represented by the following formula:

$$(A)CAR_i = \propto_i + \beta_1 Size\_Treatment_i + \beta_2 IndustryCategory_i + \beta_3 ROIC_i + \beta_4 NetDebt_i + \beta_5 DE_i + \beta_6 MB_i + \beta_7 EBIT_i + \beta_8 Age_i + \beta_9 GDP + \beta_{10} DeathsCovid19 + \beta_{11} SickCasesCovid19 + \varepsilon_{it}$$

And the second regression model performed is represented by this formula:

$$(A)CAR_i = \propto_i + \beta_1 Size\_Treatment_i + \beta_2 IndustryCategory_i + \beta_3 ROIC_i + \beta_4 NetDebt_i + \beta_5 DE_i + \beta_6 MB_i + \beta_7 EBIT_i + \beta_8 Quick\ Ratio_i + \beta_9 Age_i + \beta_{10} GDP + \beta_{11} DeathsCovid19 + \beta_{12} SickCasesCovid19 + \varepsilon_{it}$$

Adding industry fixed effects allows to control for differences in the external financing needs across industries, in line with Rajan and Zingales (1998) external finance dependence theory. The addition of the other control variables is to enhance the internal validity of a study by limiting the influence of confounding and other extraneous variables. Uncontrolled variables are alternative explanations for results. Therefore control variables are measured and taken into account to infer relationships between the main variables of interest (Bhandari, 2021).

Unfortunately, the *GDP per Capita*, *Sick per Million* and *Deaths per Million* did enter the regression but because of collinearity reasons they were omitted by STATA. The reason that these variables are omitted has to do with the fact that these values are constant per country for each company, STATA then sees no added value in terms of predictive power.

When results are described without specification the referred interval is [-1,2]. Furthermore, a value of 0.01 was used as determination whether coefficients are or are not economically significant. So, if a realistic increase in value leads to an increase/decrease of 0.01 or 1 percent, then the coefficient is seen as economically significant.

5.3.1 The Netherlands - per separate event

The results from the regression analysis for the Netherlands for each event date separately are displayed in Table 44, which can be found in the Appendix in section 7.10.

When looking at the results, it can be seen that none of the *Size Treatment* coefficients has a statistical significant value, so no decisive conclusions can be drawn about the size classification variable. Only the coefficient for the leakage period [-7,0] for event 4 has a significantly negative value. For the first EU event the *Size Treatment* is positive, but for the last EU event it is negative, so there is no clean reaction towards EU type of measures. If you have a look at event 2 and 3, the CO measures, the *Size Treatment* displays a positive value which indicates that larger firms react more positively to implemented country measures than smaller firms. Keep in mind that the results are not statistically significant. Furthermore, the estimated coefficients for *Size Treatment* from event 1 (EU) and event 3 (CO) are considered to be economically significant. If you look at event 1 (EU) for example, the coefficient of *Size Treatment* is equal to 0.0376 which indicates that larger firms on average have 3.76% higher returns compared to smaller firms. When comparing these results with the results from the regression without the *Quick Ratio* variable there are no significant changes for the *Size Treatment* variable.

The constant in the regression represents firms in the Health Care industry. This industry experiences significant lower average cumulative abnormal returns than the other industries. This is unexpected since the Health Care industry has a large role in this Covid-19 crisis. However, it is in line with the findings of Yaghoubi, Locke, & Gibb (2012) who mention that business services and medical equipment have demonstrated significantly negative long-term returns. Furthermore the Energy industry has experienced significantly negative abnormal returns in the research period. This is in line with the expectation based on Figure 2 in Appendix section 7.1. Since more people started working from home and many firms were (temporarily) closed this is what you would expect to see in this sector. The coefficient for the Consumer Discretionary industry, which consists of non-essential goods like cars, is significantly negative which is not surprising since people live in uncertainty in these times of unrest and on average don’t buy large non-essential goods. Finally the

Telecommunications industry has experienced significant positive abnormal returns in the research period. Since more people started working from home this is what you would expect to see in this industry.

When looking at the control variables *ROIC* has a (significantly) negative coefficient which equates to the expectations that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. For both the EU as the CO measures the coefficient is negative which means there is no difference in reaction towards the type of measures. If you look at the size effect of this variable most coefficients are also economically significant. The coefficient for event 2 (CO) for example has a value of -0.0714 which indicates that firms that have an one point increase in their *ROIC* on average have 7.14% lower returns. With a maximum value of ROIC of 0.462 such an increase in the *ROIC* is economically not realistic which makes this value economically not significant.

Net Debt is negative for all events and significantly negative only in the leakage period [-7,0] for event 1 (EU) and 2 (CO). This indicates that firms with a higher *Net Debt* value react more negatively to all the policy measures which contradicts the stated hypothesis that predicted a positive reaction. When looking at the economic significance of this variable event 1 (EU) is taken as example value. *Net debt* has a value of -5.28e^{-9} which indicates that a rise of two million euro in *Net Debt* leads to a decrease in Cumulative Abnormal Returns of 0.01056 alternatively 1.056%. Since an increase of 2 million euro in *Net Debt* is not a realistic value based on a mean value of 3 million euro in the summary statistics, this coefficient is economically not significant.

The variable *Debt-to-Equity Ratio* is positive for event 1 (EU) and event 2 (CO), but negative for event 3 (CO) and event 4 (EU). However, none of these values has a statistically significant value and since the reaction towards each type of measures is twofold no decisive conclusions can be drawn towards this variable. Furthermore the economic significance of this variable can be considered. Since all coefficients for this variable have a value with four or five zeros after the comma, this means that an increase of above thousand is needed to make the effect of this variable on the CAR effective which is not economically rational. Therefore this variable is not economically significant in this analysis.

The *Market-to-Book Ratio* has a negative value for both EU measures which is in line with the expectations that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. Furthermore, only one of the CO event dates shows a negative value so no conclusive statements can be made towards the CO measures. When looking at the economic significance of the *Market-to-Book Ratio* it can also be stated that the

coefficients are not economically significant for the same reason as the *Debt-to-Equity Ratio*. An increase of ten points or more will make the variable effective on the CARs and that is not feasible in reality for ratios.

The value for the coefficient of *EBIT* is positive for all events and significantly positive in the period [-7,0] which contradict the hypothesis that firms with a lower *EBIT* would profit more form the implanted policy measures. If you look at event 1 (EU) the value of *EBIT* is equal to 0.0000544 which indicates that an increase of thousand for Earnings Before Interest and Taxes leads to an average increase in the CARs of 5.44%. The coefficients for the other events are similar in magnitude. Since the maximum value of *EBIT* for the firms in the analysis for the Netherlands is equal to 27 thousand an increase of thousand in *EBIT* is achievable which makes the coefficients for *EBIT* economically significant.

When looking at the *Age* variable, the coefficient is negative for both EU measures and negative for one of the two CO measures which is in line with the expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support. The value for the *Age* coefficient is equal to -0.000327 for event 2 (CO) which indicates that firms that are 100 years older experience on average 3.27% lower CARs. Since this is not an easily viable lifespan, the variable *Age* is considered not to be economically significant. This holds for the other events for the Netherlands as well.

Lastly, the coefficient for *Quick Ratio* is positive for the country events which indicates that firms that are more liquid react more positively to the implemented policy measures than firms that are less liquid. When looking at the EU measures the coefficient is positive for the first event This contradicts the expectations about this variable. Only the last event has a negative value for *Quick Ratio*. The highest value for the *Quick Ratio* is 0.00444 for event 2 (CO) which means that firms that have ten points increase in *Quick Ratio* on average have 4.44% higher CARs. Since an increase of 10 points for ratios is not very realistic and the other events even have lower values for *Quick Ratio*, this variable does not have an economically significant impact on the returns.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for the control variables, only the variables *Net Debt* and *EBIT* show more significant results in the same direction.

5.3.2 The Netherlands - events aggregated per type

The results of the regression analysis for the ACARs for the Netherlands are displayed in Table 43, which can be found in the Appendix in section 7.10.

When looking at the results it is visible that none of the *Size Treatment* coefficients has a statistical significant value, so no decisive conclusions can be drawn about the size classification variable. However, for the EU regression the coefficient of the *Size Treatment* is positive which indicates that large firms have higher abnormal returns than smaller firms after economic policy measures in response to the COVID-19 are announced. On the other hand the regression for the CO measures shows a negative relationship. It can be stated that the hypothesis that the stock prices of smaller firms react less positively to economic policy measures taken during this period is only supported by the EU evidence. Keep in mind that the results are not statistically significant. Nevertheless, the estimated coefficients for the *Size Treatment* variable are considered to be economically significant. If you look at the EU measures for example, the coefficient of *Size Treatment* is equal to 0.017 which indicates that larger firms on average have 1.7% higher Average Cumulative Abnormal Returns compared to smaller firms.

The results for the industry categories for the ACARs are comparable to the results found in the separate events analysis.

When looking at the control variables *ROIC* has a negative coefficient for the EU measures and a significantly negative coefficient for the CO measures which equates to the expectations that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. If you look at the size effect of this variable the coefficients for ROIC are not economically significant. The coefficient for the CO measures for example has a value of -0.045 which indicates that firms that have an one point increase in their *ROIC* on average have 4.5% lower returns. Since such an increase in the *ROIC* is economically not feasible based on a mean value for ROIC of 0.462, this value is economically not significant. This holds for the EU measures as well.

The coefficient for *Net Debt* as well as for *Debt-to-Equity Ratio is* negative for both the EU measures as the CO measures. This indicates that firms with a higher *Debt-to-Equity Ratio* or more *Net Debt* react more negatively to all the policy measures which contradicts the stated hypothesis that predicted a positive reaction. When looking at the economic significance of these variables, the coefficients are so small that they are presumed not to be economically significant. An increase of more than thousand for *Net Debt* and *Debt-to-Equity*

Ratio would be needed to have an increase in ACAR of comparable magnitude as *ROIC*, which is not a realistic increase.

The *Market-to-Book Ratio* has a negative value for both the EU as the CO measures which is in line with the expectations that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. When looking at the economic significance of the *Market-to-Book Ratio* it can also be stated that the coefficients are economically not significant. With a value of -0.001 for the EU measures and -0.0002 for the CO measures an increase of ten points or more will make the variable effective on the ACARs and since that is not feasible in reality for ratios this variable is economically not significant.

The value for the coefficient of *EBIT* is significantly positive for both type of measures which contradict the hypothesis that firms with a lower *EBIT* would profit more form the implanted policy measures. If you look at the CO measures the value of *EBIT* is equal to 0.00004 which indicates that an increase of thousand leads to an average increase in the ACARs of 4%. An increase of thousand in *EBIT* is achievable since the maximum value of *EBIT* for the firms in the analysis for the Netherlands is equal to 27 thousand, and therefore the coefficients for *EBIT* are economically significant.

When looking at the *Age* variable, the coefficient is negative for the EU measures, but positive for the CO measures. Only the results from the EU measures are in line with the expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support. The value for the *Age* coefficient is equal to -0.001 for the EU measures and 0.0002 for the CO measures which indicates that firms that are 10 years older experience on average 1% lower ACARs for EU measures and an increase of 100 years is needed for an average increase of 2% in the ACARs for CO measures. Since 10 years is an viable lifespan, but 100 years is a lot harder, the variable *Age* is considered to be economically significant only for the EU measures.

Lastly, the coefficient for *Quick Ratio* is positive for the EU measures and even significantly positive for the CO measures, which indicates that firms that are more liquid react more positively to the implemented policy measures than firms that are less liquid. This contradicts the expectation about this variable. The highest value for the *Quick Ratio* is 0.003 for the CO measures which means that firms that have ten points higher *Quick Ratio* on average have 3% higher ACARs. Since an increase of 10 for ratios is not very realistic and the other events even show lower values for *Quick Ratio*, this variable is not economically significant in this regression analysis.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for the control variables, only the results are less significant.

If these results are compared to the results per event, some differences can be seen which indicates the importance of using both the aggregate as well as the separate events in the regressions.

For the *Size Treatment* the twofold reaction towards EU measures has become positive on the aggregate, so the positive reaction towards the first EU measures is stronger than the negative reaction towards the last EU measure.

Since all coefficients for *ROIC* and *Net Debt* are negative for the separate events the aggregated reaction towards these variables remains negative as well.

Furthermore, since the reaction for the separate events towards the *Debt-to-Equity Ratio* for both type of measures and towards the *Market-to-Book Ratio* for the CO measures is twofold, the aggregate regression has filtered out the positive reaction for one of the CO measures.

Since the reaction for *EBIT* for the separate events is positive for all measures there is no change in reaction for the aggregate regression.

When looking at *Age* it can be seen that the coefficients for the separate EU measures is negative as well as for the aggregated EU measures. The reaction towards the CO measures was twofold in the separate events, but became positive in the aggregate, which indicates that the positive reaction towards one of the CO measures is stronger than the negative reaction towards the other CO measure.

Lastly the coefficient for *Quick Ratio* is positive in the aggregate for both type of measures, which means that the positive coefficient for one EU measure is stronger than the negative coefficient for the other EU measure.

5.3.3 France - per separate event

The results from the regression analysis for France for each event date separately are displayed in Table 46, which can be found in the Appendix in section 7.10.

When looking at the results it is visible that none of the S*ize Treatment* coefficients has a statistical significant value. Only the coefficient for the leakage period [-7,0] for event 4 (EU) has a significantly negative value which means that larger firms react less positive to policy responses regarding the COVID-19 crisis. For the first EU event the *Size Treatment* is positive, but for the last EU event it is negative, so there is no clean reaction towards EU type of measures. If you have a look at event 1 and 3, the country measures, the *Size Treatment* displays a positive value for the first event which indicates that larger firms react more positively to implemented country measures than smaller firms, but a negative value for the third event. Keep in mind that the results are not statistically significant. Furthermore, the estimated coefficients for the *Size Treatment* variable are considered to be economically significant for all events except for event 4 (EU). If you look at event 1 (CO) for example, the coefficient of *Size Treatment* is equal to 0.0156 which indicates that larger firms on average have 1.56% higher abnormal returns compared to smaller firms. When comparing these results with the results from the regression without the *Quick Ratio* variable the difference is that the reaction towards the EU is negative for both events in that regression.

The constant in the regression represents the coefficient for firms in the Health Care industry. This industry experiences significant lower cumulative abnormal returns than the other industries for event one and two. Also the coefficient for the third event is negative but not significant. This means that firms in the Health Care sector react negatively towards country specific measures This is unexpected since the Health Care sector has a large role in this Covid-19 crisis. However, it is in line with the findings of Yaghoubi, Locke, & Gibb (2012) who mention that business services and medical equipment have demonstrated significantly negative long-term returns. The coefficient for the fourth event (EU) is significantly positive which is in line with the expectations. Also the Real Estate industry has significantly negative abnormal returns which is not surprising since people live in uncertainty in these times of unrest and on average do not spend their saving to buy houses that easily. Furthermore the Energy industry has experienced significantly negative abnormal returns in the research period. Finally the Telecommunications industry has experienced significantly positive abnormal returns in the research period. Since more people started working from home and many firms were (temporarily) closed this is what you would expect to see in the Energy and Telecommunication industry.

When looking at the control variables *ROIC* has a significantly positive coefficient for event 2 (EU) and a positive value for event 1 (CO) and event 4 (EU). This contradicts the expectation that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. The *ROIC* value is negative for event 3 (CO). So the overall reaction for EU measures is positive and the reaction for CO measures is twofold. If you look at the size effect of this variable the coefficients for *ROIC* are also economically significant. The coefficient for ROIC lies between 0.0380 for event 4 (EU) and a value of 0.153 for event 2 (EU) which indicates that firms that have an one tenth point increase in their *ROIC* on average have 0.38% till 1.53% higher returns. Since the maximum value for ROIC is 0.246 in this analysis an increase of one tenth point in *ROIC* is economically not feasible, the reaction from this variable is economically not significant.

The variable *Net Debt* is negative for all events and significantly negative only in the leakage period [-7,0] for event 2 (EU) and event 4 (EU). This indicates that firms with more *Net Debt* react more negatively to all the policy measures which contradicts the stated hypothesis that predicted an opposite reaction. When looking at the economic significance of this variable event 1 (EU) is taken as example value since all coefficients lie in the same order of magnitude. *Net Debt* has a value of $-2.07\mathrm{e}^{-9}$ which indicates that a rise of a million euro in *Net Debt* leads to a decrease in CAR of 0.00207 alternatively 0.207 percent. Since an increase of a million euro in *Net Debt* is not a realistic value this coefficient is economically not significant.

For the *Debt-to-Equity Ratio* the coefficient is negative for event 1 (CO), event 2 (EU), but positive for event 3 (CO) and event 4 (EU). Since the reaction towards both type of measures is twofold no definitive conclusions can be made towards the *Debt-to-Equity Ratio*. Furthermore the economic significance of this variable can be considered. Since all coefficients for this variable have a value with three or more zeros after the comma this means that an increase of above hundred is required to make the effect of this variable on the CAR effective which is not economically rational. Therefore this variable is not economically significant in this analysis.

The *Market-to-Book Ratio* has a positive value for both CO measures, which contradict the expectations that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. Furthermore, only one of the EU event dates shows a positive value so no conclusive statements can be made towards the EU measures. When looking at the economic significance of the *Market-to-Book Ratio* it can also be stated that the coefficients are not economically significant for the same reason as the *Debt-to-Equity Ratio*.

The value for the coefficient of *EBIT* is positive for all events, but only significantly positive for event 3 (EU) and for event 4 (EU) in [-7,0] which contradict the hypothesis that firms with a lower *EBIT* would profit more from the implemented policy measures both from the EU and CO. If you look at the coefficients for *EBIT* they differ between 0.000000460 for event 4 (EU) and 0.0000177 for event 3 (CO) which indicates that an increase of thousand in *EBIT* leads to an average increase in the CARs between 0.046% and 1.77%. Since the maximum value of *EBIT* for the firms in the analysis for France is equal to 28 thousand, an increase of thousand in *EBIT* is achievable. However, this would lead to a relative small increase in the CARs for all events except for event 4 (EU). Therefore the coefficients for *EBIT* are considered not to be economically significant.

When looking at the *Age* variable, the coefficient is significantly positive for event 1 (CO) and event 2 (EU), but the coefficient for *Age* is significantly negative for event 3 (CO) and event 4 (EU). The expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support only holds for event 3 and 4. The value for the *Age* coefficient is equal to 0.00123 for event 2 (EU) which indicates that firms that are 10 years older experience on average 1.23% higher CARs. The other events have a coefficient that is ten times smaller. Since 100 years is not an easily viable lifespan, the variable *Age* is considered to be economically significant only for event 2 (EU).

Lastly, the coefficient for *Quick Ratio* is significantly positive for event 1 (CO) and positive for event 2 (EU) which indicates that firms that are more liquid react more positively to the implemented policy measures than firms that are less liquid. When looking at event 3 (CO) and event 4 (EU) the coefficient is negative which is in line with the expectations about the sign of *Quick Ratio*. The value for the *Quick Ratio* is 0.0121 for event 1 (CO) which means that firms that have one point higher *Quick Ratio* on average have 1.21% higher CARs. The coefficients for the other three events lie in the same magnitude. With a maximum value of 7.14 for ROIC an increase of 1 is realistic and the variable *Quick* Ratio is considered to be economically significant.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for the control variables, only the variables *ROIC* and *EBIT* show more significant results in the same direction as the regression with liquidity.

5.3.4 France - events aggregated per type

The results of the regression analysis for the ACARs for France are displayed in Table 45, which can be found in the Appendix in section 7.10.

When looking at the results it is visible that none of the *Size Treatment* coefficients has a statistical significant value, so no decisive conclusions can be drawn about the size classification variable. However, for both the EU regression as the CO regression the coefficient for *Size Treatment* is positive which indicates that larger firms have higher abnormal returns than smaller firms after economic policy measures in response to the COVID-19 are announced. Keep in mind that the results are not statistically significant. Furthermore, the estimated coefficients for the *Size Treatment* variable are considered not to be economically significant. The value of *Size Treatment* is 0.008 for the EU measures and 0.002 for the CO measures which indicates that larger firms on average have 0.2% till 0.8% higher ACARs compared to smaller firms.

The results for the industry categories for the ACARs are comparable to the results found in the separate events analysis.

When looking at the control variables *ROIC* has a significantly positive coefficient for the EU measures and a negative coefficient for the CO measures. Only the results from the CO measures equate to the expectations that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. If you look at the size effect of this variable the coefficients for *ROIC* are also economically significant. The coefficient for the EU measures is 0.096 and -0.011 for the CO measures which indicates that firms that have an one point increase in their *ROIC* on average have 9.6% higher returns for the EU measures and 1.1% lower returns for the CO measures. Since such an increase in the *ROIC* is economically not feasible looking at the summary statistics for France, these coefficients are economically not significant.

The reaction of *Net Debt* for the EU measures is positive which is in line with the expectation, but the CO measures show a negative sign unfortunately. When looking at the economic significance of this variable, the coefficients are so small that they are considered not to be economically significant. An increase of more than thousand for *Net Debt* would be needed to have an increase in ACAR of comparable magnitude as *ROIC*, which is not a realistic increase.

The *Debt-to-Equity Ratio is* negative for both the EU measures as the CO measures. This indicates that firms with a higher *Debt-to-Equity Ratio* react more negatively to all the policy measures which contradicts the stated hypothesis that predicted a positive reaction.

Also for this ratio the coefficients for both the EU as the CO measures are so small that an increase of above thousand would give an economic valuable impact. Since such an increase in the *Debt-to-Equity Ratio* is not achievable in reality, the impact of this variable is not economically significant.

The *Market-to-Book Ratio* has a negative value for the EU measures which is in line with the expectations that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. However, the results from the CO measures are positive which contradicts the expectation. When looking at the economic significance of the *Market-to-Book Ratio* it can be stated that the coefficients are not economically significant. With a coefficient of -0.00006 for the EU measures and 0.0001 for the CO measures an increase of 100 points or more will make the variable effective on the ACARs and since that is not feasible in reality this variable does not have an economically significant impact.

The coefficient of *EBIT* is positive for both type of measures and even significantly positive for the CO measures which contradict the hypothesis that firms with a lower *EBIT* would profit more form the implanted policy measures. If you look at the CO measures the value of *EBIT* is equal to 0.00001 which indicates that an increase of thousand for Earnings Before Interest and Taxes leads to an average increase in the ACARs of 1%. An increase of thousand in *EBIT* is achievable since the maximum value of *EBIT* for the firms in the analysis for France is equal to 28 thousand and therefore the coefficients for *EBIT* are economically significant.

When looking at the *Age* variable, the coefficient is positive for the EU measures, but negative for the CO measures. Only the results from the CO measures are in line with the expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support. The value for the *Age* variable is equal to 0.0003 for the EU measures and -0.0002 for the CO measures which indicates that firms that are 100 years older experience on average 2% lower ACARs for EU measures and have an average increase of 3% in the ACARs for CO measures. Since 100 years is not a viable lifespan the variable *Age* is considered not to be economically significant.

Lastly, the coefficient for *Quick Ratio* is positive for both the EU as the CO measures, which indicates that firms that are more liquid react more positively to the implemented policy measures than firms that are less liquid. This contradicts the expectations about this variable. The highest value for the *Quick Ratio* is 0.001 for the CO measures which means that firms that have ten points higher *Quick Ratio* on average have 1% higher ACARs. Since

an increase of 10 for ratios is not very realistic and the coefficient for the EU measures even has a lower value for *Quick Ratio*, the variable is not economically significant.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for the control variables, only the results are more significant for *ROIC* and *EBIT*.

If these results are compared to the results per event, some differences can be seen which indicates the importance of using both the aggregate as well as the separate events in the regressions.

For the *Size Treatment* the twofold reaction towards EU measures has become positive on the aggregate, so the positive reaction towards one of the EU measures is stronger than the negative reaction towards the other EU measure.

Since the coefficients for *ROIC* are positive for both EU measures in the separate events, there is no difference for the aggregate events. However, the reaction for *ROIC* has become negative for the CO measures which means that the negative reaction for one of the CO measures is stronger than the positive reaction for the other one.

Since the coefficient for *Net Debt* is negative for all separate events the aggregated reaction towards these variables remains negative as well.

Furthermore, since the reaction for the separate events towards the *Debt-to-Equity Ratio* for both type of measures and towards the *Market-to-Book Ratio* for the EU measures is twofold, the aggregate regression has filtered out the positive reaction for one of the measures and the negative reaction remains.

Since the reaction for *EBIT* for the separate events is positive for all measures there is no change in reaction for the aggregate regression.

When looking at the *Age* variable, the coefficient is positive for the aggregate EU measures, but negative for the aggregate CO measures. This means that the positive effect from one EU measure is stronger than the negative effect from the other EU measures and the significantly negative effect from the one CO measure is stronger than the positive effect from the other CO measure.

Lastly the coefficient for Quick Ratio is positive in the aggregate for both type of measures, which means that the positive coefficient for one event has filtered out the negative effect for the other event for both type of measures.

5.3.5 Germany - per separate event

The results from the regression analysis for Germany for each event date separately are displayed in Table 48, which can be found in the Appendix in section 7.10.

When looking at the results it is visible that none of the S*ize Treatment* coefficients has a statistical significant value. The coefficient for *Size Treatment* is positive for event 1 (EU) and event 4 (EU) which indicates that larger firms react more positive to EU policy responses regarding the COVID-19 crisis. For event 2 (CO) and event 3 (CO) the coefficient of *Size Treatment* is negative, which implies that smaller firms react more positive to country policy measures regarding the COVID-19 crisis. Keep in mind that the results are not statistically significant. When comparing these results with the results from the regression without the Quick Ratio variable the difference is that the reaction towards event 4 (EU) has become significantly positive. Furthermore, the estimated coefficients for the *Size Treatment* variable are considered to be economically significant. The value of the coefficients lies between -0.0115 for event 2 (CO) and 0.0336 for event 4 (EU) with the other coefficients in the same line of magnitude. This indicates that larger firms on average have between 1.15% lower and 3.26% higher CARs compared to smaller firms which is an economic valuable increase.

The constant in the regression should be interpreted as the coefficient for firms in the Health Care industry. This industry experiences more positive cumulative abnormal returns than the other industries for event 1 (EU) and event 4 (EU). This means that firms in the Health Care industry react positively towards EU measures, which is in line with the findings of Yaghoubi, Locke, & Gibb (2012) who mention that business services and medical equipment have demonstrated significantly negative long-term returns. On the other hand, the firms in the Health Care industry react negatively towards the implemented country specific measures, but these coefficients are not significant. Second, the Consumer Discretionary industry, which makes non-essential goods like cars, experiences significantly negative returns which is not surprising since people live in uncertainty in these times of unrest and on average do not buy large non-essential goods. Also the Real Estate industry has significantly negative abnormal returns which is understandable since people live in uncertainty in these times of unrest and on average do not spend their saving to buy houses that easily. Furthermore the Energy industry has experienced significantly negative abnormal returns in the research period. Since more people started working from home and many firms were (temporarily) closed this is what you would expect to see in the Energy industry.

When looking at the control variables *ROIC* has a negative coefficient for event 1 (EU), event 2 (CO) and event 4 (EU). This is in line with the expectation that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. The *ROIC* value is positive for event 3 (CO). So the overall reaction for EU measures is negative and the reaction for CO measures is twofold. If you look at the size effect of this variable most coefficients are also economically significant. The coefficient for event 2 (CO) for example has a value of -0.0768 which indicates that firms that have an one point increase in their *ROIC* on average have 7.68% lower returns. With a maximum value of 0.35 for the firms in this sample such an increase in the *ROIC* is economically not feasible which makes this value economically not significant.

The coefficient for *Net Debt* is positive for all events and even significantly positive for event 2 (CO) and event 3 (CO). This indicates that firms with a higher *Net Debt* value react more positively to all the policy measures which correspond to the stated hypothesis that firms with a higher debt value profit more from the implemented policy measures. When looking at the economic significance of this variable event 1 (EU) is taken as example value. *Net debt* has a value of $9.19e^{-12}$ for this event which indicates that a rise of a billion euro in *Net Debt* leads to an increase in CAR of 0.919%. Since such an increase in *Net Debt* is not a realistic value based on the variable statistics of this research the coefficients for *Net Debt* are economically not significant.

For the *Debt-to-Equity Ratio* the coefficient is negative for event 1 (EU), and event 4 (EU) which contradicts the expectation, but these coefficients are not statistically significant. Furthermore the economic significance of this variable can be considered. Since all coefficients for this variable have a value with three or more zeros after the comma this means that an increase of above hundred will make the effect of this variable on the CAR effective which is not economically rational. Therefore this variable is not economically significant in this analysis.

The *Market-to-Book Ratio* has a positive value for both CO measures and a significant value for one of those which contradict the expectation that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. Furthermore, the coefficient of *Market-to-Book Ratio* is negative but not statistically significant for the country measures, which is the expected direction for this variable. When looking at the economic significance of the *Market-to-Book Ratio* it can also be stated that the coefficients are not economically significant for the same reason as the *Debt-to-Equity Ratio*.

The value for the coefficient of *EBIT* is negative for event 2 (CO), event 3 (CO) and event 4 (EU), but only significantly negative for event 3, which equals the expectation that firms with a lower *EBIT* would profit more from the implemented policy measures for the country measures. Since the coefficient for event 1 (EU) is positive no clear conclusions can be made about the effect of *EBIT* from EU measures. If you look at event 1 (EU) the value of *EBIT* is equal to 0.00000152 which indicates that an increase of ten thousand for EBIT leads to an average increase in the CARs of 1.52%. Since the maximum value of *EBIT* for the firms in the analysis for Germany is equal to 21 thousand, an increase of ten thousand in *EBIT* is not easy achievable in reality and therefore the coefficients for *EBIT* are economically not significant.

When looking at the *Age* variable, the coefficient is negative for event 1 (EU) and event 4 (EU), but only significantly negative on the interval [-7,0] for event 4. When looking at the country measures the coefficient for *Age* is positive for event 2 (CO) and significantly positive for event 3 (CO). The expectation that younger firms profit more from the implemented policy measures only holds for the EU measures. The value for the *Age* coefficient is equal to 0.000962 for event 3 (CO) and the other coefficients for *Age* lie in the same line of magnitude which indicates that firms that are 10 years older experience on average 0.962% higher CARs. Since this is reasonable lifespan, the variable *Age* is considered to be economically significant.

Lastly, the coefficient for *Quick Ratio* is positive for event 2 (CO) and significantly positive for event 3 (CO) which indicates that firms that are more liquid react more positively to the implemented country specific policy measures than firms that are less liquid.
When looking at event 1 (EU) and event 4 (EU) the coefficient is negative but not significant however, which is in line with the expectations about the sign of *Quick Ratio*. To draw conclusions about the economic significance of this variable the highest coefficient in absolute value is analyzed. The highest value for the *Quick Ratio* is 0.00967 for event 3 (CO) which means that firms that have an one point higher *Quick Ratio* on average have 0.967% higher CARs. Even though an increase of 1 for ratios is realistic the other coefficients are smaller which makes the effect of *Quick Ratio* overall economically not significant.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for the control variables. However, *ROIC* becomes significantly for event 3 (CO) on the interval [-7,0] , *Net Debt* becomes significant for event 1 (EU) and *Market-to-Book Ratio* becomes significant for both CO measures.

5.3.6 Germany - events aggregated per type

The results of the regression analysis for the ACARs for Germany are displayed in Table 47, which can be found in the Appendix in section 7.10.

When looking at the results it is visible that for both the EU regression as the CO regression the coefficient of the *Size Treatment* is positive and even significantly positive for the CO measures which indicates that large firms have higher abnormal returns than smaller firms after economic policy measures in response to the COVID-19 are announced. Furthermore, the estimated coefficient for *Size Treatment* for the CO measures is considered to be economically significant. This coefficient is equal to 0.022 which indicates that larger firms on average have 2.2% higher Average Cumulative Abnormal Returns compared to smaller firms. Since the coefficient for the EU measures is ten times smaller the coefficient for the EU measures is economically not significant.

The results for the industry categories for the ACARs are comparable to the results found in the separate events analysis.

When looking at the control variables *ROIC* has a significantly negative coefficient for the EU measures and a positive coefficient for the CO measures. Only the results from the EU measures equate to the expectations that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. If you look at the size effect of this variable the coefficient for the EU measures is economically significant. The coefficient for the EU measures has a value of -0.106 which indicates that firms that have an one tenth point increase in their *ROIC* on average have 1.06% lower returns. Since such an increase in the *ROIC* is economically feasible, this value is economically significant. The value of the coefficient for the CO measures is equal to 0,002 which is fifty times smaller and therefore considered not to be economically significant.

The reaction of *Net Debt* for the EU measures is positive and for the CO measures significantly positive which is in line with the expectation that firms with a higher *Net Debt* value react more positively to the policy measures. When looking at the economic significance of this variable, the coefficients are so small that they are considered not to be economically significant. An increase of more than thousand would be needed to have an increase in ACAR of comparable magnitude as *ROIC*, which is not a realistic increase.

The *Debt-to-Equity Ratio is* negative for the EU measures, but positive for the CO measures. Only the reaction towards the CO measures lives up to the expectations about this variable. The coefficients are so small that they are considered not to be economically significant. For example the coefficient for the CO measures is 0.00006 which means that an

increase of more than thousand for *Debt-to-Equity Ratio* would be needed to have an increase in ACAR of impactful magnitude, which is not a realistic increase.

The *Market-to-Book Ratio* has a negative value for the EU measures which is in line with the expectations that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. However, the results from the CO measures are significantly positive which contradicts the expectations. When looking at the economic significance of the *Market-to-Book Ratio* it can be stated that the coefficients are economically not significant. An increase of at least ten points would make the variable effective on the ACARs and since that is not feasible in reality for ratios this variable is not economically significant.

The value for the coefficient of *EBIT* is positive for both type of measures and even significantly positive for the CO measures which contradict the hypothesis that firms with a lower *EBIT* would profit more form the implanted policy measures. If you look at the size of the coefficients for *EBIT* they have more than three zeros behind the comma which indicates that an increase of more than thousand for *EBIT* would be needed to have a meaningful increase in the ACARs. Since the *EBIT* for Germany has a maximum value of 21 thousand an increase of above thousand in *EBIT* is not realistic and therefore the coefficients for *EBIT* are economically not significant.

When looking at the *Age* variable, the coefficient is positive for the both measures, which contradicts the expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support. The value for the *Age* coefficient is equal to 0.0001 for the EU measures and 0.00001 for the CO measures which indicates that firms that are 100 years older experience on average 1% higher ACARs for EU measures and 0.1% higher ACARs for the CO measures. Since 100 years or more is not an reasonable lifespan for the average firm when looking at the summary statistics for the firms in this research the variable *Age* is considered not to be economically significant.

Lastly, the coefficient for *Quick Ratio* is negative for the EU measures, which indicates that firms that are less liquid react more positively to the implemented policy measures than firms that are more liquid. This is in line with the expectations about this variable. The coefficient is significantly positive for the CO measures which contradicts the hypothesis. The coefficient is -0.001 for the EU measures and 0.009 for the CO measures. This means that firms that have a ten points higher *Quick Ratio* on average have 1% lower ACARs for the EU measures and on average 9% higher returns for CO measures. Since an

increase of 10 points for ratios is not very realistic the effect of *Quick Ratio* is economically not significant.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for most control variables, only the results for *ROIC* become all negative.

If these results are compared to the results per event, some differences can be seen which indicates the importance of using both the aggregate as well as the separate events in the regressions.

For the *Size Treatment* both EU measures have a positive sign and both CO measures have a negative sign in the separate event regressions which results in an aggregate event reaction in the same direction.

Since the coefficients for *ROIC* are negative for both EU measures in the separate events, there is no difference for the aggregate events. However, the reaction for *ROIC* has become positive for the CO measures which means that the positive reaction for one of the CO measures is stronger than the negative reaction for the other one.

Because the reaction of *Net Debt* for all separate events is positive there is no change in reaction for the aggregate regression.

The *Debt-to-Equity Ratio* and *Market-to-Book Ratio* is negative for the EU measures, but positive for the CO measures which correspond to the sign from the separate events.

The value for the coefficient of *EBIT* is positive for both type of measures in the aggregate which is surprising since both CO measures in the separate event regression have a negative sign.

When looking at the *Age* variable, the coefficient is positive for both measures, even though the reaction towards the EU measures is negative in the separate event regression.

Lastly, the coefficient for *Quick Ratio* is negative for the EU measures and significantly positive for the CO measures which corresponds to the overall reactions found in the separate event regressions.

5.3.7 Italy - per separate event

The results from the regression analysis for Italy for each event date separately are displayed in Table 50, which can be found in the Appendix in section 7.10.

When looking at the results none of the S*ize Treatment* coefficients has a significant value, so no decisive conclusions can be drawn about the size classification variable. For event 1 (EU), event 2 (CO) and event 3 (CO) the *Size Treatment* is positive, which indicates that larger firms react more positively to implemented country measures than smaller firms. Since the coefficient from *Size Treatment* is negative for event 4 (EU) no definitive conclusions can be drawn about the reaction towards EU measures. Keep in mind that the results are not statistically significant. Furthermore, the estimated coefficients for the *Size Treatment* variable are considered not to be economically significant. If you look at event 1 (EU) for example, the coefficient of *Size Treatment* is equal to 0.00980 which indicates that larger firms on average have 0.98% higher abnormal returns compared to smaller firms. When comparing these results with the results from the regression without the *Quick Ratio* variable the difference is that the reaction towards all measures is positive and even significantly positive for event 1 (EU).

The constant in the regression is the coefficient for firms in the Health Care sector. This industry experiences lower cumulative abnormal returns than the other industries for event 1 (EU), event 2 (CO) and event 4 (EU). The coefficient for the third event is positive but not significant which is in line with the expectations. This means that firms in the Health Care sector react negatively towards EU measures This is unexpected since the Health Care sector has a large role in this Covid-19 crisis. However, it is in line with the findings of Yaghoubi, Locke, & Gibb (2012) who mention that business services and medical equipment have demonstrated significantly negative long-term returns. Also the Real Estate industry has significantly negative abnormal returns which is not surprising since people live in uncertainty in these times of unrest and on average do not spend their saving to buy houses that easily. Furthermore the Energy industry has experienced significantly negative abnormal returns in the research period. Since more people started working from home and many firms were (temporarily) closed this is what you would expect to see in the Energy industry.

When looking at the control variables *ROIC* has a positive coefficient for event 1 (EU), event 3 (CO) and event 4 (EU), but only the coefficient for event 3 (CO) in the period [-7,0] is significantly positive. This contradicts the expectation that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. The *ROIC* value is negative for event 2 (CO). So the overall reaction for EU measures is positive and the reaction for CO measures is twofold. If you look at the size effect of this

variable the coefficients are economically not significant. The coefficient for event 2 (CO) for example has a value of -0.0413 which indicates that firms that have an one point increase in their *ROIC* on average have 4.13% lower returns. Since such an increase in the *ROIC* is economically not feasible based on the summary statistics, this value is economically significant.

The coefficient for *Net Debt* is positive for event 4 (EU) and significantly positive for event 2 (CO). This indicates that firms with a higher *Net Debt* value react more positively to the policy measures which correspond to the stated hypothesis that firms with a higher debt value profit more from the implemented policy measures. However, the value for *Net Debt* is negative for event 1 (EU) and event 3 (CO) and significantly negative for event 1 (EU) on the interval [-7,0]. When looking at the economic significance of this variable event 1 (EU) is taken as example value. *Net Debt* has there a value of -9.08e^{-11} which indicates that a rise of 100 million euro in *Net Debt* leads to a decrease in Abnormal Returns of 0.00908 alternatively 0.908 percent. Since such an increase in *Net Debt* is not a realistic value the effect of this variable is economically not significant.

The coefficient for *Debt-to-Equity Ratio* is negative for event 1 (EU), event 2 (CO), event 3 (CO) and significantly negative for event 1 (EU) on the interval [-7,0], which contradicts the expectation about this debt variable. Furthermore the economic significance of this variable can be considered. Since all coefficients for this variable have a value with four or more zeros after the comma, this means that an increase of above thousand is needed to make the effect of this variable on the CAR effective which is not economically rational. Therefore this variable is economically not significant in this analysis.

The *Market-to-Book Ratio* has a positive value for event 1 (EU), event 2 (CO) and event 4 (EU), which contradict the expectations that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures on behalf of the EU measures. Furthermore, event 3 (CO) displays a negative coefficient also for the interval [-7,0]. Since only one of the CO event dates shows a positive value no conclusive statements can be made towards the CO measures in general. When looking at the economic significance of the *Market-to-Book Ratio* it can be stated that the coefficients are not economically significant. Since the value of the coefficients lies between 0.0018 for event 4 (EU) and 0.00589 for event 1 (EU) an increase of two till ten points or more will make the variable effective on the CARs and since that is not feasible in reality this variable is not economically significant.

The value for the coefficient of *EBIT* is negative for all events, but only significantly negative for event 2 (CO) and for event 1 (EU) on the interval [-7,0] which is in line with the hypothesis that firms with a lower *EBIT* would profit more from the implemented policy measures both from the EU and Country. If you look at the value of the coefficients this lies between -0.0000313 for event 2 (CO) and -0.000000127 for event 1 (EU) which indicates that an increase of more than thousand is needed for the *EBIT* to have an meaningful impact on the CARs. Since the maximum value of *EBIT* for the firms in the analysis for the Italy is equal to 10 thousand, an increase of thousand or more in *EBIT* is not realistic and therefore the coefficients for *EBIT* are not economically significant.

When looking at the *Age* variable, the coefficient is negative for event 1 (EU), event 3 (CO) and event 4 (EU). The expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support therefore holds for these 3 events and the EU measures overall. Since the coefficient for event 2 (CO) is positive no overall conclusions can be made about the effect of CO measures towards the CAR. The highest value for the *Age* coefficient is equal to 0.000832 for event 2 (CO) which indicates that firms that are 100 years older experience on average 8.32% higher CARs. Since this is not an easily viable lifespan and the other coefficients are even ten times smaller for *Age*, the variable *Age* is considered not to be economically significant.

Lastly, the coefficient for *Quick Ratio* is significantly positive for event 1 (EU), event 2 (CO) and event 4 (EU) which indicates that firms that are more liquid react more positively to the implemented policy measures than firms that are less liquid. When looking at event 3 (CO) the coefficient is negative which is in line with the expectations about the sign of *Quick Ratio*. Since both EU measures have a positive sign it could be stated that the overall reaction towards EU measures is positive for the *Quick Ratio.* The highest value for the *Quick Ratio* is 0.0123 for event 1 (EU) which means that firms that have an one point increase in their *Quick Ratio* on average have 1.23% higher CARs. The coefficients for Quick Ratio for the other three events are more than ten times smaller than for event 1. Since an increase of 1 for such ratios could be realistic but an increase of 10 or more is not very realistic only the coefficient for the first event is economically significant.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, the coefficient from *Net Debt* for event 1 (EU) becomes significantly positive, also the coefficient from *EBIT* from event 1 (EU) becomes significantly negative instead. There are no differences in sign for the other control variables.

5.3.8 Italy - events aggregated per type

The results of the regression analysis for the ACARs for Italy are displayed in Table 49, which can be found in the Appendix in section 7.10.

When looking at the results it is visible that none of the *Size Treatment* coefficients has a statistically significant value, so no decisive conclusions can be drawn about the size classification variable. However, for both the EU regression as the CO regression the coefficient of the *Size Treatment* is positive which indicates that large firms have higher abnormal returns than smaller firms after economic policy measures in response to the COVID-19 are announced. Keep in mind that the results are not statistically significant. However, the estimated coefficient for the *Size Treatment* variable for the CO measures is considered to be economically significant. If you look at the CO measures the coefficient of *Size Treatment* is equal to 0.018 which indicates that larger firms on average have 1.8% higher Average Cumulative Abnormal Returns compared to smaller firms. The value for the EU measures is equal to 0.003 which is 0.3% and unfortunately not economically significant.

The results for the industry categories for the ACARs are comparable to the results found in the separate events analysis.

When looking at the control variables *ROIC* has a positive coefficient for the EU measures and a negative coefficient for the CO measures. Only the results from the CO measures equate to the expectation that firms with a lower *ROIC* would profit more from the implemented policy measures than firms with a higher *ROIC*. If you look at the size effect of this variable the coefficients for *ROIC* are not economically significant. The coefficient for the EU measures has a value of 0.001 and the value for the CO measures is -0.006 which indicates that firms that have an one point increase in their *ROIC* on average have 0.1% higher returns for EU measures and 0.6% lower returns for CO measures. This increase/decrease is not economically significant.

The reaction of *Net Debt* for both type of measures is positive which is in line with the expectations. When looking at the economic significance the coefficients are so small that they are considered not to be economically significant. An increase of more than thousand would be needed to have an increase in ACAR of meaningful magnitude which is not a realistic increase for the average firm when the summary statistics for the Italian sample are consulted.

The *Debt-to-Equity Ratio is* negative for both the EU measures as the CO measures. This indicates that firms with a higher *Debt-to-Equity Ratio* react more negatively to all the policy measures which contradicts the stated hypothesis that predicted a positive reaction.

When looking at the economic significance of this ratio, the coefficients are so small that they are considered not to be economically significant. An increase of more than hundred would be needed to have an impactful increase in ACAR which is not a realistic increase.

The *Market-to-Book Ratio* has a significantly positive value for the EU measures and a positive value for CO measures, which contradicts the expectation that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. When looking at the size of the coefficients for the *Market-to-Book Ratio* the value for the EU measures is 0.003 and for the CO measures it is 0.0002. These values are not economically significant since an increase of ten points or more will make the variable effective on the ACARs and that is not feasible in reality.

The value for the coefficient of *EBIT* is negative for both type of measures which is in line with the hypothesis that firms with a lower *EBIT* would profit more from the implemented policy measures. The coefficients for both type of measures are so small that an increase of thousand or more for Earnings Before Interest and Taxes is needed for a significant increase in the ACARs. Since an increase of such amount is not easily achievable the coefficients for *EBIT* are not economically significant.

When looking at the *Age* variable, the coefficient is positive for the EU measures as well as the CO measures, which contradicts the expectation that younger firms profit more from the implemented policy measures since older firms are in less need of support. The value for the *Age* coefficient is equal to 0.00001 for the EU measures and 0.0001 for the CO measures which indicates that firms that are 100 years older experience on average 0.1% higher ACARs for EU measures and on average 1% higher returns for the CO measures. Since 100 years is not an easily viable lifespan for the average firm the variable *Age* is considered not to be economically significant.

Lastly, the coefficient for *Quick Ratio* is positive for the EU measures, which indicates that firms that are more liquid react more positively to the implemented policy measures than firms that are less liquid. This is not in line with the expectations about this variable. The coefficient is negative for the CO measures which is in line with the hypothesis. The highest value for the *Quick Ratio* is 0.008 for the EU measures which means that firms that have ten points higher *Quick Ratio* on average have 8% higher ACARs. Since an increase of 10 for ratios is not very realistic and the coefficient for the CO measures is even lower, the variable *Quick Ratio* does not have an economically significant effect on the returns.

When comparing the regression results from the first regression without the liquidity variable *Quick Ratio* with the second regression where *Quick Ratio* is included, there are no differences in sign for most variables, only the values for the CO measures for the *Market-to-Book Ratio* become negative and the values for *EBIT* become significant for both measures.

Hereafter, the results are compared to the results per event. Some differences can be seen which indicates the importance of using both the aggregate as well as the separate events in the regressions.

For the *Size Treatment* the twofold reaction towards EU measures has become positive on the aggregate, so the positive reaction towards one EU measures is stronger than the negative reaction towards the other EU measure.

Since the coefficients for *ROIC* are positive for both EU measures in the separate events, there is no difference for the aggregate events. However, the reaction for *ROIC* has become negative for the CO measures which means that the negative reaction for one of the CO measures is stronger than the positive reaction for the other.

The reaction of *Net Debt* for both measures in the aggregate event regression is positive, which indicates that the twofold reaction found for the separate events is smoothed out into the positive sign. The *Debt-to-Equity Ratio is* negative for both type of measures in the aggregate event analysis, which indicates that the negative reaction for the separate events is stronger than the positive reaction for both type of measures .

Furthermore, since the reaction for the separate events towards the *Market-to-Book Ratio* for the CO measures is twofold, the aggregate regression has filtered out the negative reaction for one of the CO measures. The positive reaction towards the EU measures remains.

Since the reaction for *EBIT* for the separate events is negative for all measures there is no change in reaction for the aggregate regression.

When looking at the *Age* variable, the coefficient is negative for the separate EU measures, but becomes positive in the analysis with the aggregate events. Furthermore, the reaction towards the CO measures is twofold in the separate event regression but negative for the aggregate CO measures.

Lastly, the coefficient for *Quick Ratio* is positive for the EU measures both in the aggregate and separate analysis. The coefficient is negative for the CO measures which means that the negative coefficient for one event has filtered out the positive effect for the other event.

5.4 Difference-in-differences analysis

After performing the regression analysis, as a second method a difference-in-differences analysis will be performed to look into the COVID-19 pandemic more closely.

Before the analysis will be performed, the parallel trend assumption will be tested for each country which is a underlying condition to perform a difference-in-differences analysis.

After this, a difference-in-differences regression will be conducted of firm-level daily abnormal returns. March 13 will be used as the policy time variable for the Netherlands, Germany and Italy which marks the first event of the aggregate policy measures implemented by the EU and the start date of assertive fiscal and monetary policy for each country.
Since France has the first country specific implemented policy measure at March 11, that will be the policy time variable for France.

To control for firm-specific unobservable effects the standard errors will be clustered at the firm level. The following regression will be performed run:

$$AR_{it} = \beta_0 + \beta_1 Size\_Treatment_i + \beta_2 Post_t + \beta_3 Size\_Treatment_i \times Post_t + X_{it} + \varepsilon_{it}$$

The control variables added to the regression based on lowest BIC value are: *Industry Code, ROIC, Net Debt, Debt-to-Equity Ratio, Market-to-Book Ratio, EBIT, Quick Ratio, Age, Deaths per Million, Sick per Million* and *Reproduction Rate*.

The difference-in-differences regression will also make use of firm and day fixed effects to account for other unobservable effects, and cluster the standard errors on a firm and day basis. Furthermore industry fixed effects will be controlled for by the *Industry Code* variable.

Furthermore, a value of 0.01 was used as determination whether coefficients are or are not economically significant. So, if a realistic increase in value leads to an increase/decrease of 0.01 or 1 percent, then the coefficient is seen as economically significant.

5.4.1 The Netherlands

Figure 39a

Daily abnormal returns

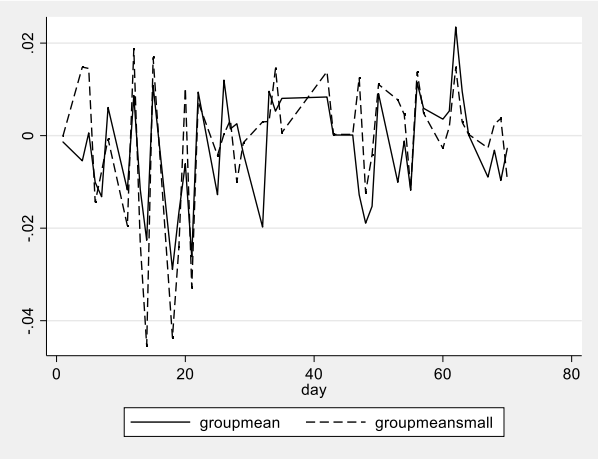
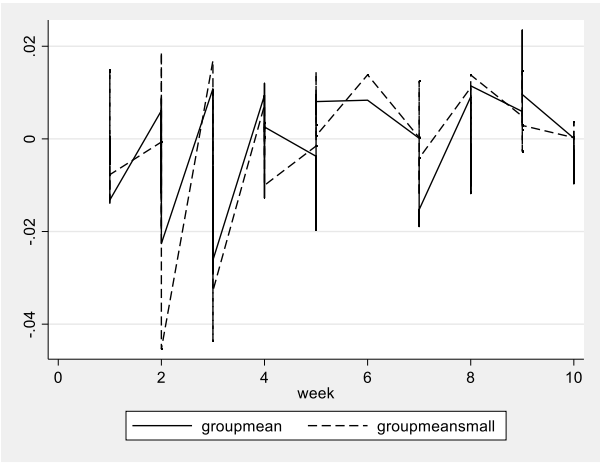


Figure 39b

Weekly abnormal returns



Within Figure 39a day 15 corresponds to the event date March 13 and this date is depicted by week 3 in Figure 39b. As can be seen in Figure 39a and Figure 39b, the parallel trend assumption does not hold for the Netherlands without control variables. Therefore, a difference-in-differences regression with control variables will be performed in line with the method of Richardson & Troost (2009) to ensure that the common trend assumption holds conditionally. Furthermore, the standard errors will be clustered on ISIN to control for company specific unobserved variation before and after the announcements and the variable *Industry Code* is included to control for industry fixed effects. The coefficient of the interaction term can be interpreted as the treatment effect, namely the effect of the size treatment on large firms.

A robustness check will also be performed with a difference-in-differences regression where the control variables will be replaced by firm-time fixed effects to control for possible demand effects of liquidity. Similar results are obtained for the treatment effect, but the coefficient is even less significant than in the difference-in-differences regression with control variables.

It can be seen in Table 51 in the Appendix section 7.11 that the coefficient for the interaction term between *Size Treatment* and *Post* is equal to -0.00425 but not statistically significant. This implies that smaller firms exhibit higher abnormal returns than larger firms for the Netherlands sample. Furthermore the coefficient is economically not significant. This contradicts the hypothesis that the stock prices of smaller listed firms react less positively to the economic policy measures taken by the European Union and the countries

itself. However, this means that the implemented policy measures which were intended to support the smaller firms indeed mostly ended up at those firms.

When looking more closely at the control variables the coefficient for *ROIC* is significantly negative which is in line with the stated expectations. The coefficient has a value of -0.00192 which indicates that firms that have an one point increase in their ROIC on average have 0.192 percentage decline in their returns. With a maximum value of 0.462 for the firms in the Dutch sample the coefficient is not economically significant.

Furthermore, the coefficients for *Net Debt* and *Debt-to-Equity* are significantly negative which contradicts the idea that firms with more debt would profit more from the economic implemented policy measures. The value for Net Debt is equal to $-5.13e^{-10}$ and for the Debt-to-Equity Ratio -0.00000203 which indicates that an increase of ten thousand of more is needed to have an economic impact on the returns. Since such an increase in these variables is not viable based on the summary statistics in this analysis and the fact that for ratios this never occurs, the coefficients are both not economically significant.

The *Market-to-Book Ratio* is significantly positive which contradicts the expectation that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. The coefficient for this value is 0.00000235 which implies that an increase of ten thousand of more is needed to have an economic impact on the returns. Since this is a ratio and therefore this increase is not feasible, the coefficient is not economically significant.

Furthermore *EBIT* is significantly positive which is surprising. With a value of 0.000144 an increase of 100 leads to an increase of 1.44% in the AR. Since *EBIT* has a mean value of 631 and a maximum value of 21 thousand an increase of 100 is feasible and therefore this variable is considered to be economically significant.

The *Age* variable is positive which does not correspond to the expectations. However, the coefficient is not economically significant with a value if 0.0000227 where an increase of thousand would be needed to have an economic impact.

The coefficient from *Quick Ratio* is significantly negative, which supports the hypothesis that firms that are less liquid react more positively to the implemented policy measures than firms that are more liquid. The coefficient is -0.000116 which indicates that an increase of hundred would lead to an decrease in abnormal returns of 1.16 percent. Since such an increase is not realistic for a ratio, the coefficient is not economically significant.

Lastly the corona specific variables are verified where the *Sick per Million* and *Deaths per Million* both have a significant positive effect on the abnormal returns, but the *Reproduction Rate* has a significantly negative effect. The direction from the coefficients for

Sick per Million and *Deaths per Million* is in line with the expectation that when the size of the crisis is bigger more financial support packages are introduced and firms react more positively. However, the *Reproduction Rate* has a sign in the opposite direction than expected, which is surprising. Since this variable is used to a lesser extent to base policy measures on, it is less problematic. When looking at the size effect of these variables the coefficient for *Sick per Million* is equal to 0.000000112 and for *Death per Million* equal to 0.000000826. This indicates that an additional increase of hundred thousand is needed to have an increase in the abnormal returns of between 1.26% and 8.26%. For the *Reproduction Rate* the coefficient is -0.00343, which implies that an increase of ten is needed to have a decrease in Abnormal Returns of 3.43%. Since these increases in value lie outside the minimum and maximum value denoted in the summary statistics, the coefficients are considered not to be economically significant.

5.4.2 France

Figure 40a

Daily abnormal returns

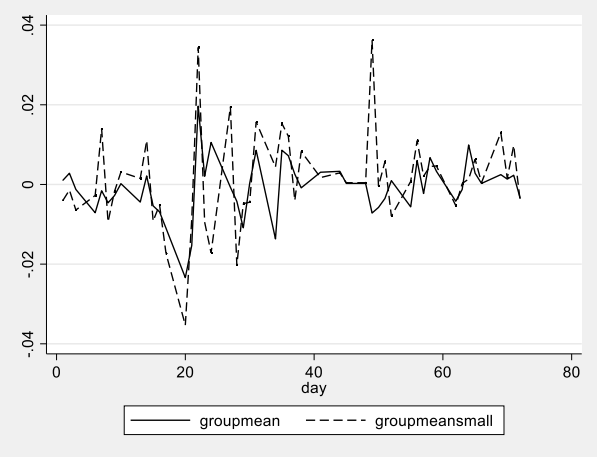
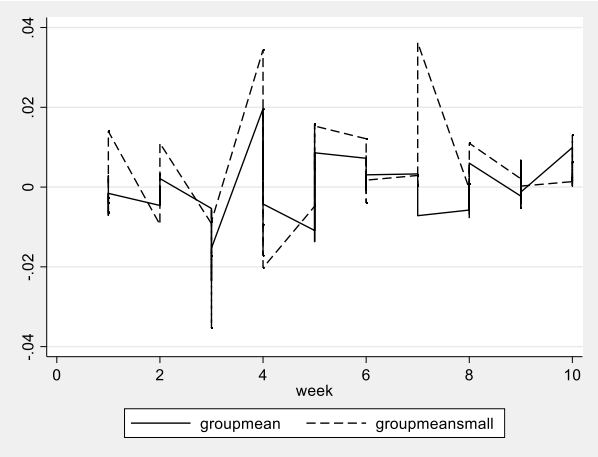


Figure 40b

Weekly abnormal returns



When looking at Figure 40a day 15 corresponds to the event date March 11 and this date is depicted by week 3 in Figure 40b. It can be seen in Figure 40a and 40b that the parallel trend assumption does not hold without control variables. Therefore, a difference-in-differences regression with control variables will be performed for France in line with the method of Richardson & Troost (2009) to ensure that the common trend assumption holds conditionally. Furthermore, the standard errors will be clustered on ISIN to control for company specific unobserved variation before and after the announcements. Also the variable *Industry Code* has entered the regression to control for industry fixed effects. The coefficient of the

interaction term can be interpreted as the treatment effect, namely the effect of the size treatment on large firms.

A robustness check will also be performed with a difference-in-differences regression where the control variables will be replaced by firm-time fixed effects to control for possible demand effects of liquidity. Similar results are obtained for the treatment effect, but the coefficient is smaller than in the difference-in-differences regression with control variables.

It can be seen in Table 52 in the Appendix section 7.11 that the coefficient for the interaction term between *Size Treatment* and *Post* is significantly positive. This implies that larger firms exhibit higher abnormal returns than smaller firms for France. This is in line with the hypothesis that the stock prices of smaller listed firms react less positively to the economic policy measures taken by the European Union and the countries itself. However, this means that the implemented policy measures which were intended to support the smaller firms mostly ended up at the larger firms. Furthermore, with a value of 0.00680 the coefficient is economically not significant.

When looking further at the control variables the coefficient for *ROIC* is negative which corresponds to the expectations about this variable. The coefficient is equal to -0.00114 which indicates that ten points increase in *ROIC* leads to 1.14% decrease in Abnormal Returns. Such an increase in *ROIC* is not viable since the maximum value for the firms in France in this research is 0.246 and therefore the coefficient for *ROIC* is considered not to be economically significant.

Furthermore, the coefficient for *Net Debt* is negative and *Debt-to-Equity* is significantly negative which contradicts the hypothesis that these variables would show a positive value. The coefficient for *Net Debt* is $-2.11e^{-10}$. This means that an increase of 100 million would lead to an decrease in returns of 2.11%. Based on the summary statistics for this variable an increase of hundred million is not achievable and therefore this coefficientsis viewed as economically not significant. Sunsequently, the *Debt-to-Equity Ratio* has a coefficient equal to -0.0000115 which indicates that an increase of thousand would lead to a decrease in Abnormal Returns of 1.15%. Since such an increase is not realistic, the coefficient for this variable is not economically significant.

The *Market-to-Book Ratio* is significantly positive which contradicts the expectation that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. Looking at the size effect of this variable the coefficient is 0.000412 which states that an increase of hundred points in ratio leads to an increase in the AR of 4.12%. With a

maximum value of 15 which is for this ratio in the summary statistics this increase is not realistic and the coefficient is not economically significant.

Furthermore *EBIT* is significantly positive which is surprising. The coefficient has a value of 0.000000866 which indicates that an increase of ten thousand would lead to an increase in the AR of 0.866%. With a maximum value of 28 thousand and an average value of 10 thousand this increase is not realistic and therefore the coefficient is not economically significant.

The coefficient for *Age* is positive which contradicts the expectation that younger firms profit more from the implemented policy measures than older firms. The coefficient is equal to 0.0000344 which means that an increase of 100 years would lead to an increase in returns of 0.344%. Since such lifespan is not viable and the increase in returns even remains under the one percent, this coefficient is considered to be not significant.

Furthermore, the coefficient from *Quick Ratio* is positive, which contradicts the hypothesis that firms that are less liquid react more positively to the implemented policy measures than firms that are more liquid. When looking at the size effect the value is equal to 0.0000692. With a maximum value of seven for the firms in the Italian analysis and a mean value of 1.3 the coefficient is not economically significant since an increase of more than hundred is needed for the variable to have an economic impact on the returns.

Lastly the corona specific variables are looked into where *Sick per Million* and *Deaths per Million* have a negative effect and the *Reproduction Rate* has a significantly negative effect on the abnormal returns. The direction of the coefficients contradict the expectation that when the size of the crisis is bigger more financial support packages are introduced and firms react more positively. When looking at the size effect of these variables the coefficient for *Sick per Million* is equal to -0.000000716 and for *Death per Million* equal to -0.00000294. This indicates that an additional increase of ten thousand is needed to have a decrease in the abnormal returns of between 0.716% and 2.94%. Since these increases in value lie close to the mean value of 13 thousand for the *Sick Per Million* and above the maximum value of *Deaths per Million* in line with the summary statistics, the coefficients are considered not to be economically significant. For the *Reproduction Rate* the coefficient is -0.0268, which implies that an increase of one point leads to a decrease of 2.68% in the Abnormal Returns. With a mean vale of 2.498 and a maximum value of 3.02 an increase of one point is harder to achieve but not unrealistic and therefore the coefficient is considered to be economically significant.

5.4.3 Germany

Figure 41a

Daily abnormal returns

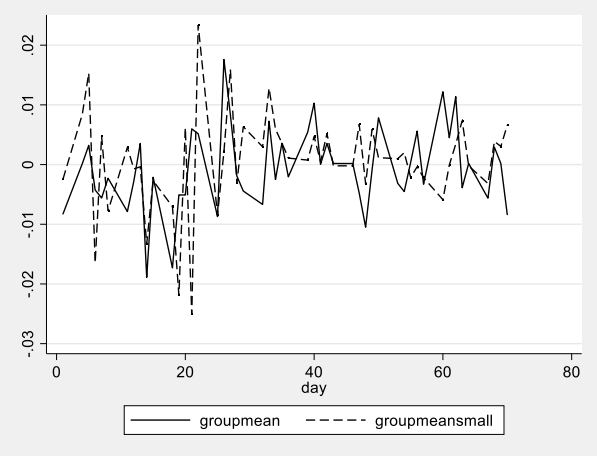
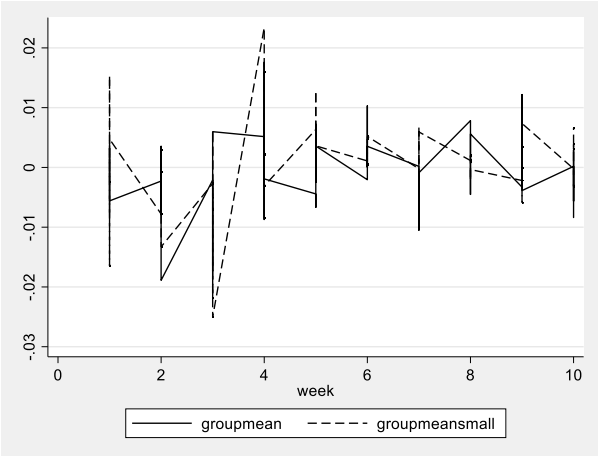


Figure 41b

Weekly abnormal returns



Within Figure 41a day 15 corresponds to the event date March 13 and this date is depicted by week 3 in Figure 41b. It can be seen that also for Germany the parallel trend assumption does not hold without control variables. This is visible in Figure 41a and 41b. Therefore, a difference-in-differences regression with control variables will be performed in line with the method of Richardson & Troost (2009) to ensure that the common trend assumption holds conditionally. Furthermore, the standard errors will be clustered on ISIN to control for company specific unobserved variation before and after the announcements. Industry fixed effects are also controlled for by the variable *Industry Code*. The coefficient of the interaction term can be interpreted as the treatment effect, namely the effect of the size treatment on large firms.

A robustness check will also be performed with a difference-in-differences regression where the control variables will be replaced by firm-time fixed effects to control for possible demand effects of liquidity. Similar, but more positive results are obtained for the treatment effect compared to the difference-in-differences regression with control variables.

It can be seen in Table 53 in the Appendix section 7.11 that the coefficient for the interaction term between *Size Treatment* and *Post* is negative but not statistically significant. This implies that larger firms exhibit lower abnormal returns than smaller firms in Germany. This contradicts the hypothesis that the stock prices of smaller listed firms react less positively to the economic policy measures taken by the European Union and the countries itself. However, this means that the implemented policy measures which were intended to support the smaller firms did end up were they were meant for. Furthermore the coefficient is economically not significant with a value of -0.000363.

When looking further at the control variables the coefficient for *ROIC* is significantly negative which corresponds to the expectation that firms with a lower *ROIC* would profit more from the implemented policy measures. The value for *ROIC* is equal to -0.0147 which indicates that an one point increase in this ratio leads to an 1.47% decline of the Abnormal Returns. With mean value of 0.07 and a maximum value of 0.35 an increase of one point in *ROIC* is not feasible which makes the coefficient economically not significant.

Furthermore, the coefficients for *Net Debt* and *Debt-to-Equity* are negative which contradicts the hypothesis that these variables would show a positive value. The coefficient for *Net Debt* is $-1.13e^{-11}$ which equates -0.0000000000113. This means that an increase of one billion in *Net Debt* leads to an increase in returns of 1.13%. With a mean value of 5 million for Germain firms an increase of billion is not feasible which makes the coefficient economically not significant. The *Debt-to-Equity Ratio* has a coefficient of -0.00000255 which indicates that an increase of ten thousand would lead to a decrease of 2.55% in returns. Since such a increase is not realistic this coefficient is considered not to be economically significant.

The *Market-to-Book Ratio* is positive which contradicts the expectation that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. With a coefficient of 0.000000126 an increase of ten thousand is needed for an increase od 1.26% in the AR. Such an increase is not economic realistic this coefficient is not economically significant.

Furthermore *EBIT* is positive which is surprising. When looking at the size effect of this variable the coefficient is equal to 0.000120 which indicates that an increase of 100 in *EBIT* leads to an increase in AR of 1.20%. With a mean value of 800 and a maximum value of 21 thousand for Germain firms an increase of 100 is realistic which makes the coefficient for this variable economically significant.

The coefficient for *Age* is significantly negative which is in line with the expectation that younger firms profit more from the implemented policy measures than older firms. When looking at the size effect the coefficient is equal to -0.0000747 which indicates that an increase of 100 would lead to a decrease of 0.747% in AR. Since this increase in *Age* is not realistic the coefficient is considered not to be economically significant.

Lastly, the coefficient from *Quick Ratio* is negative, which is in line with the hypothesis that firms that are less liquid react more positively to the implemented policy measures than firms that are more liquid. The coefficient is equal to -0.00000414 which is

economically not significant with a mean value of 1.4 and a maximum value of 7 for *Quick Ratio*

Lastly looking at the corona specific variables *Sick per Million* is positive and *Deaths per Million and Reproduction Rate* both have a significant negative effect on the abnormal returns. The direction of the coefficients for *Deaths per Million* and *Reproduction Rate* contradict the expectation that when the size of the crisis is bigger more financial support packages are introduced and firms react more positively. When looking at the size effect of these variables the coefficient for *Sick per Million* is equal to 0.0000000291 and for *Death per Million* equal to -0.000000902. This indicates that an additional increase of hundred thousand is needed to have an increase in the abnormal returns of between 0.29% and 9.02%. For the *Reproduction Rate* the coefficient is -0.00399, which implies that an increase of ten is needed to have a decrease in Abnormal Returns of 3.99%. Since these increases in value lie outside the interval denoted in the summary statistics, the coefficients are considered not to be economically significant.

5.4.4 Italy

Figure 42a

Daily abnormal returns

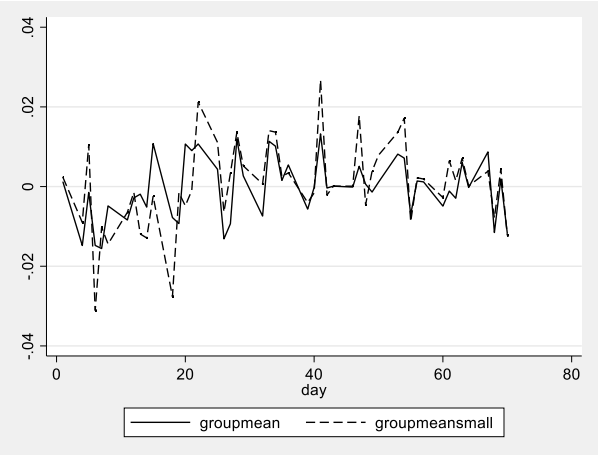
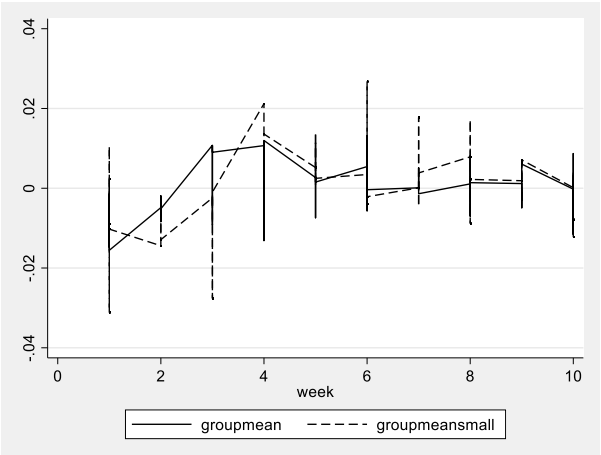


Figure 42b

Weekly abnormal returns



For Italy day 15 in Figure 42a corresponds to the event date March 13 and this date is depicted by week 3 in Figure 42b. As can be seen in Figure 42a and 42b, the parallel trend assumption also does not hold for Italy without control variables. Therefore, a difference-in-differences regression with control variables will be performed in line with the method of Richardson & Troost (2009) to ensure that the common trend assumption holds conditionally. Furthermore, the standard errors will be clustered on ISIN to control for company specific unobserved variation before and after the announcements. Industry fixed effects are also

controlled for by the variable *Industry Code*. The coefficient of the interaction term can be interpreted as the treatment effect, namely the effect of the size treatment on large firms.

A robustness check will also be performed with a difference-in-differences regression where the control variables will be replaced by firm-time fixed effects to control for possible demand effects of liquidity. Similar results are obtained for the treatment effect, but the coefficient is even less significant than in the difference-in-differences regression with control variables.

It can be seen in Table 54 in the Appendix section 7.11 that the coefficient for the interaction term between Size Treatment and Post is negative but not significant. This implies that larger firms exhibit lower abnormal returns than smaller firms in Germany. This is not in line with the hypothesis that the stock prices of smaller listed firms react less positively to the economic policy measures taken by the European Union and the countries itself. However, this means that the implemented policy measures which were intended to support the smaller firms did not end up were they were meant for. Furthermore, with a value of -0.000278 the coefficient is economically not significant.

When looking further at the control variables the coefficient for *ROIC* is negative which corresponds to the expectation that firms with a lower *ROIC* would profit more from the implemented policy measures. The coefficient is equal to -0.000774 which indicates that an increase of ten points leads to a decrease in AR of 0.774%. Since such an increase in *ROIC* is not economic feasible the coefficient is considered to not to be economically significant.

Furthermore, the coefficients for *Net Debt* and *Debt-to-Equity* are negative which contradicts the hypothesis that these variables would show a positive value. With a value of $-5.34e^{-11}$ for *Net Debt* and -0.00000544 for *Debt-to-Equity Ratio* the variables are considered to be economically not significant in this analysis

The *Market-to-Book Ratio* is significantly positive which contradicts the expectation that firms with a lower *Market-to-Book Ratio* profit more from the implemented policy measures. When looking at the size effect of this variable the coefficient is equal to 0.000306. An increase of hundred would lead to an increase of 3.06% in AR. However, such an increase is not realistic which makes the coefficient economically not significant.

Furthermore *EBIT* is positive which is surprising. With a value of 0.000000239 an increase of ten thousand would lead to a increase in returns of 2.39%. With a maximum value of ten thousand for *EBIT* according to the summary statistics for Italy an increase in ten thousand is not viable which makes the coefficient economically not significant.

The coefficient for *Age* is positive which contradicts the hypothesis that younger firms profit more from the implemented policy measures than older firms. The coefficient is equal to 0,0000238 which indicates that an increase of thousand is needed to have an increase of 2.38% in AR. Since such a lifespan is not realistic the coefficient is considered not to be economically significant.

Subsequently, the coefficient from *Quick Ratio* is positive, which contradicts the hypothesis that firms that are less liquid react more positively to the implemented policy measures than firms that are more liquid. The coefficient is 0.000551 which indicates that an increase of hundred would lead to an increase in abnormal returns of 5.51 percent. Since such an increase is not realistic for a ratio, the coefficient is not economically significant.

Lastly the corona specific variables are verified where the *Sick per Million*, *Deaths per Million* and the *Reproduction Rate* all have a positive effect on the abnormal returns. The direction of the coefficients is in line with the expectation that when the size of the crisis is bigger more financial support packages are introduced and firms react more positively. When looking at the size effect of these variables the coefficient for *Sick per Million* is equal to $2.31e^{-8}$ and for *Death per Million* equal to 0.000000237. This indicates that an additional increase of at least ten thousand is needed to have an increase in the abnormal returns of between 0.231% and 2.37%. For the *Reproduction Rate* the coefficient is 0.00174, which implies that an increase of ten is needed to have an increase in Abnormal Returns of 1.74%. Since the Reproduction Rate has a mean value of 1.31 and a maximum value of 2.86 described in the summary statistics, the coefficients are considered not to be economically significant.

6. Conclusion and Discussion

In this paper it was studied how the stock prices of smaller listed firms reacted to economic policy responses regarding the COVID-19 crisis and whether this reaction was different from those of larger listed firms. Did the stock prices of smaller listed firms react less positively to the economic policy measures taken by the European Union and the countries self as was hypothesized in the theoretical framework?

To answer this research question an event study is performed on the economic implemented European Union (EU) policy measures and the country specific (CO) policy measures for the Netherlands, France, Germany and Italy on four event dates for each country. Hereafter, a regression analysis and a difference-in-differences analysis are conducted.

To determine the size classification in this research there is not made use of a general classification for size like amount of employees or a standard amount of total assets. Instead, a machine learning tool with a Random Forest (RF) classification algorithm is implemented modified to the dataset for each country to find the best possible size classification for each country. This cut differs between countries, because the dataset for each country contains different values for each variable.

It is important to denote that the firms used in this research paper are only listed firms on total stock exchanges in the Netherlands, France, Germany and Italy. This is not necessarily a problem for drawing conclusions based on the findings, but this implies that the paper does not exactly assess the way in which policy packages have been received for the smallest local companies.

The findings differ between the several countries. When looking at the results from the Netherlands it is found that the stock prices of smaller firms indeed react less positively to economic European Union policy measures in response to the COVID-19 pandemic, but they react negatively towards the country policy measures. However, this positive relationship only holds partly, because the difference-in-differences analysis shows a negative treatment effect.

If you move on to the findings from France, the results are twofold for both the EU as the implemented CO policy measures in the separate event regression analysis. When looking at the aggregate event regression it is found that the stock prices of smaller firms indeed react less positively to economic EU and CO policy measures in response to the COVID-19

pandemic. This positive relationship holds for both analysis since the difference-in-differences analysis shows a significant positive treatment effect.

Furthermore, it is found for Germany that the stock prices of smaller firms indeed react less positively to economic European Union policy measures in response to the COVID-19 pandemic, but they react negatively towards the country policy measures. When looking at the aggregate event regression it is found that the stock prices of smaller firms indeed react less positively to economic European Union and country policy measures in response to the COVID-19 pandemic. However, a negative coefficient is found for the difference-in-differences analysis.

Lastly, the results are twofold for Italy. When looking at the separate event regression it is found that the stock prices of smaller firms indeed react less positively to economic country policy measures in response to the COVID-19 pandemic, but the reaction towards the EU policy measures is not clear. The aggregate regression results show a positive relation between size and reaction to the EU and CO policy measures. This result is supported by the difference-in-differences regression.

To conclude for the size treatment effect, the stock prices of smaller firms indeed react less positively to most implemented economic EU and CO policy measures in response to the COVID-19 pandemic in the Netherlands, France, Germany and Italy. However, these results are not statistically significant so no decisive conclusions can be made based on the findings.

When looking into the corona specific control variables from the difference-in-differences analysis it is found that the Abnormal Returns reacted positively towards the amount of sick cases, deaths and reproduction rate for the Netherlands and Italy and the reaction is twofold within France and Germany. This indicates that the size of the crisis could contribute to the height of the implemented economic policy measures and consequently the reaction from the firms as was expected.

Based on previous research described in the literature review section, the expectation was that stock prices of larger companies would react more favorably to the announcement of economic policy measures, as these firms are able to benefit more from those policy tools, such as asset purchasing packages (Bankowska et al., 2020; Li et al., 2020; Acharya and Steffen, 2020; Macchiarelli et al., 2017). However, the scope and nature of the current COVID-19 crisis are completely different from the status of the past crises. The way in which the COVID-19 pandemic hit smaller companies with its steep decrease in consumer spending and the ongoing expenses the firms have, in particular makes that small and medium sized

companies are now more a focus of attention than in past crises (Kreiser, 2020). Even though this impact of the COVID-19 pandemic is documented, it is still found that the market responds less positively to announced policy measures for smaller companies compared to larger companies. Given the compensatory forces acting on small companies during this pandemic, this finding is particular.

If the efficient market assumption holds in the semi-strong or strong form, then this indicates that large companies benefit to a greater extent from policy measures in response to the COVID-19 crisis than smaller companies (Maverick, 2020). Even if this assumption does not fully hold then it at least implies that investors might feel this way and it therefore is reflected in the returns.

It is further found that liquidity channel, performed by the *Quick Ratio* does not fully explain the divide between small and large companies. On the one hand this finding confirms that the market reacts less positively to policy measures for smaller companies in part due to the fact that the purchases and liquidity provided by such measures tends to end up at large companies. The important role that liquidity plays during this crisis suggests that it pays to ensure that liquidity is provided to all sections of the real economy and not only the largest firms in each country.

Since the liquidity channel is not able to fully explain the results found for the size coefficient, there are other factors that may be driving the research results. Therefore, focusing solely on liquidity-providing measures for smaller companies is not sufficient to remove the disparity between the different sized firms. This finding is thus relevant for policymakers to take in consideration that other channels may be driving the course in combatting this crisis. Making small-business lending programs, low-interest loans and advance payments to smaller companies, which are the main focus points of the implemented EU and CO policy measures, is thus not sufficient enough to combat the crisis.

The results indicate that the implemented economic policy measures designed to support mostly the smaller companies have still not done enough to support the smallest firms. Alternatively, it could be that the current support and relief measures for smaller companies do make a significant difference for such firms, but that the market is not fully of aware of this. When the effect of the COVID-19 policy measures can be evaluated more accurately and all policy measures are fully implemented, further research should provide conclusive evidence on whether market movements may have been reflective of sentiment more so than substance.

A limitation within this research is that the scope and severity of the COVID-19 crisis make it difficult to fully isolate the impact of individual economic policy measures. To control for this difficult isolation problem without losing the value of the separate events, the results when the events are aggregated to an average EU effect and an average CO effect are compared to when all events are analyzed separately. When interpreting the results of the aggregate effects of the European Union policy measures on one hand and the country specific policy measures on the other hand, you can only state that the aggregate economic policy support packages for small and large firms seem to have a dissimilar effect on both groups. Using the aggregate of two policy measures from the EU and two country specific policy measures, however, could lead to some measures greatly benefitting small companies, but that this effect is offset by the other policy tools. This problem does not occur when you address the events separately.

The data within this research is collected from WRDS and the Eikon Datastream service, but when other databases would be consulted for the same variables with different or less firms, other results might be established. Even though the ratios in the analysis are Winsorized at the one percent level to remove outliers some other variables have values in the summary statistics that do not hold in the standard economic theories. It could thus be stated that the data collection process is essential for results and is therefore a limitation for research in general. Furthermore, coefficients of a better model based on for example the BIC criteria or the R2 are preferred over statistically significant coefficients. Unfortunately, these not significant results limit in giving a possible rejection of the hypothesis. Definitive conclusions can thus not always be made in this research. Another limitation that is important to address is possible Omitted Variable Bias (OVB). OVB is the situation in which values calculated from a statistical model systematically overestimate or underestimate a degree of relationship or other quantity of interest because an important variable has been left out of the model (Hanck, 2020). Since there are always more variables that could be included to explain the disparity in the abnormal returns in an analysis, in this research also some OVB will be present.

Even though the findings for the size coefficient do not always show a significant result, this paper could be considered a stable groundwork for future research. The significance might be established within the different research methods when there are more firms included in the sample since this sample includes only between 111 and 248 firms within each country. It is also possible that with more data in the sample the regressions with the variables *ROE* and *Interest Coverage* would lead to a lower BIC and conclusions about

those variables could be drawn as well. When performing future research there are several perspectives that could be looked into. For example, it would be interesting to make use of information about cash reserves or the credit rating of firms that could contribute to the explanation why the findings are reasonable. For this research paper only listed firms on total stock exchanges are used, but in further research it is interesting to use data from private firms from their balance sheets and the information whether or not they received the support packages to be able to exactly assess the way in which policy packages have been received for the smallest local companies. Lastly, it could be informative to look at other countries outside the EU to see how these countries have handled the crisis and whether the results for the smaller firms are more positive than within the EU.

Since it is found that the stock prices of smaller firms indeed react less positively to most implemented economic EU and CO policy measures in response to the COVID-19 pandemic in the Netherlands, France, Germany and Italy, it could be stated that those measures did not fully serve their intentions. Therefore, it is recommended for the policymakers to have a critical look at which factors determine the negative reaction from smaller firms towards the economic implemented policy measures. How could these factors affect the effectiveness of the support packages and how can policymakers address this issue so that policy measures in the future will serve the way which they are intended to.

7. Appendix

7.1 Stock price development and sector performance

Figure 1

Value of indices over the corona period (Bloomberg, 24 January 2021)

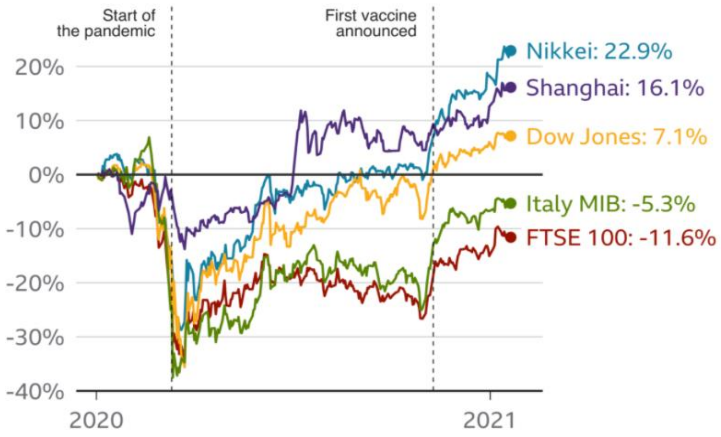


Figure 2

Sector Performance over the corona period (Bloomberg, nd)

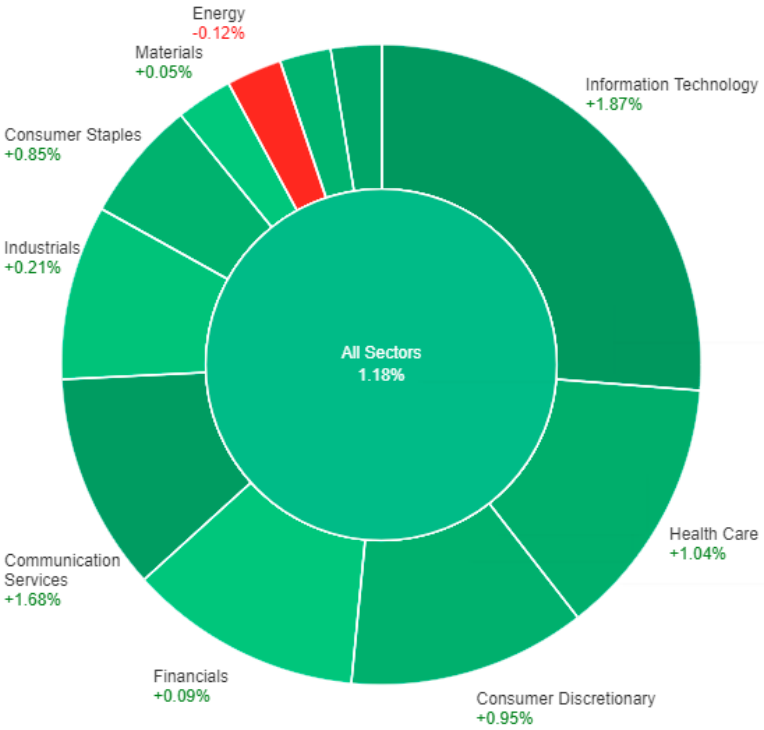


Figure 3

Stock prices AEX Index for the Netherlands (Investing.com, 2020a)

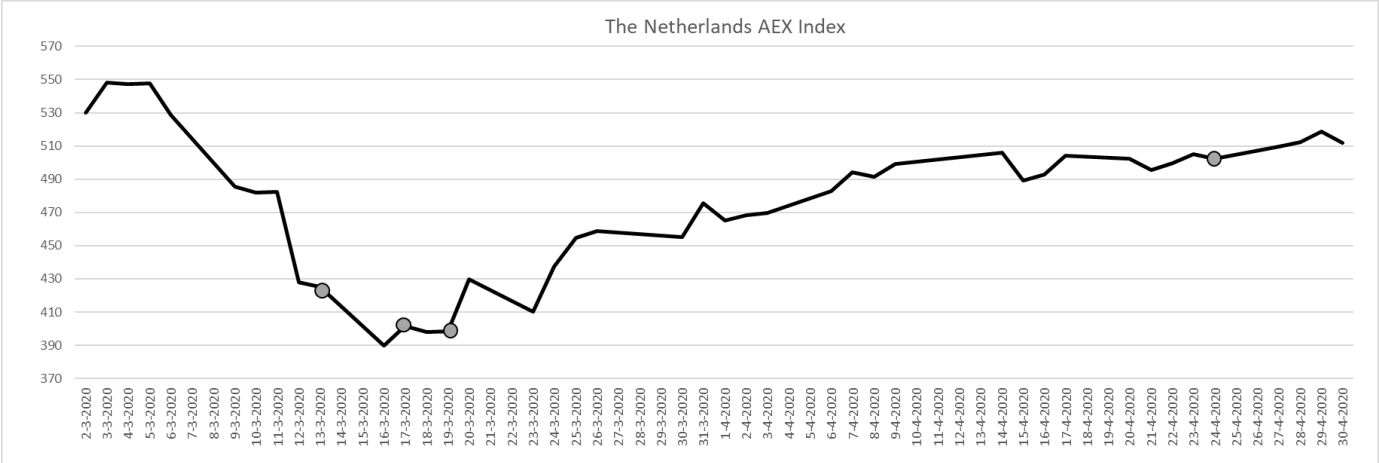


Figure 4

Stock prices CAC Index for France (Investing.com, 2020b).

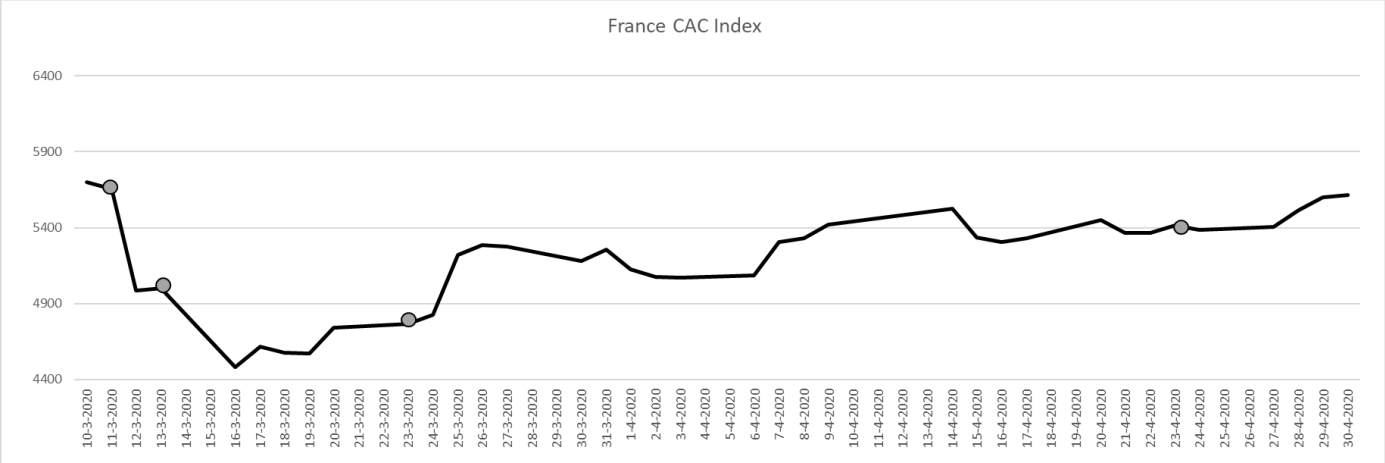


Figure 5

Stock prices DAX Index for Germany (Investing.com, 2020c)

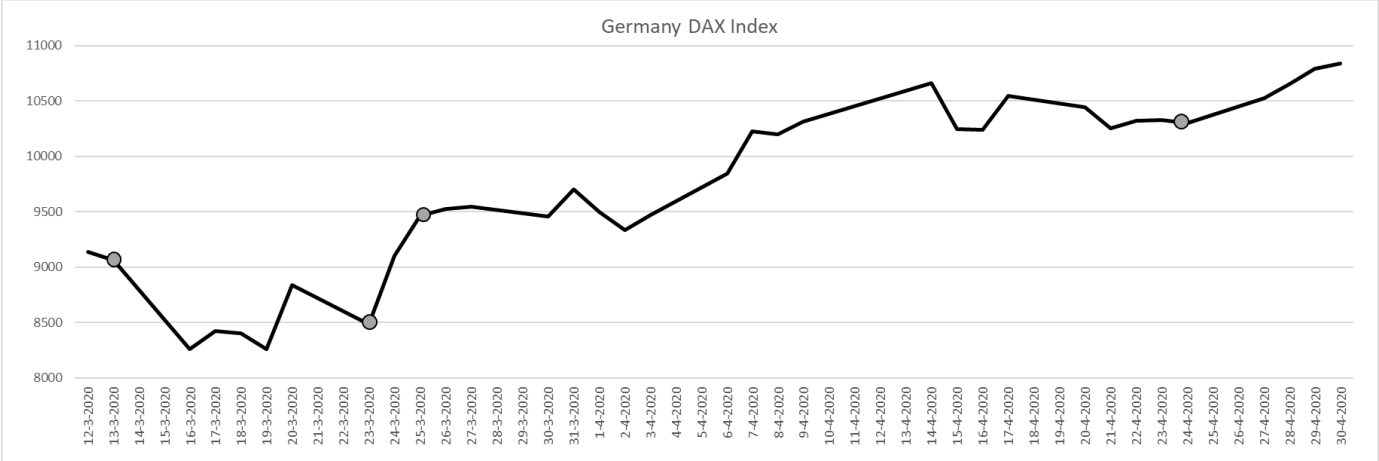
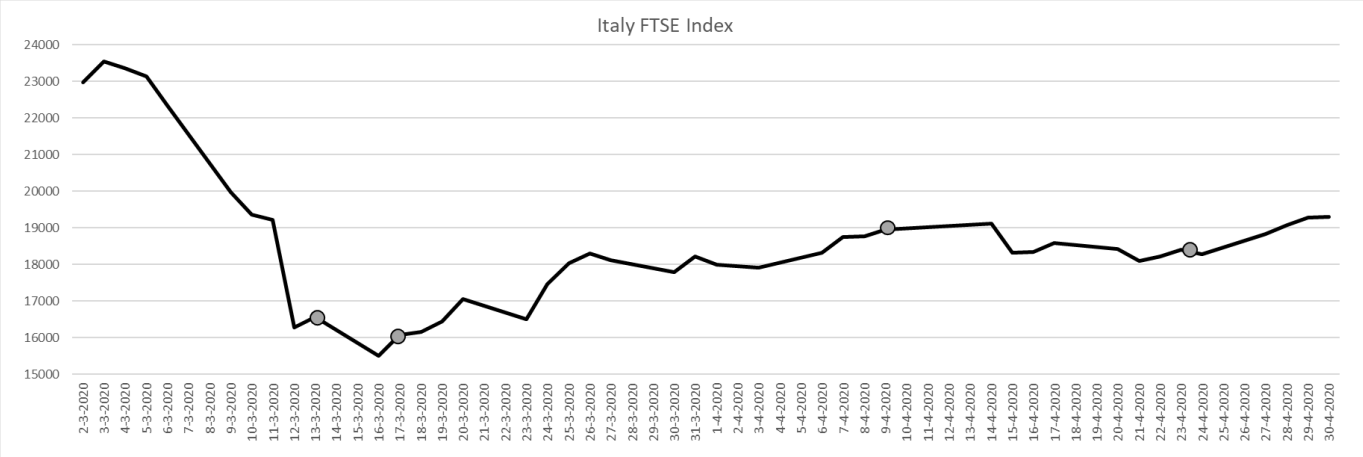


Figure 6

Stock prices FTSE Index for Italy (Investing.com, 2020d)



7.2 Event dates overview

Table 1

Event dates overview for the Netherlands

Event number	Date	Type event	Short information
1	March 13, 2020	EU measure	€1 billion EU budget to incentive banks to provide liquidity to SMEs and midcaps
2	March 17, 2020	CO measure	Package of economic measures and extension of the GO scheme
3	March 19, 2020	CO measure	Direct compensation for entrepreneurs in affected sectors
4	April 23, 2020	EU measure	EU recovery fund established

Table 2

Event dates overview for France

Event number	Date	Type event	Short information
1	March 11, 2020	CO measure	Eased credit terms, postponed tax payment deadlines and partial unemployment benefits
2	March 13, 2020	EU measure	€1 billion EU budget to incentive banks to provide liquidity to SMEs and midcaps
3	March 23 , 2020	CO measure	Grant guarantees €300 billion
4	April 23, 2020	EU measure	EU recovery fund established

Table 3

Event dates overview for Germany

Event number	Date	Type event	Short information
1	March 13, 2020	EU measure	€1 billion EU budget to incentive banks to provide liquidity to SMEs and midcaps
2	March 23 , 2020	CO measure	Supplementary budget of €50 billion for small businesses and self-employed persons
3	March 25, 2020	CO measure	Aid package of €750 billion
4	April 23, 2020	EU measure	EU recovery fund established

Table 4

Event dates overview for Italy

Event number	Date	Type event	Short information
1	March 13, 2020	EU measure	€1 billion EU budget to incentive banks to provide liquidity to SMEs and midcaps
2	March 17 , 2020	CO measure	€25 billion 'Cure Italy' decree
3	April 9, 2020	CO measure	Guarantee Fund SMEs tool of covering up €100 billion of liquidity
4	April 23, 2020	EU measure	EU recovery fund established

7.3 Variable description

Table 5

Variable description and source

Variable	Source	Description
Average Cumulative Abnormal Return (ACAR)	Datastream	The Cumulative Abnormal Return calculated over the interval [-1,2], averaged over the two event dates for the economic EU policy measures and the country specific policy measures. Also the Cumulative Abnormal Return is calculated over the interval [-7,0], averaged over the two event dates for the economic EU policy measures and the country specific policy measures to check possible leakages.
Size Treatment	Datastream	Dummy variable equal to 1 if the company is defined as large based on total assets and 0 if the company is small capitalized. Determined by the machine learning tool.
Earnings Before Interest and Taxes (EBIT)	WRDS	EBIT represents the earnings of a company before interest expense and income taxes. It is calculated by taking the pre-tax income and adding back interest expense on debt and subtracting interest capitalized. $EBIT = pretax\ income + interst\ expense\ on\ debt - interest\ capitalized$
Total Assets	Datastream	Total assets is the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.
Net Debt	Datastream	$Net\ Debt = Total\ Debt - Cash$ Cash is Cash Due from Banks for Banks, Cash for Insurance companies and Cash & Short Term investments for all other industries
Quick Ratio	Datastream	Liquidity ratio calculated by the following formula: $\frac{Cash\ \&\ Equivalents\ +\ Receivables\ (Net)}{Current\ Liabilities\ (Total)}$
Return On Equity (ROE)	Datastream	Profitability Ratio calculated by: $\frac{Net\ Income - Preferred\ Dividend\ Requirement}{Average\ of\ Last\ Year's\ and\ Current\ Year's\ Common\ Equity}$
Return On Invested Capital (ROIC)	WRDS	ROIC is calculated to assess a company's efficiency at allocating the capital under its control to profitable investments. ROIC = $\frac{(EBIT - taxes)}{invested\ capital}$

Variable	Source	Description
Market-to-Book Ratio (M/B)	WRDS	M/B is defined as the market value of the ordinary (common) equity divided by the balance sheet value of the ordinary (common) equity in the company.
Interest Coverage Ratio	WRDS	The Interest Coverage Ratio is a debt ratio and profitability ratio used to determine how easily a company can pay its interest on the outstanding debt. The ratio is calculated by: $\frac{EBIT}{Interest\ Expense}$
Industry Category	Datastream	Industry Code for the company based on Industry Classification Benchmark (ICB) with the following industries in the data with the accompanied numeric values. Health Care – 1 Financials – 2 Consumer Discretionary – 3 Industrials – 4 Utilities – 5 Real Estate – 6 Technology – 7 Basic Materials – 8 Consumer Staples – 9 Energy – 10 Telecommunications – 11
Age	Datastream	Age is defined as the difference between the first event date of each firm within a country and the date of base.
GDP	CBS.nl	Gross Domestic Product is the sum of all gross value added (at market prices) by businesses and government produced within the borders of a country in a given year. This value of GDP is divide by the amount of inhabitants to get the GDP per capita for each country.
Deaths COVID-19	Our World in Data	Amount of daily identified new deaths per million inhabitants due to the COVID-19 sickness within each nation. A daily average is calculated for the regression analysis.
Sick cases COVID-19	Our World in Data	Amount daily identified new sick cases per million inhabitants due to the COVID-19 sickness within each nation. A daily average is calculated for the regression analysis.
Reproduction Rate	Our World in Data	The reproduction rate shows how fast the virus is spreading. The number shows how many people are on average infected by someone who is infected with the corona virus.

7.4 Descriptive statistics regression analysis

The Netherlands

Table 6

Descriptive statistics for the Netherlands. This table presents summary statistics for the sample of all firms within the Netherlands. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	111	-.034	-.239	.124	.072
ACAR EU leakage	Percent	111	-.037	-.265	.2	.083
ACAR Country	Percent	111	-.056	-.454	.269	.095
ACAR Country leakage	Percent	111	-.099	-.504	.257	.159
Size Treatment	Dummy 0/1	111	0,4998	0	1	0
Total Assets	Euro	108	2.40e+07	46	8.91e+08	1.03e+08
Industry Code	Number	115	4.904	1	11	2.721
ROIC	Number	102	-.11	-12.5	.462	1.272
ROIC Winsorized	Number	102	-.0027	-1.5639	.462	.328
Net Debt	Euro	108	3050000	-5760000	1.18e+08	1.41e+07
Debt-to-Equity Ratio	Number	107	-88.116	-12700	557.3	1318.344
Debt-to-Equity Ratio Winsorized	Number	107	-12.66	-4571.43	496.88	647.544
Market-to-Book Ratio	Number	102	7.004	-47.325	446.667	44.671
Market-to-Book Ratio Winsorized	Number	102	3.165	-26.689	34.523	7.5
EBIT	Number	102	631.537	-410	21275	2281.087
Interest Coverage Ratio	Number	98	6.518	-305.333	284.402	57.434
Interest Coverage Ratio Winsorized	Number	98	6.518	-305.333	284.402	57.434
Quick Ratio	Number	83	1.997	.08	45.29	5.331
Quick Ratio Winsorized	Number	83	1.997	.08	45.29	5.331
Age	Number	115	24.238	.211	47.2	15.903
GDP per Capita	Number	115	53900	53900	53900	0
Deaths per Million	Number	115	3.49	3.49	3.49	0
Sick per Million	Number	115	26.96	26.96	26.96	0
ROE	Number	105	-17.637	-2142.86	87.9	212.458
ROE Winsorized	Number	105	0.302	-227.74	56.3	41.892

Table 7

Descriptive statistics for Small Companies in the Netherlands (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	55	-.046	-.175	.124	.068
ACAR EU leakage	Percent	55	-.027	-.209	.2	.078
ACAR Country	Percent	55	-.055	-.285	.269	.097
ACAR Country leakage	Percent	55	-.12	-.387	.211	.149
Size Treatment	Dummy 0/1	56	0	0	0	0
Total Assets	Euro	56	259000	46	1290000	342000
Industry Code	Number	56	4.982	1	10	2.519
ROIC	Number	51	-.296	-12.5	.462	1.786
ROIC Winsorized	Number	51	-.081	-1.564	.462	.444
Net Debt	Euro	56	40834.88	-121000	464000	111000
Debt-to-Equity Ratio	Number	55	-197.287	-12700	466.91	1723.603
Debt-to-Equity Ratio Winsorized	Number	55	-49.393	-4571.43	466.91	636.776
Market-to-Book Ratio	Number	51	12.225	-26.689	446.667	62.549
Market-to-Book Ratio Winsorized	Number	51	4.144	-26.689	34.523	8.993
EBIT	Number	51	19.933	-53.149	216.434	46.761
Interest Coverage Ratio	Number	48	-4.56	-305.333	131.413	60.024
Interest Coverage Ratio Winsorized	Number	48	-4.56	-305.333	131.413	60.024
Quick Ratio	Number	45	2.641	.08	45.29	7.026
Quick Ratio Winsorized	Number	45	2.641	.08	45.29	7.026
Age	Number	56	23.704	.728	47.2	14.247
GDP per Capita	Number	56	53900	53900	53900	0
Deaths per Million	Number	56	3.49	3.49	3.49	0
Sick per Million	Number	56	26.96	26.96	26.96	0
ROE	Number	53	-46.268	-2142.86	56.3	297.163
ROE Winsorized	Number	53	-10.134	-227.74	56.6	55.461

Table 8

Descriptive statistics for Large Companies in the Netherlands (Size Dummy = 1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	56	-.023	-.239	.113	.074
ACAR EU leakage	Percent	56	-.047	-.265	.177	.087
ACAR Country	Percent	56	-.058	-.454	.13	.093
ACAR Country leakage	Percent	56	-.078	-.504	.257	.167
Size Treatment	Dummy 0/1	59	1	1	1	0
Total Assets	Euro	52	4.95e+07	1300000	8.91e+08	1.45e+08
Industry Code	Number	59	4.831	1	11	2.919
ROIC	Number	51	.076	-.275	.324	.088
ROIC Winsorized	Number	51	.076	-.275	.324	.088
Net Debt	Euro	52	6300000	-5760000	1.18e+08	1.99e+07
Debt-to-Equity Ratio	Number	52	27.354	-4571.43	557.3	663.603
Debt-to-Equity Ratio Winsorized	Number	52	26.192	-4571.43	496.88	662.709
Market-to-Book Ratio	Number	51	1.782	-47.325	25.168	7.935
Market-to-Book Ratio Winsorized	Number	51	2.187	-26.689	25.168	5.548
EBIT	Number	51	1243.141	-410	21275	3121.781
Interest Coverage Ratio	Number	50	17.153	-101.031	284.402	53.279
Interest Coverage Ratio Winsorized	Number	50	17.153	-101.031	284.402	53.279
Quick Ratio	Number	38	1.234	.29	10.25	1.784
Quick Ratio Winsorized	Number	38	1.234	.29	10.25	1.784
Age	Number	59	24.744	.211	47.2	17.437
GDP per Capita	Number	59	53900	53900	53900	0
Deaths per Million	Number	59	3.49	3.49	3.49	0
Sick per Million	Number	59	26.96	26.96	26.96	0
ROE	Number	52	11.545	-28.66	87.9	17.012
ROE Winsorized	Number	52	10.938	-28.66	56.3	14.628

France

Table 9

Descriptive statistics for France. This table presents summary statistics for the sample of all firms within France For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	242	-.029	-.311	.244	.076
ACAR EU leakage	Percent	242	-.008	-.214	.314	.087
ACAR Country	Percent	242	-.017	-.23	.251	.062
ACAR Country leakage	Percent	242	-.021	-.254	.346	.092
Size Treatment	Dummy 0/1	248	.597	0	1	.492
Total Assets	Euro	248	4.16e+07	16563	2.16e+09	2.06e+08
Industry Code	Number	248	4.456	1	11	2.505
ROIC	Number	241	.054	-1.385	1.365	.207
ROIC Winsorized	Number	241	.05	-.88	.246	.165
Net Debt	Euro	248	5520000	-4410000	2.80e+08	2.35e+07
Debt-to-Equity Ratio	Number	248	59.108	-8225.35	1271.55	564.869
Debt-to-Equity Ratio Winsorized	Number	248	95.176	-386.85	615.52	130.025
Market-to-Book Ratio	Number	241	1.822	-96.342	17.103	7.359
Market-to-Book Ratio Winsorized	Number	241	2.275	-9.398	15.113	3.02
EBIT	Number	242	1077.526	-123.552	28442	3068.15
Interest Coverage Ratio	Number	239	19.226	-5843.2	3175.278	476.205
Interest Coverage Ratio Winsorized	Number	239	23.028	-574.2	532.5	103.892
Quick Ratio	Number	206	1.326	.24	15.89	1.524
Quick Ratio Winsorized	Number	206	1.274	.31	7.34	1.137
Age	Number	248	26.755	.019	120.197	20.098
GDP per Capita	Number	248	42747	42747	42747	0
Deaths per Million	Number	248	3.79	3.79	3.79	0
Sick per Million	Number	248	15.31	15.31	15.31	0
ROE	Number	242	1.356	-825.54	75.11	63.813
ROE Winsorized	Number	242	3.746	-266.98	51.7	37.385

Table 10

Descriptive statistics for Small Companies in France (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	97	-.031	-.311	.244	.076
ACAR EU leakage	Percent	97	.012	-.214	.314	.089
ACAR Country	Percent	97	-.022	-.23	.251	.062
ACAR Country leakage	Percent	97	-.017	-.22	.186	.084
Size Treatment	Dummy 0/1	100	0	0	0	0
Total Assets	Euro	100	586000	16563	1560000	442000
Industry Code	Number	100	4.4	1	10	2.437
ROIC	Number	94	.015	-1.385	1.365	.324
ROIC Winsorized	Number	94	.006	-.88	.246	.251
Net Debt	Euro	100	59124.24	-311000	733000	175000
Debt-to-Equity Ratio	Number	100	25.667	-2156.76	399.17	233.602
Debt-to-Equity Ratio Winsorized	Number	100	43.366	-386.85	399.17	88.665
Market-to-Book Ratio	Number	94	1.204	-96.342	15.654	11.321
Market-to-Book Ratio Winsorized	Number	94	2.388	-9.398	15.113	3.625
EBIT	Number	94	39.37	-123.552	246.199	56.299
Interest Coverage Ratio	Number	93	22.272	-5843.2	3175.278	764.374
Interest Coverage Ratio Winsorized	Number	93	32.046	-574.2	532.5	159.446
Quick Ratio	Number	87	1.673	.28	9.72	1.506
Quick Ratio Winsorized	Number	87	1.646	.31	7.34	1.374
Age	Number	100	22.404	.019	120.197	17.21
GDP per Capita	Number	100	42747	42747	42747	0
Deaths per Million	Number	100	3.79	3.79	3.79	0
Sick per Million	Number	100	15.31	15.31	15.31	0
ROE	Number	96	-8.737	-825.54	75.11	94.343
ROE Winsorized	Number	96	-3.163	-266.98	51.7	50.128

Table 11

Descriptive statistics for Large Companies in France (Size Dummy = 1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	145	-.027	-.269	.173	.076
ACAR EU leakage	Percent	145	-.022	-.211	.211	.083
ACAR Country	Percent	145	-.014	-.151	.181	.062
ACAR Country leakage	Percent	145	-.024	-.254	.346	.097
Size Treatment	Dummy 0/1	148	1	1	1	0
Total Assets	Euro	148	6.93e+07	1570000	2.16e+09	2.64e+08
Industry Code	Number	148	4.493	1	11	2.557
ROIC	Number	147	.079	-.096	.246	.047
ROIC Winsorized	Number	147	.079	-.096	.246	.047
Net Debt	Euro	148	9210000	-4410000	2.80e+08	3.00e+07
Debt-to-Equity Ratio	Number	148	81.704	-8225.35	1271.55	705.769
Debt-to-Equity Ratio Winsorized	Number	148	130.183	-386.85	615.52	141.609
Market-to-Book Ratio	Number	147	2.217	-9.398	17.103	2.643
Market-to-Book Ratio Winsorized	Number	147	2.203	-9.398	15.113	2.57
EBIT	Number	148	1736.895	-19	28442	3782.086
Interest Coverage Ratio	Number	146	17.285	-.271	411.966	38.735
Interest Coverage Ratio Winsorized	Number	146	17.285	-.271	411.966	38.735
Quick Ratio	Number	119	1.072	.24	15.89	1.492
Quick Ratio Winsorized	Number	119	1.001	.31	7.34	.833
Age	Number	148	29.695	.436	120.197	21.393
GDP per Capita	Number	148	42747	42747	42747	0
Deaths per Million	Number	148	3.79	3.79	3.79	0
Sick per Million	Number	148	15.31	15.31	15.31	0
ROE	Number	146	7.993	-314.89	56.49	28.722
ROE Winsorized	Number	146	8.288	-266.98	51.7	24.985

Germany

Table 12

Descriptive statistics for Germany. This table presents summary statistics for the sample of all firms within Germany. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	236	-.0029619	-.1789492	.2903208	.0733096
ACAR EU leakage	Percent	236	-.0181905	-.3773955	.321425	.0889868
ACAR Country	Percent	236	.0044204	-.2314926	.2730623	.0772723
ACAR Country leakage	Percent	236	-.0251895	-.4269043	.3858796	.0986552
Size Treatment	Dummy 0/1	246	0,500	0	1	0
Total Assets	Euro	246	3.01e+07	1165	1.29e+09	1.20e+08
Industry Code	Number	247	4.862348	1	11	2.618974
ROIC	Number	234	.0740302	-.5194602	.3672457	.1025339
ROIC Winsorized	Number	234	.0747448	-.3400878	.3536048	.0984761
Net Debt	Euro	246	5158250	-4.33e+07	1.56e+08	2.11e+07
Debt-to-Equity Ratio	Number	246	110.0662	-302.08	1121.95	161.5661
Debt-to-Equity Ratio Winsorized	Number	246	110.1551	-6.74	816.48	150.8241
Market-to-Book Ratio	Number	234	639.6165	-14.74807	148830	9.29.087
Market-to-Book Ratio Winsorized	Number	234	3.558888	.2354966	23.33989	4.171359
EBIT	Number	234	802.0657	-1358	21173	2263.889
Interest Coverage Ratio	Number	233	45.20636	-81.21429	4540.5	309.5829
Interest Coverage Ratio Winsorized	Number	233	23.37076	-61.60243	335.1369	52.92263
Quick Ratio	Number	199	1.587487	.11	46.45	3.376015
Quick Ratio Winsorized	Number	199	1.39005	.16	7.11	1.160485
Age	Number	247	21.16744	.2	47.2	13.99757
GDP per Capita	Number	247	40875	40875	40875	0
Deaths per Million	Number	247	1.205	1.205	1.205	0
Sick per Million	Number	247	12.67	12.67	12.67	0
ROE	Number	240	11.43633	-50.55	170.96	17.62393
ROE Winsorized	Number	240	11.02792	-30.82	54	13.907

Table 13

Descriptive statistics for Small Companies in Germany (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	98	-.0004203	-.152076	.1892625	.0726058
ACAR EU leakage	Percent	98	-.0125163	-.3773955	.321425	.1039197
ACAR Country	Percent	98	-.0024284	-.2314926	.1957366	.0794492
ACAR Country leakage	Percent	98	-.0265497	-.2699013	.1956415	.0820495
Size Treatment	Dummy 0/1	105	0	0	0	0
Total Assets	Euro	105	604345.6	1165	1572047	428551
Industry Code	Number	105	5.114286	1	11	2.576948
ROIC	Number	100	.0771899	-.5194602	.3672457	.1343276
ROIC Winsorized	Number	100	.078862	-.3400878	.3536048	.1269329
Net Debt	Euro	105	74240.47	-607394	688910	215551.7
Debt-to-Equity Ratio	Number	105	80.70848	-110.25	1121.95	143.8793
Debt-to-Equity Ratio Winsorized	Number	105	78.78505	-6.74	816.48	123.2922
Market-to-Book Ratio	Number	100	1493.924	.4873526	148830	14882.43
Market-to-Book Ratio Winsorized	Number	100	5.396579	.4873526	23.33989	5.424679
EBIT	Number	100	43.50338	-120.9	254.144	58.33763
Interest Coverage Ratio	Number	100	74.47223	-81.21429	4540.5	454.8536
Interest Coverage Ratio Winsorized	Number	200	32.65187	-61.60243	335.1369	65.3807
Quick Ratio	Number	89	1.767865	.23	7.11	1.287566
Quick Ratio Winsorized	Number	89	1.767865	.23	7.11	1.287566
Age	Number	105	17.09243	.2	47.2	10.43587
GDP per Capita	Number	105	40875	40875	40875	0
Deaths per Million	Number	105	1.205	1.205	1.205	0
Sick per Million	Number	105	12.67	12.67	12.67	0
ROE	Number	101	13.28554	-50.55	170.96	23.56501
ROE Winsorized	Number	101	12.43564	-30.82	54	17.02654

Table 14

Descriptive statistics for Large Companies in Germany (Size Dummy = 1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	61	.0036046	-.1789492	.2903208	.070876
ACAR EU leakage	Percent	61	-.0241596	-.2068931	.1530603	.0727156
ACAR Country	Percent	61	.0025639	-.1188789	.2730623	.0719033
ACAR Country leakage	Percent	61	-.0231912	-.3111933	.1862807	.084796
Size Treatment	Dummy 0/1	63	1	1	1	0
Total Assets	Euro	62	1.13e+08	9017883	1.29e+09	2.20e+08
Industry Code	Number	63	4.301587	1	11	2.550363
ROIC	Number	60	.072603	-.0592364	.2565106	.0472246
ROIC Winsorized	Number	60	.072603	-.0592364	.2565106	.0472246
Net Debt	Euro	62	1.93e+07	-4.33e+07	1.56e+08	3.89e+07
Debt-to-Equity Ratio	Number	62	136.379	.11	887.99	157.4467
Debt-to-Equity Ratio Winsorized	Number	62	135.2256	.11	816.48	152.0188
Market-to-Book Ratio	Number	60	1.73389	0	8.556.608	1.581995
Market-to-Book Ratio Winsorized	Number	60	1.737815	.2354966	8.556.608	1.577907
EBIT	Number	60	2765.861	-1358	21173	3853.613
Interest Coverage Ratio	Number	59	11.12557	-3.25	1.368.142	21.24123
Interest Coverage Ratio Winsorized	Number	59	11.12557	-3.25	1.368.142	21.24123
Quick Ratio	Number	44	.9565909	.23	6.49	.9149176
Quick Ratio Winsorized	Number	44	.9565909	.23	6.49	.9149176
Age	Number	63	26.84665	.5416667	47.2	17.46056
GDP per Capita	Number	63	40875	40875	40875	0
Deaths per Million	Number	63	1.205	1.205	1.205	0
Sick per Million	Number	63	12.67	12.67	12.67	0
ROE	Number	62	10.59226	-13.55	66.18	10.78996
ROE Winsorized	Number	62	10.39581	-13.55	54	9.829417

Italy

Table 15

Descriptive statistics for Italy. This table presents summary statistics for the sample of all firms within Italy. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	145	-.009	-.148	.149	.061
ACAR EU leakage	Percent	145	-.01	-.224	.205	.076
ACAR Country	Percent	145	-.002	-.124	.301	.057
ACAR Country leakage	Percent	145	-.006	-.178	.29	.078
Size Treatment	Dummy 0/1	157	.65	0	1	.479
Total Assets	Euro	157	2.81e+07	41289	8.44e+08	1.05e+08
Industry Code	Number	157	4.306	1	11	2.579
ROIC	Number	151	.072	-1.542	.315	.174
ROIC Winsorized	Number	151	.075	-1.015	.296	.144
Net Debt	Euro	157	5820000	-2780000	2.41e+08	2.52e+07
Debt-to-Equity Ratio	Number	157	134.628	-355.89	939.03	174.559
Debt-to-Equity Ratio Winsorized	Number	157	135.109	-201.31	859.91	169.929
Market-to-Book Ratio	Number	151	2.744	-3.37	52.777	4.888
Market-to-Book Ratio Winsorized	Number	151	2.551	-.775	21.001	3.037
EBIT	Number	152	643.658	-121.152	10530	1771.166
Interest Coverage Ratio	Number	152	24.728	-5.433	798.286	71.424
Interest Coverage Ratio Winsorized	Number	152	20.797	-5.06	200.519	36.434
Quick Ratio	Number	122	1.083	.2	4.21	.646
Quick Ratio Winsorized	Number	122	1.078	.29	3.52	.62
Age	Number	157	17.052	.258	47.2	12.822
GDP per Capita	Number	157	35435	35435	35435	0
Deaths per Million	Number	157	4.46	4.46	4.46	4.46
Sick per Million	Number	157	33.33	33.33	33.33	33.33
ROE	Number	152	12.153	-77.25	74.9	15.769
ROE Winsorized	Number	152	12.113	-66.42	57.98	14.982

Table 16

Descriptive statistics for Small Companies in Italy (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	45	-.02	-.148	.101	.059
ACAR EU leakage	Percent	45	-.014	-.224	.16	.08
ACAR Country	Percent	45	-.009	-.111	.104	.053
ACAR Country leakage	Percent	45	-.015	-.178	.15	.07
Size Treatment	Dummy 0/1	55	0	0	0	0
Total Assets	Euro	55	378000	41289	804000	211000
Industry Code	Number	55	4.6	1	11	2.664
ROIC	Number	51	.057	-1.542	.315	.288
ROIC Winsorized	Number	51	.067	-1.015	.296	.234
Net Debt	Euro	55	42595.46	-86900	404000	94367.17
Debt-to-Equity Ratio	Number	55	58.761	-201.31	441.29	85.764
Debt-to-Equity Ratio Winsorized	Number	55	58.761	-201.31	441.29	85.764
Market-to-Book Ratio	Number	51	2.972	-3.37	11.923	2.743
Market-to-Book Ratio Winsorized	Number	51	3.023	-.775	11.923	2.646
EBIT	Number	52	23.924	-121.152	111.569	32.377
Interest Coverage Ratio	Number	52	52.617	-5.433	798.286	116.723
Interest Coverage Ratio Winsorized	Number	52	41.129	-5.06	200.519	54.912
Quick Ratio	Number	50	1.057	.2	2.48	.51
Quick Ratio Winsorized	Number	50	1.059	.29	2.48	.507
Age	Number	55	10.429	.258	47.2	9.818
GDP per Capita	Number	55	35435	35435	35435	0
Deaths per Million	Number	55	4.46	4.46	4.46	0
Sick per Million	Number	55	33.33	33.33	33.33	0
ROE	Number	53	13.601	-66.42	41.48	16.096
ROE Winsorized	Number	53	13.601	-66.42	41.48	16.096

Table 17

Descriptive statistics for Large Companies in Italy (Size Dummy = 1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
ACAR EU	Percent	100	-.005	-.147	.149	.062
ACAR EU leakage	Percent	100	-.008	-.174	.205	.074
ACAR Country	Percent	100	.002	-.124	.301	.059
ACAR Country leakage	Percent	100	-.002	-.159	.29	.082
Size Treatment	Dummy 0/1	102	1	1	1	0
Total Assets	Euro	102	4.31e+07	856000	8.44e+08	1.28e+08
Industry Code	Number	102	4.147	1	11	2.531
ROIC	Number	100	.079	-.07	.269	.06
ROIC Winsorized	Number	100	.079	-.07	.269	.06
Net Debt	Euro	102	8940000	-2780000	2.41e+08	3.09e+07
Debt-to-Equity Ratio	Number	102	175.537	-355.89	939.03	195.721
Debt-to-Equity Ratio Winsorized	Number	102	176.277	-201.31	859.91	189.161
Market-to-Book Ratio	Number	100	2.627	-.12	52.777	5.689
Market-to-Book Ratio Winsorized	Number	100	2.309	-.12	21.001	3.204
EBIT	Number	100	965.919	-84.518	10530	2116.031
Interest Coverage Ratio	Number	100	10.225	-2.246	63.166	11.889
Interest Coverage Ratio Winsorized	Number	100	10.225	-2.246	63.166	11.889
Quick Ratio	Number	72	1.101	.29	4.21	.728
Quick Ratio Winsorized	Number	72	1.092	.29	3.52	.691
Age	Number	102	20.622	.908	47.2	12.87
GDP per Capita	Number	102	35435	35435	35435	0
Deaths per Million	Number	102	4.46	4.46	4.46	0
Sick per Million	Number	102	33.33	33.33	33.33	0
ROE	Number	99	11.378	-77.25	74.9	15.618
ROE Winsorized	Number	99	11.317	-66.42	57.98	14.371

7.5 Descriptive statistics difference-in-differences analysis

Note. Since the only difference in the summary statistics between the regression analysis and the difference-in-differences analysis for the other control variables is the amount of observations, these variables are not denoted in the summary statistics in the tables in this Appendix section.

The Netherlands

Table 18

Descriptive statistics for the Netherlands. This table presents summary statistics for the sample of all firms within the Netherlands. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	5106	-.002	-.302	.849	.046
Size Treatment	Dummy 0/1	5290	.5130435	0	1	.4998771
Sick per Million	Number	5175	30919.99	0	65622	24261.49
Deaths per Million	Number	5175	3309.297	0	8854	3232.771
Reproduction Rate	Number	5175	1.272	0	2.71	.833

Table 19

Descriptive statistics for Small Companies in the Netherlands (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	2530	-.001	-.302	.409	.05
Size Treatment	Dummy 0/1	2576	0	0	0	0
Sick per Million	Number	2520	30919.99	0	65622	24263.96
Deaths per Million	Number	2520	3309.297	0	8854	3233.1
Reproduction Rate	Number	2520	1.272	0	2.71	.833

Table 20

Descriptive statistics for Small Companies in the Netherlands (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	2576	-.003	-.262	.849	.042
Size Treatment	Dummy 0/1	2714	1	1	1	0
Sick per Million	Number	2655	30919.99	0	65622	24263.72
Deaths per Million	Number	2655	3309.297	0	8854	3233.067
Reproduction Rate	Number	2655	1.272	0	2.71	.833

France

Table 21

Descriptive statistics for France. This table presents summary statistics for the sample of all firms within France. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	12400	0	-.389	.689	.04
Size Treatment	Dummy 0/1	12400	.597	0	1	.491
Sick per Million	Number	4960	13504.24	.378	42899	13988.98
Deaths per Million	Number	4960	618.37	.004	3267	1119.536
Reproduction Rate	Number	4960	2.498	1.75	3.02	.432

Table 22

Descriptive statistics for Small Companies in France (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	5000	.001	-.389	.689	.044
Size Treatment	Dummy 0/1	5000	0	0	0	0
Sick per Million	Number	2000	13504.24	.378	42899	13991.06
Deaths per Million	Number	2000	618.37	.004	3267	1119.703
Reproduction Rate	Number	2000	2.498	1.75	3.02	.433

Table 23

Descriptive statistics for Large Companies in France (Size Dummy =1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	7400	-.001	-.215	.295	.037
Size Treatment	Dummy 0/1	7400	1	1	1	0
Sick per Million	Number	2960	13504.24	.378	42899	13989.93
Deaths per Million	Number	2960	618.37	.004	3267	1119.612
Reproduction Rate	Number	2960	2.498	1.75	3.02	.432

Germany

Table 24

Descriptive statistics for Germany. This table presents summary statistics for the sample of all firms within Germany. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	11771	0	-.433	.425	.041
Size Treatment	Dummy 0/1	12350	.255	0	1	.436
Sick per Million	Number	12103	24802.47	.244	69662	23295.77
Deaths per Million	Number	12103	1127.145	0	2965	1096.573
Reproduction Rate	Number	12103	1.581	.65	3.11	.936

Table 25

Descriptive statistics for Small Companies in Germany (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	8721	.001	-.433	.425	.043
Size Treatment	Dummy 0/1	9200	0	0	0	0
Sick per Million	Number	9016	24802.47	.244	69662	23296.1
Deaths per Million	Number	9016	1127.145	0	2965	1096.588
Reproduction Rate	Number	9016	1.581	.65	3.11	.936

Table 26

Descriptive statistics for Large Companies in Germany (Size Dummy = 1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	3050	-.001	-.18	.244	.033
Size Treatment	Dummy 0/1	3150	1	1	1	0
Sick per Million	Number	3087	24802.47	.244	69662	23298.58
Deaths per Million	Number	3087	1127.145	0	2965	1096.705
Reproduction Rate	Number	3087	1.581	.65	3.11	.937

Italy

Table 27

Descriptive statistics for Italy. This table presents summary statistics for the sample of all firms within Italy. For variable definitions see Table 5 in section 7.3.

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	7229	0	-.247	.262	.034
Size Treatment	Dummy 0/1	7850	.65	0	1	.477
Sick per Million	Number	7693	49987.03	4.27	93457	27225.59
Deaths per Million	Number	7693	6241.992	.106	13468	4349.305
Reproduction Rate	Number	7693	1.314	.66	2.86	.676

Table 28

Descriptive statistics for Small Companies in Italy (Size Dummy = 0)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	2229	.001	-.145	.262	.035
Size Treatment	Dummy 0/1	2750	0	0	0	0
Sick per Million	Number	2695	49987.03	4.27	93457	27228.87
Deaths per Million	Number	2695	6241.992	.106	13468	4349.829
Reproduction Rate	Number	2695	1.314	.66	2.86	.676

Table 29

Descriptive statistics for Large Companies in Italy (Size Dummy = 1)

Variable	Unit	Observations	Mean	Minimum	Maximum	Standard Deviation
AR	Percent	5000	0	-.247	.245	.034
Size Treatment	Dummy 0/1	5100	1	1	1	0
Sick per Million	Number	4998	49987.03	4.27	93457	27226.54
Deaths per Million	Number	4998	6241.992	.106	13468	4349.457
Reproduction Rate	Number	4998	1.314	.66	2.86	.676

7.6 Kernel density

Figure 7

Kernel density estimate based on total assets for the Netherlands

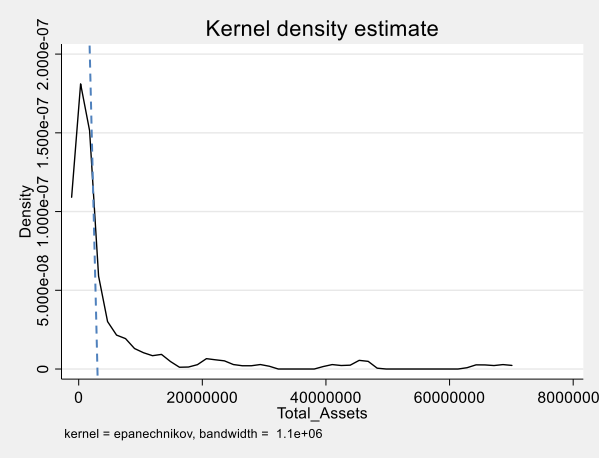


Figure 8

Kernel density estimate based on total assets for Germany

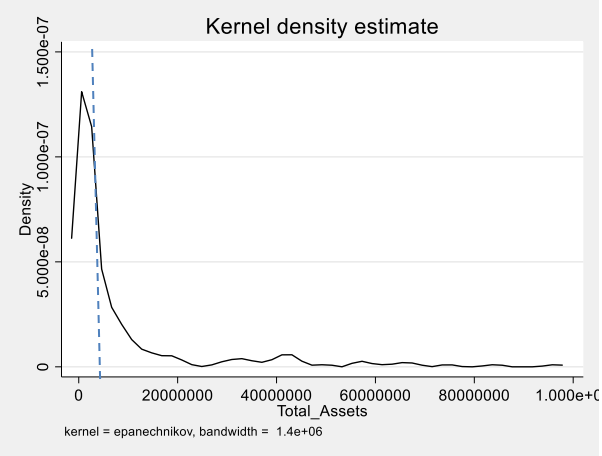


Figure 9

Kernel density estimate based on total assets for France

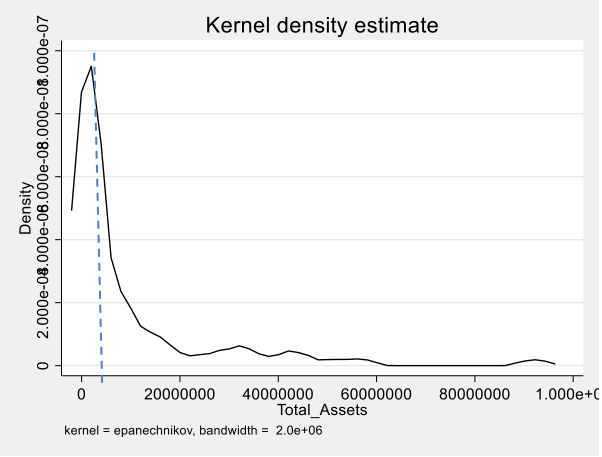
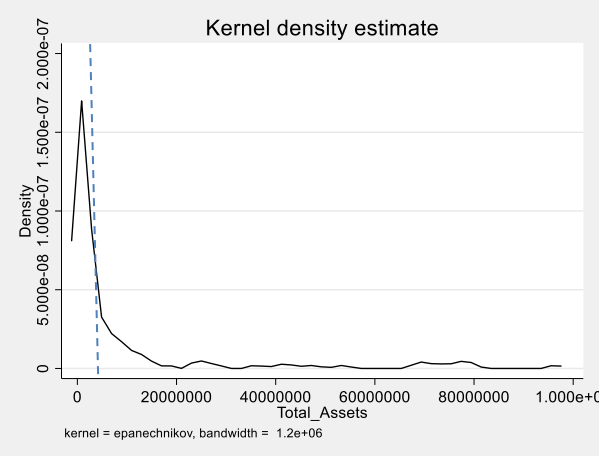


Figure 10

Kernel density estimate based on total assets for Italy



7.7 Diagnostic tests for the regression analysis

The Netherlands

Table 30

Collinearity diagnostics for the Netherlands for the regression analysis. W stands for Winsorized.

Variable	VIF without Liquidity EU	VIF with Liquidity EU	VIF without Liquidity Country	VIF with Liquidity Country
Size Treatment	1.277	1.614	1.277	1.614
Industry Code				
2	2.816	1.415	2.816	1.415
3	2.588	2.911	2.588	2.911
4	3.355	3.765	3.355	3.765
5	1.844	1.916	1.844	1.916
6	2.023		2.023	
7	2.874	3.05	2.874	3.05
8	2.049	2.3	2.049	2.3
9	2.347	2.776	2.347	2.776
10	1.292	1.378	1.292	1.378
11	1.17	1.328	1.17	1.328
ROIC (W)	1.581	1.575	1.581	1.575
Net Debt	7.35	4.226	7.35	4.226
Debt-to-Equity Ratio (W)	1.132	1.125	1.132	1.125
Market-to-Book Ratio (W)	1.658	1.731	1.658	1.731
EBIT	7.502	4.396	7.502	4.396
Interest Coverage Ratio (W)	1.271	1.477	1.271	1.477
Age	1.32	1.366	1.32	1.366
Quick Ratio (W)		1.24		1.24

Table 31

Correlation table for the Netherlands for the regression analysis

Variables	ACAR EU	ACAR EU leakage	ACAR Country	ACAR Country leakage	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	ROE (W)
ACAR EU	1.000														
ACAR EU leakage	0.205	1.000													
ACAR Country	0.481	0.106	1.000												
ACAR Country leakage	0.798	0.405	0.681	1.000											
Size treatment	0.308	0.052	0.045	0.282	1.000										
Industry Code	0.125	-0.151	0.223	0.102	0.057	1.000									
ROIC (W)	0.088	-0.056	-0.064	-0.017	0.201	0.011	1.000								
Net Debt	0.154	-0.054	0.181	0.135	0.340	0.337	0.075	1.000							
Debt-to-Equity Ratio (W)	-0.000	-0.208	0.053	0.027	0.014	0.118	0.003	0.083	1.000						
Market-to-Book Ratio (W)	-0.096	0.181	-0.076	-0.035	-0.106	-0.040	0.050	-0.079	0.232	1.000					
EBIT	0.237	0.120	0.238	0.264	0.462	0.239	0.165	0.801	0.070	0.015	1.000				
Interest Coverage Ratio (W)	0.055	0.042	-0.016	0.117	0.242	-0.087	0.433	-0.118	-0.015	-0.002	0.131	1.000			
Age	-0.054	0.018	0.009	-0.076	0.098	0.041	0.180	0.289	0.019	-0.189	0.328	0.064	1.000		
Quick Ratio (W)	-0.042	0.031	0.218	0.127	-0.138	-0.171	-0.095	-0.132	0.018	-0.019	-0.084	-0.017	-0.184	1.000	
ROE (W)	0.245	-0.133	0.051	0.153	0.250	0.073	0.688	0.083	0.400	-0.134	0.148	0.195	0.114	-0.085	1.000

Figure 11

Normality of residuals in the regression analysis for the Netherlands EU measures without liquidity

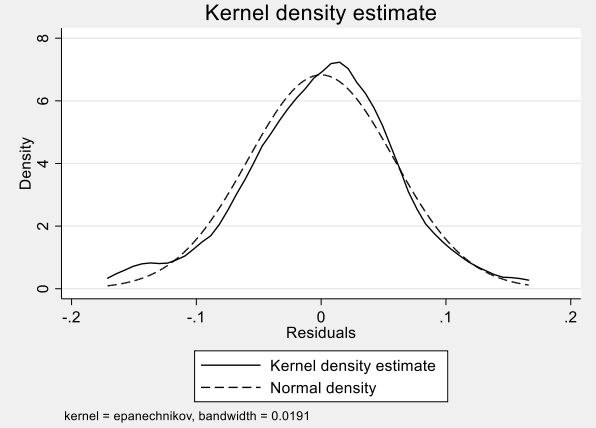


Figure 12

Normality of residuals in the regression analysis for the Netherlands EU measures with liquidity

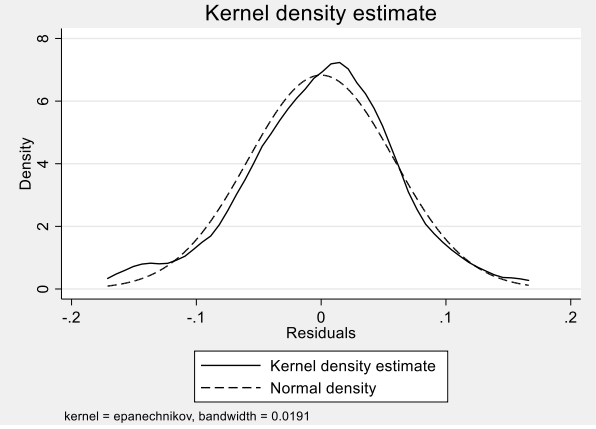


Figure 13

Normality of residuals in the regression analysis for the Netherlands Country measures without liquidity

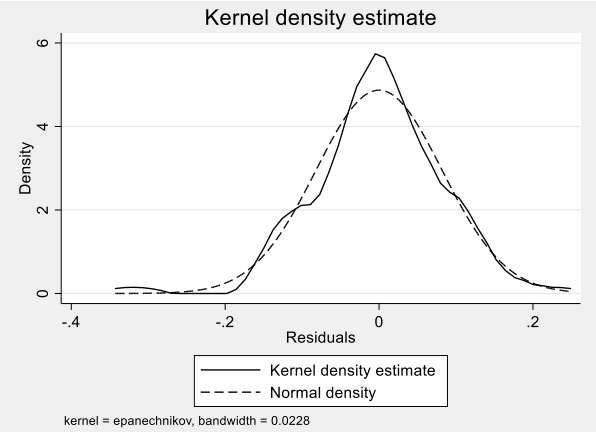
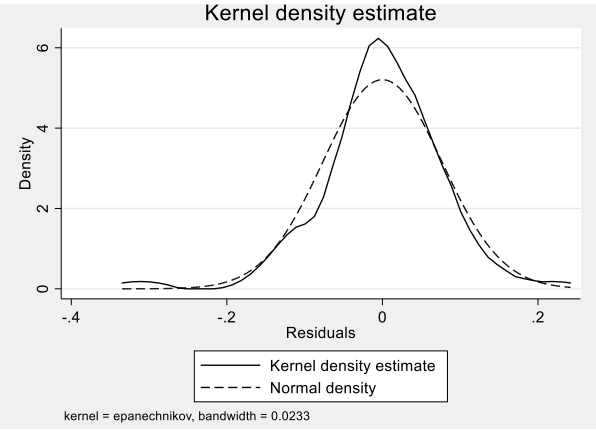


Figure 14

Normality of residuals in the regression analysis for the Netherlands Country measures with liquidity



France

Table 32

Collinearity diagnostics France for the regression analysis

Variable	VIF without Liquidity EU	VIF with Liquidity EU	VIF without Liquidity Country	VIF with Liquidity Country
Size Treatment	1.361	1.5	1.361	1.5
Industry Code				
2	2.153	1.372	2.153	1.372
3	2.595	2.527	2.595	2.527
4	2.539	2.449	2.539	2.449
5	1.374	1.414	1.374	1.414
6	1.798	1.141	1.798	1.141
7	2.103	2.071	2.103	2.071
8	1.341	1.342	1.341	1.342
9	1.607	1.619	1.607	1.619
10	1.259	1.276	1.259	1.276
11	1.146	1.247	1.146	1.247
ROIC (W)	1.226	1.335	1.226	1.335
Net Debt	2.368	2.698	2.368	2.698
Debt-to-Equity Ratio (W)	1.524	1.398	1.524	1.398
Market-to-Book Ratio (W)	1.132	1.22	1.132	1.22
EBIT	1.983	2.501	1.983	2.501
Age	1.173	1.21	1.173	1.21
Quick Ratio (W)		1.574		1.574

Table 33

Correlation table for France for the regression analysis

Variables	ACAR EU	ACAR EU leakage	ACAR Country	ACAR Country leakage	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	ROE (W)
ACAR EU	1.000														
ACAR EU leakage	0.521	1.000													
ACAR Country	0.168	0.170	1.000												
ACAR Country leakage	0.632	0.651	0.183	1.000											
Size treatment	0.083	-0.158	0.073	0.003	1.000										
Industry Code	0.068	0.004	-0.018	0.067	0.040	1.000									
ROIC (W)	0.067	0.0485	0.0881	-0.0019	0.2139	0.1966	1.000								
Net Debt	0.053	-0.241	0.004	-0.087	0.351	0.085	0.047	1.000							
Debt-to-Equity Ratio (W)	-0.093	-0.189	-0.083	-0.124	0.287	-0.038	0.095	0.257	1.000						
Market-to-Book Ratio (W)	-0.024	0.030	0.050	0.083	-0.078	-0.024	0.053	-0.098	0.169	1.000					
EBIT	0.098	-0.079	0.203	0.027	0.342	0.047	0.123	0.702	0.081	0.081	1.000				
Interest Coverage Ratio (W)	-0.076	-0.018	0.033	-0.127	-0.040	0.127	0.432	-0.074	-0.139	0.228	-0.019	1.000			
Age	0.126	-0.013	0.039	0.156	0.216	-0.002	0.185	0.061	0.107	-0.070	0.239	0.010	1.000		
Quick Ratio (W)	-0.058	0.205	0.009	0.012	-0.271	-0.066	-0.387	-0.195	-0.276	0.032	-0.167	-0.026	-0.162	1.000	
ROE (W)	-0.089	-0.027	0.081	-0.037	0.165	0.190	0.758	0.010	0.297	0.116	0.092	0.226	0.135	-0.300	1.000

Figure 15

Normality of residuals in the regression analysis for France EU measures without liquidity

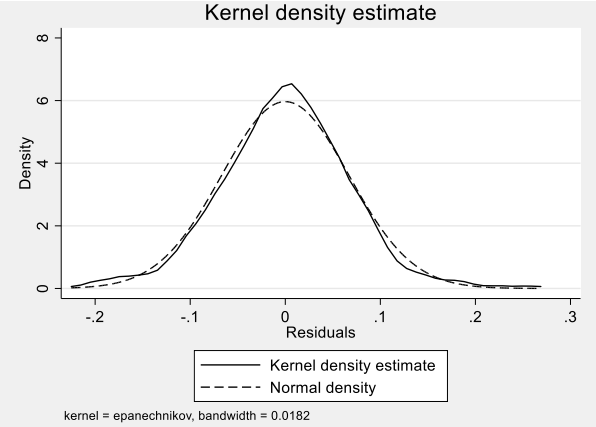


Figure 16

Normality of residuals in the regression analysis for France EU measures with liquidity

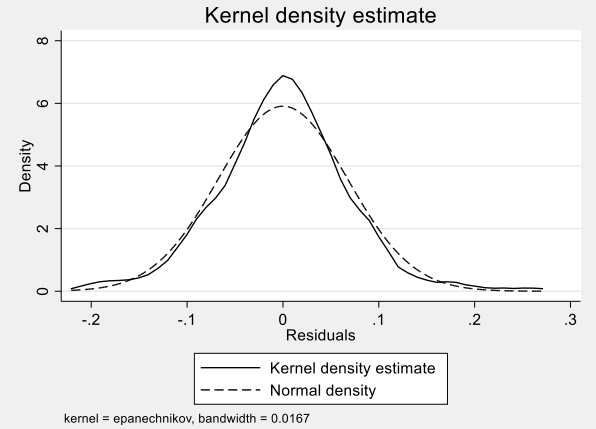


Figure 17

Normality of residuals in the regression analysis for France Country measures without liquidity

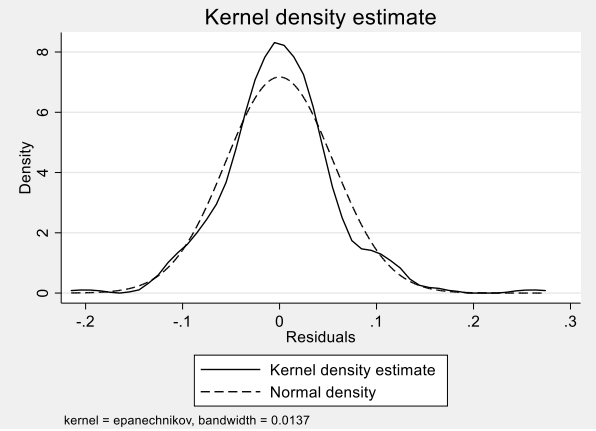
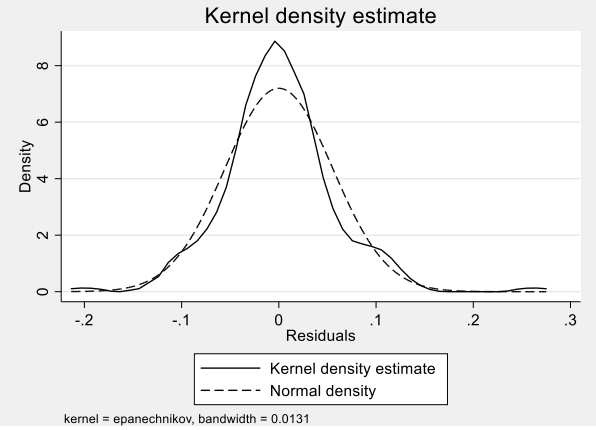


Figure 18

Normality of residuals in the regression analysis for France Country measures with liquidity



Germany

Table 34

Collinearity diagnostics for Germany for the regression analysis

Variable	VIF without Liquidity EU	VIF with Liquidity EU	VIF without Liquidity Country	VIF with Liquidity Country
Size Treatment	1.498	1.5	1.498	1.5
Industry Code				
2	2.284	1,246	2.284	1.246
3	2.403	2.376	2.403	2.376
4	2.681	2.654	2.681	2.654
5	1.591	1.622	1.591	1.622
6	2.412	1.186	2.412	1.186
7	2.268	2.235	2.268	2.235
8	1.744	1.719	1.744	1.719
9	1.419	1.394	1.419	1.394
10	1.278	1.287	1.278	1.287
11	1.418	1.466	1.418	1.466
ROIC (W)	1.235	1.29	1.235	1.29
Net Debt	2.694	3.534	2.694	3.534
Debt-to-Equity Ratio (W)	1.308	1.336	1.308	1.336
Market-to-Book Ratio (W)	1.359	1.372	1.359	1.372
EBIT	3.002	3.902	3.002	3.902
Age	1.235	1.251	1.235	1.251
Quick Ratio (W)		1.279		1.279

Table 35

Correlation table for Germany for the regression analysis

Variables	ACAR EU	ACAR EU leakage	ACAR Country	ACAR Country leakage	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	ROE (W)
ACAR EU	1.000														
ACAR EU leakage	0.150	1.000													
ACAR Country	-0.377	-0.123	1.000												
ACAR Country leakage	0.205	0.553	0.171	1.000											
Size treatment	0.023	-0.031	0.024	0.068	1.000										
Industry Code	-0.090	0.085	0.006	0.069	-0.027	1.000									
ROIC (W)	-0.147	-0.189	0.023	-0.241	-0.005	0.050	1.000								
Net Debt	0.050	-0.033	0.045	0.040	0.202	-0.070	-0.037	1.000							
Debt-to-Equity Ratio (W)	-0.039	-0.156	0.086	-0.083	0.126	-0.058	0.086	0.217	1.000						
Market-to-Book Ratio (W)	-0.053	0.058	0.143	-0.035	-0.369	-0.050	0.450	-0.145	0.167	1.000					
EBIT	0.053	-0.018	-0.023	0.045	0.271	-0.070	0.055	0.830	0.130	-0.145	1.000				
Interest Coverage Ratio (W)	-0.118	0.047	0.106	-0.009	-0.168	0.194	0.524	-0.088	-0.198	0.315	-0.070	1.000			
Age	0.034	-0.153	-0.025	-0.039	0.300	-0.081	0.052	0.156	0.081	-0.146	0.210	-0.078	1.000		
Quick Ratio (W)	0.020	0.018	0.085	0.044	-0.265	-0.007	-0.083	-0.124	-0.304	0.015	-0.138	0.182	-0.141	1.000	
ROE (W)	-0.1178	-0.191	0.0287	-0.1766	-0.0278	-0.0513	0.6668	-0.0056	0.1004	0.4895	0.0349	0.3265	0.0154	-0.0403	1.000

Figure 19

Normality of residuals in the regression analysis for Germany EU measures without liquidity

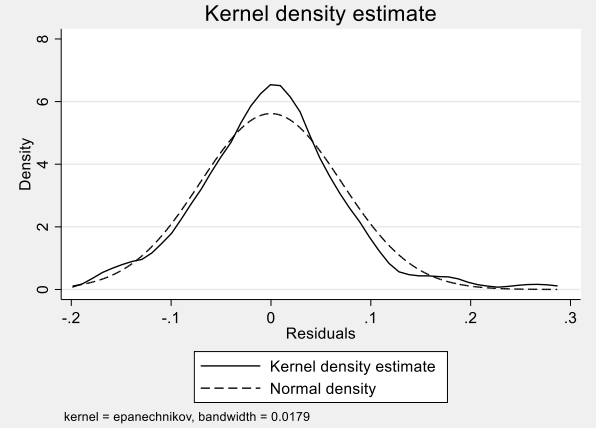


Figure 20

Normality of residuals in the regression analysis for Germany EU measures with liquidity

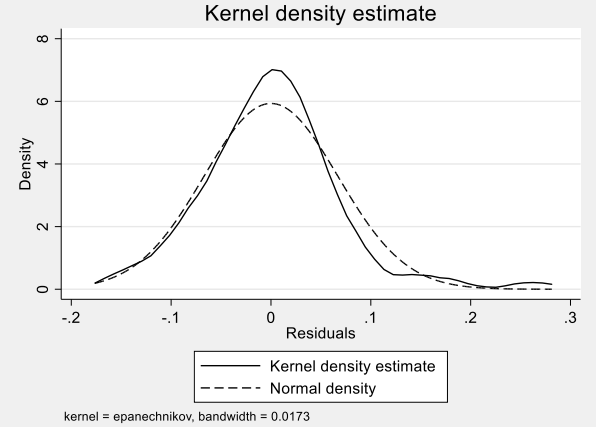


Figure 21

Normality of residuals in the regression analysis for Germany Country measures without liquidity

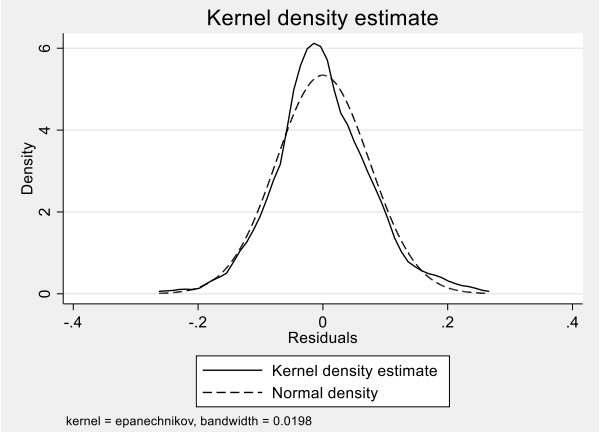
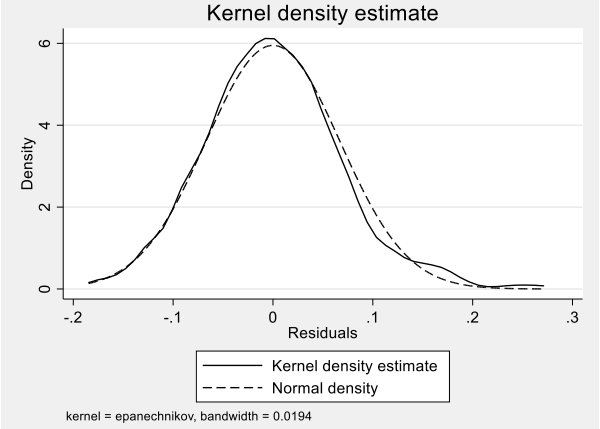


Figure 22

Normality of residuals in the regression analysis for Germany Country measures with liquidity



Italy

Table 36

Collinearity diagnostics Italy for the regression analysis

Variable	VIF without Liquidity EU	VIF with Liquidity EU	VIF without Liquidity Country	VIF with Liquidity Country
Size Treatment	1.454	1.427	1.454	1.427
Industry Code				
2	5.794	1.768	5.794	1.768
3	4.821	5.052	4.821	5.052
4	5.39	5.254	5.39	5.254
5	3.107	3.17	3.107	3.17
6	1.412		1.412	
7	2.239	2.274	2.239	2.274
8	1.35	1.189	1.35	1.189
9	2.182	2.243	2.182	2.243
10	1.957	2	1.957	2
11	1.954	2.075	1.954	2.075
ROIC (W)	1.262	1.255	1.262	1.255
Net Debt	2.162	3.032	2.162	3.032
Debt-to-Equity Ratio (W)	1.535	1.653	1.535	1.653
Market-to-Book Ratio (W)	1.48	1.609	1.48	1.609
EBIT	2.054	2.831	2.054	2.831
Age	1.412	1.349	1.412	1.349
Quick Ratio (W)		1.336		1.336

Table 37

Correlation table Italy for the regression analysis

Variables	ACAR EU	ACAR EU leakage	ACAR Country	ACAR Country leakage	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	ROE (W)
ACAR EU	1.000														
ACAR EU leakage	0.471	1.000													
ACAR Country	0.390	0.251	1.000												
ACAR Country leakage	0.189	0.612	0.290	1.000											
Size treatment	0.029	-0.069	0.072	-0.110	1.000										
Industry Code	0.047	-0.083	0.023	-0.097	0.038	1.000									
ROIC (W)	-0.188	0.138	-0.203	0.239	-0.224	-0.224	1.000								
Net Debt	0.041	-0.150	-0.060	-0.132	0.231	0.116	-0.090	1.000							
Debt-to-Equity Ratio (W)	0.005	-0.117	0.031	-0.112	0.293	-0.109	-0.273	0.384	1.000						
Market-to-Book Ratio (W)	0.086	0.260	0.014	0.132	-0.072	-0.200	0.407	-0.088	0.278	1.000					
EBIT	-0.074	-0.081	-0.121	0.009	0.242	0.056	0.018	0.750	0.172	-0.090	1.000				
Interest Coverage Ratio (W)	0.023	0.112	-0.114	0.206	-0.390	-0.132	0.515	-0.152	-0.308	0.225	-0.121	1.000			
Age	-0.003	-0.062	0.041	0.057	0.311	-0.015	-0.233	0.103	0.040	-0.313	0.160	-0.186	1.000		
Quick Ratio (W)	-0.007	0.036	0.001	0.107	0.060	-0.031	0.023	-0.099	-0.183	-0.013	-0.093	0.175	0.081	1.000	
ROE (W)	-0.164	0.023	-0.126	0.116	-0.049	-0.105	0.693	-0.053	-0.252	0.157	0.026	0.286	-0.172	0.044	1.000

Figure 23

Normality of residuals in the regression analysis for Italy EU measures without liquidity

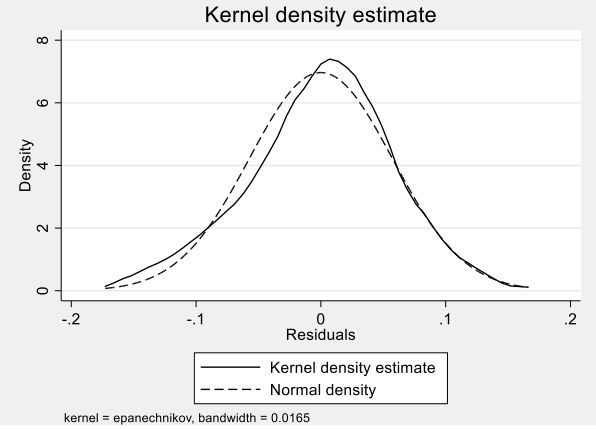


Figure 24

Normality of residuals in the regression analysis for Italy EU measures with liquidity

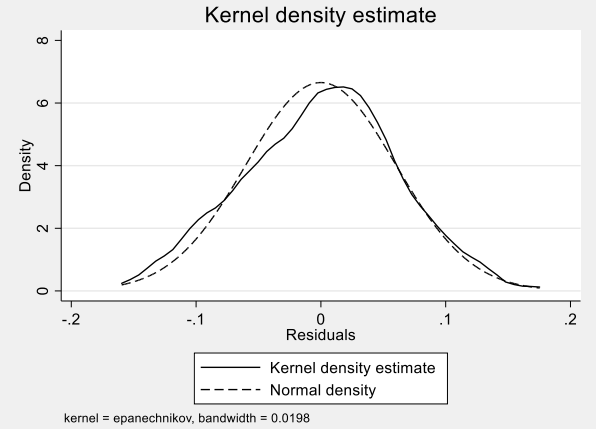


Figure 25

Normality of residuals in the regression analysis for Italy Country measures without liquidity

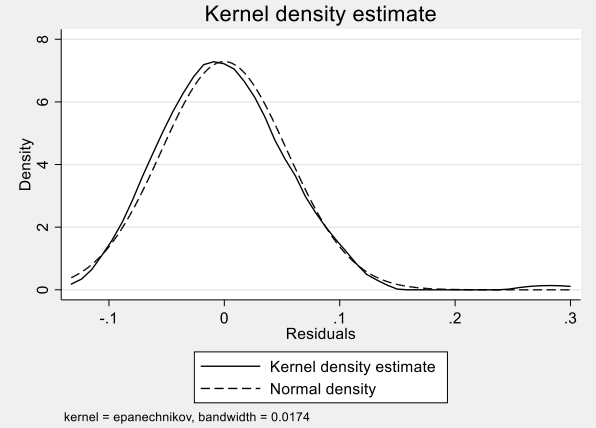
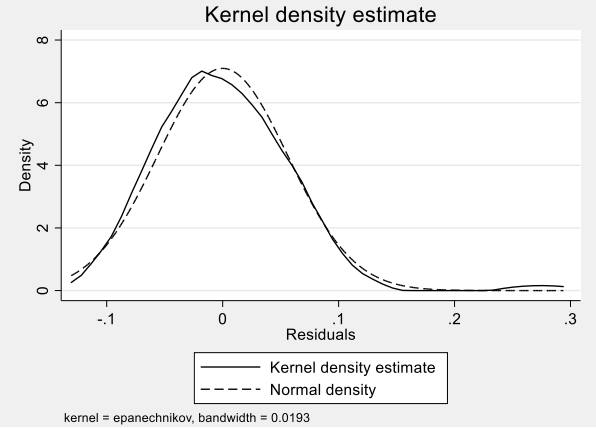


Figure 26

Normality of residuals in the regression analysis for Italy Country measures with liquidity



7.8 Diagnostic tests for the difference-in-differences analysis

Table 38

Collinearity diagnostics for the difference-in-differences analysis

Variable	VIF the Netherlands	VIF France	VIF Germany	VIF Italy
Size Treatment	5.603	3.368	5.946	5.915
Post	2.644	5.265	2.794	6.589
Size Treatment x Post	5.837	4.326	5.725	7.318
Industry Code				
2	1.4	1.363	1.252	1.768
3	2.844	2.554	2.37	5.047
4	3.767	2.466	2.653	5.248
5	1.542	1.446	1.622	3.171
6		1.14	1.186	
7	2.952	2.057	2.234	2.273
8	2.271	1.339	1.719	1.189
9	2.778	1.618	1.394	2.242
10	1.37	1.275	1.277	2.002
11	1.326	1.245	1.466	2.038
ROIC (W)	1.293	1.311	1.288	1.27
Net Debt	3.591	2.665	3.535	3.043
Debt-to-Equity Ratio (W)	1.112	1.457	1.337	1.651
Market-to-Book Ratio (W)	1.525	1.266	1.372	1.611
EBIT	4.089	2.501	3.901	2.834
Age	1.32	1.194	1.249	1.348
Quick Ratio (W)	1.231	1.541	1.281	1.338
Sick per Million	3.491	5.837	1.359	2.733
Deaths per Million	2.628	6.059	4.078	2.269
Reproduction Rate	1.225	10.535	8.673	4.044
ICU Patients per Million	4.409	7.518	4.801	1.691

Table 39

Correlation table the Netherlands for the difference-in-differences analysis

Variables	AR	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	Sick per M	Deaths per M	Reproduction Rate	ICU Patients per M
AR	1.000														
Size treatment	-0.003	1.000													
Industry Code	0.008	0.042	1.000												
ROIC (W)	-0.016	0.246	-0.069	1.000											
Net Debt	-0.002	0.344	0.328	0.091	1.000										
Debt-to-Equity Ratio (W)	-0.022	0.015	0.114	0.008	0.084	1.000									
Market-to-Book Ratio (W)	0.014	-0.124	-0.069	-0.067	-0.079	0.199	1.000								
EBIT	0.014	0.466	0.228	0.169	0.801	0.070	-0.005	1.000							
Interest Coverage Ratio (W)	0.014	0.244	-0.088	0.339	-0.116	-0.015	-0.015	0.133	1.000						
Age	-0.004	0.082	0.052	0.061	0.282	0.018	-0.145	0.318	0.061	1.000					
Quick Ratio (W)	-0.001	-0.134	-0.175	-0.055	-0.130	0.018	-0.002	-0.083	-0.017	-0.185	1.000				
Sick per Million	0.070	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000	-0.000	-0.000	0.000	1.000			
Deaths per Million	0.085	0.000	0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.649	1.000		
Reproduction Rate	-0.080	-0.000	-0.000	0.000	-0.000	-0.000	0.000	0.000	-0.000	0.000	0.000	-0.150	-0.333	1.000	
ICU Patients per Million	0.059	-0.000	0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	0.000	-0.000	0.830	0.757	-0.222	1.000

Figure 27

Normality of residuals in the difference-in-differences analysis for the Netherlands

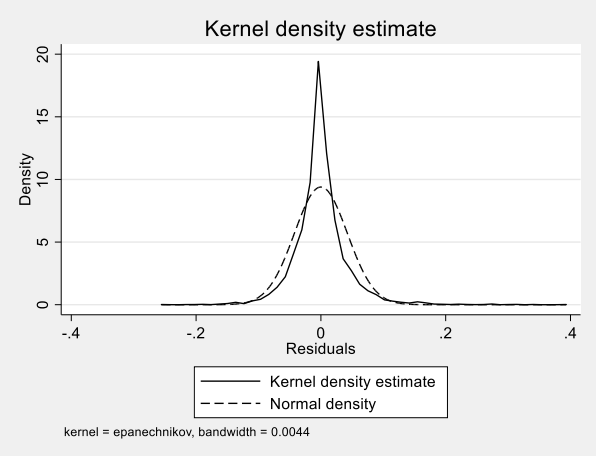


Table 40

Correlation table France for the difference-in-differences analysis

Variables	AR	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	Sick per M	Deaths per M	Reproduction Rate	ICU Patients per M
AR	1.000														
Size treatment	0.002	1.000													
Industry Code	0.000	0.050	1.000												
ROIC (W)	-0.008	0.236	0.189	1.000											
Net Debt	-0.010	0.345	0.092	0.051	1.000										
Debt-to-Equity Ratio (W)	-0.024	0.281	0.005	0.153	0.241	1.000									
Market-to-Book Ratio (W)	0.019	0.011	0.012	0.071	-0.056	0.284	1.000								
EBIT	0.017	0.337	0.056	0.122	0.703	0.089	0.084	1.000							
Interest Coverage Ratio (W)	-0.023	0.004	0.157	0.318	-0.053	-0.065	0.290	-0.003	1.000						
Age	0.019	0.200	0.015	0.152	0.072	0.096	-0.034	0.246	0.035	1.000					
Quick Ratio (W)	0.005	-0.255	-0.049	-0.302	-0.184	-0.201	0.043	-0.157	-0.006	-0.143	1.000				
Sick per Million	0.002	0.000	-0.000	-0.000	-0.000	-0.000	0.000	0.000	-0.000	0.000	-0.000	1.000			
Deaths per Million	0.009	-0.000	0.000	-0.000	-0.000	0.000	0.000	-0.000	0.000	-0.000	-0.000	0.904	1.000		
Reproduction Rate	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	-0.981	-0.820	1.000	
ICU Patients per Million	0.047	0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	0.830	0.819	-0.784	1.000

Figure 28

Normality of residuals in the difference-in-differences analysis for France

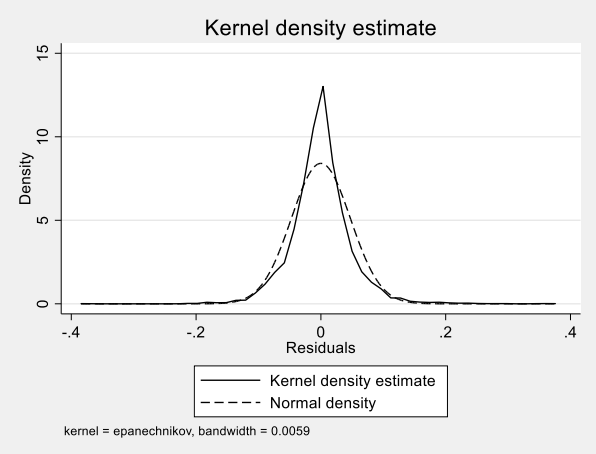


Table 41

Correlation table Germany for the difference-in-differences analysis

Variables	AR	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	Sick per M	Deaths per M	Reproduction Rate	ICU Patients per M
AR	1.000														
Size treatment	-0.013	1.000													
Industry Code	-0.003	-0.056	1.000												
ROIC (W)	-0.034	-0.001	0.106	1.000											
Net Debt	-0.008	0.400	-0.068	-0.032	1.000										
Debt-to-Equity Ratio (W)	-0.015	0.124	-0.061	0.087	0.218	1.000									
Market-to-Book Ratio (W)	0.013	-0.230	-0.094	0.274	-0.141	0.138	1.000								
EBIT	-0.009	0.508	-0.067	0.058	0.830	0.131	-0.145	1.000							
Interest Coverage Ratio (W)	-0.007	-0.155	0.197	0.516	-0.086	-0.189	0.255	-0.068	1.000						
Age	-0.030	0.276	-0.080	0.065	0.157	0.089	-0.169	0.211	-0.068	1.000					
Quick Ratio (W)	0.013	-0.185	-0.033	-0.124	-0.123	-0.301	0.063	-0.138	0.173	-0.138	1.000				
Sick per Million	0.025	-0.001	-0.001	-0.002	-0.000	-0.001	-0.001	-0.000	-0.001	-0.002	0.003	1.000			
Deaths per Million	0.017	-0.001	-0.002	-0.003	-0.000	-0.001	-0.001	-0.001	-0.002	-0.003	0.004	0.283	1.000		
Reproduction Rate	-0.029	0.001	0.003	0.003	0.000	0.001	0.000	0.001	0.002	0.003	-0.004	-0.419	-0.839	1.000	
ICU Patients per Million	0.017	-0.001	-0.002	-0.003	-0.000	-0.001	-0.001	-0.001	-0.002	-0.003	0.004	0.267	0.820	-0.869	1.000

Figure 29

Normality of residuals in the difference-in-differences analysis for Germany

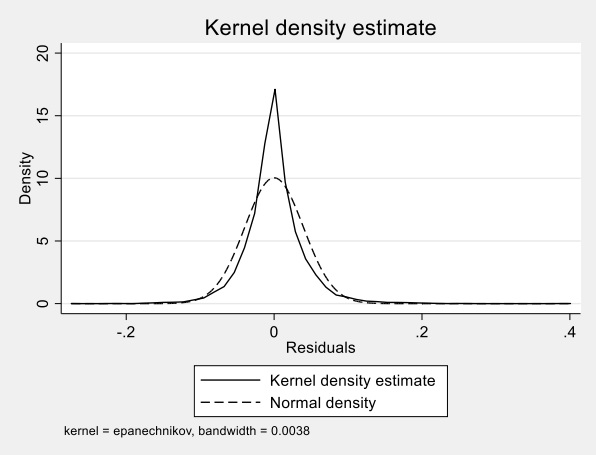


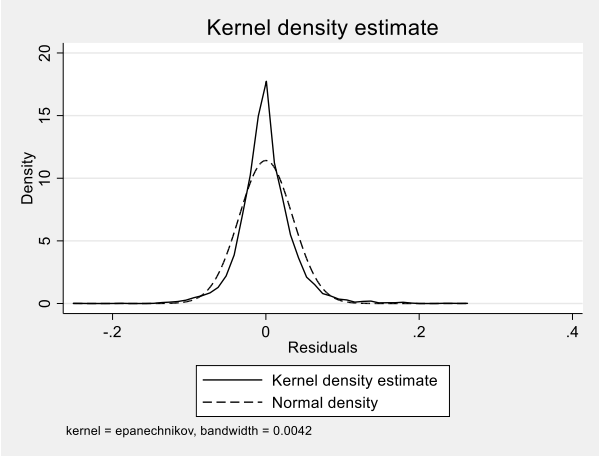
Table 42

Correlation table Italy for the difference-in-differences analysis

Variables	AR	Size treatment	Industry Code	ROIC (W)	Net Debt	Debt-to-Equity Ratio (W)	Market-to-Book Ratio (W)	EBIT	Interest Coverage Ratio (W)	Age	Quick Ratio (W)	Sick per M	Deaths per M	Reproduction Rate	ICU Patients per M
AR	1.000														
Size treatment	-0.019	1.000													
Industry Code	0.005	0.023	1.000												
ROIC (W)	-0.001	0.087	-0.201	1.000											
Net Debt	-0.014	0.231	0.112	0.001	1.000										
Debt-to-Equity Ratio (W)	-0.023	0.280	-0.111	0.161	0.362	1.000									
Market-to-Book Ratio (W)	0.019	-0.054	-0.206	0.288	-0.079	0.328	1.000								
EBIT	-0.009	0.240	0.055	0.054	0.750	0.186	-0.074	1.000							
Interest Coverage Ratio (W)	0.007	-0.361	-0.175	0.289	-0.145	-0.218	0.248	-0.109	1.000						
Age	-0.001	0.295	0.001	-0.115	0.100	0.018	-0.314	0.156	-0.174	1.000					
Quick Ratio (W)	0.011	0.070	-0.041	0.139	-0.089	-0.072	0.028	-0.075	0.201	0.073	1.000				
Sick per Million	0.105	-0.001	0.002	0.000	-0.000	-0.001	0.000	-0.000	0.003	-0.001	0.000	1.000			
Deaths per Million	0.097	-0.003	0.006	0.001	-0.001	-0.002	0.000	-0.001	0.009	-0.003	0.000	0.642	1.000		
Reproduction Rate	-0.097	0.005	-0.010	-0.002	0.001	0.003	-0.001	0.001	-0.015	0.006	-0.000	-0.476	-0.639	1.000	
ICU Patients per Million	0.084	-0.002	0.003	0.001	-0.000	-0.001	0.000	-0.000	0.004	-0.002	0.000	0.623	0.439	-0.394	1.000

Figure 30

Normality of residuals in the difference-in-differences analysis for Italy



7.9 Variable importance

Figure 32

Relative importance of each variable in the RF model for the Netherlands

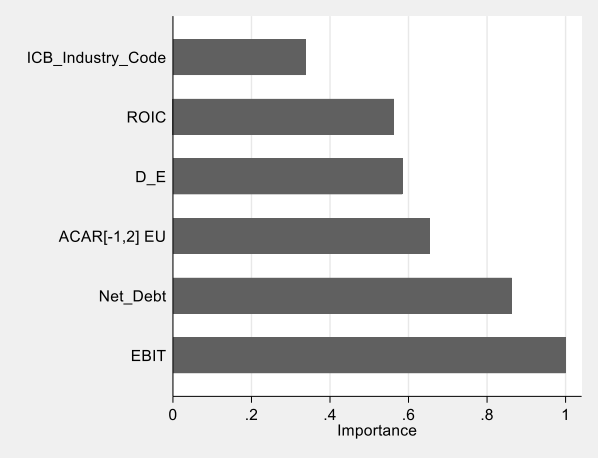


Figure 34

Relative importance of each variable in the RF model for France

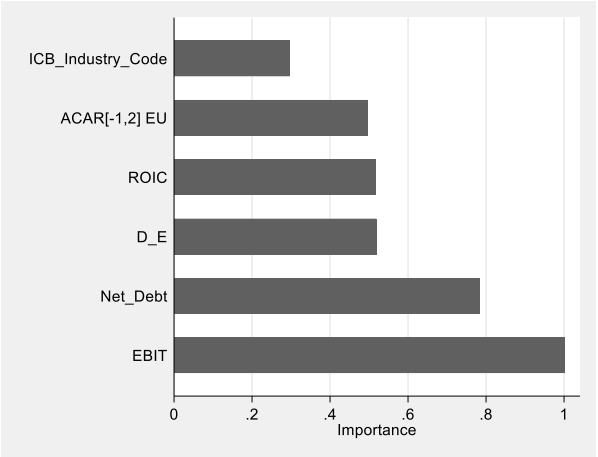


Figure 36

Relative importance of each variable in the RF model for Germany

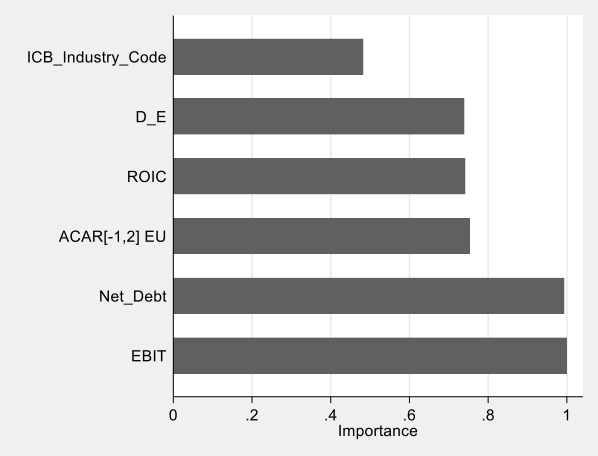
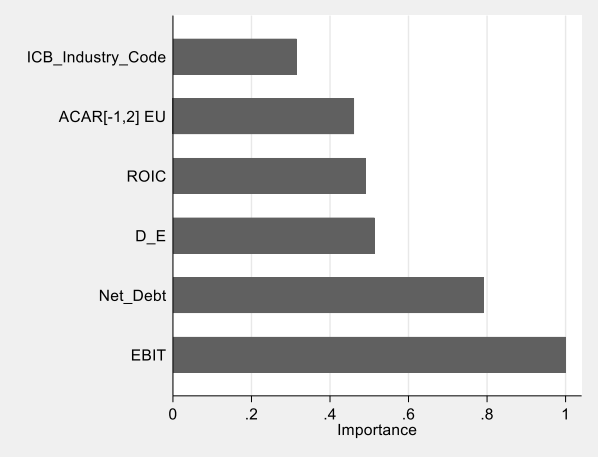


Figure 38

Relative importance of each variable in the RF model for Italy



7.10 Regression results

The Netherlands

Table 43

Regression analysis with liquidity for the Netherlands with ACAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	ACAR EU [-1,2]	ACAR EU [-7,0]	ACAR CO [-1,2]	ACAR CO [-7,0]
Constant	-0.039	0.006	-0.073**	-0.102*
	(-1.51)	(0.17)	(-2.17)	(-1.68)
Size Treatment	0.017	-0.004	-0.014	0.037
	(0.76)	(-0.19)	(0.46)	(0.73)
ROIC (W)	-0.021	-0.024	-0.045**	-0.096**
	(-1.18)	(-1.07)	(-2.47)	(-2.62)
Net Debt	-0.000	-0.000*	-0.000	0.000*
	(-1.55)	(-1.79)	(-0.84)	(-1.83)
Debt-to-Equity Ratio (W)	-0.000	-0.00003***	-0.000	0.000
	(-0.01)	(-4.59)	(-0.10)	(-0.08)
Market-to-Book Ratio (W)	-0.001	0.003*	-0.0002	0.000
	(-0.72)	(1.82)	(-0.14)	(-0.08)
EBIT	0.000**	0.00003**	0.00004*	0.000***
	(2.35)	(2.29)	(1.83)	(2.95)
Age	-0.001	0.001	0.0002	-0.001
	(-0.96)	(0.88)	(0.25)	(-0.61)
Quick Ratio	0.000	-0.001	0.003***	0.003**
	(-0.08)	(-0.94)	(3.58)	(2.33)
R2	0.276	0.280	0.273	0.333
Degrees of Freedom	78	78	78	78
Industry Fixed effects	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

Table 44

Regression analysis with liquidity for the Netherlands with CAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	CAR EU Event 1 [-1,2]	CAR EU Event 1 [-7,0]	CAR CO Event 2 [-1,2]	CAR CO Event 2 [-7,0]	CAR CO Event 3 [-1,2]	CAR CO Event 3 [-7,0]	CAR EU Event 4 [-1,2]	CAR EU Event 4 [-7,0]
Constant	-0.0525	-0.0766	-0.101	-0.0598	-0.0498	-0.144*	-0.0203	0.0885*
	(-0.90)	(-1.54)	(-1.69)	(-0.92)	(-0.71)	(-2.28)	(-0.76)	(2.31)
Size treatment	0.0376	0.0523	-0.00246	0.0551	-0.0208	0.0176	-0.00860	-0.0607*
	(0.86)	(1.67)	(-0.05)	(1.13)	(-0.70)	(0.32)	(-0.51)	(-2.01)
ROIC (W)	-0.0411	-0.0595	-0.0714*	-0.0941*	-0.0192	-0.0988*	-0.000932	0.0110
	(-1.20)	(-1.97)	(-2.47)	(-2.39)	(-1.02)	(-2.62)	(-0.04)	(0.31)
Net Debt	-5.28e-09	-1.25e-08*	-5.58e-09	-1.32e-08*	-2.42e-09	-1.25e-08	-3.38e-09	-1.27e-09
	(-0.91)	(-2.20)	(-0.68)	(-2.07)	(-0.47)	(-1.50)	(-1.12)	(-0.39)
Debt-to-Equity Ratio (W)	0.00000579	-0.00000614	0.00000431	-0.00000843	-0.00000639	0.00000316	-0.00000690	-0.0000574***
	(0.28)	(-0.28)	(0.22)	(-0.28)	(-0.49)	(0.10)	(-1.09)	(-4.72)
Market-to-Book Ratio (W)	-0.000565	0.00339	-0.00207	0.000747	0.00186	-0.00122	-0.00122	0.00246
	(-0.27)	(1.27)	(-1.09)	(0.24)	(1.61)	(-0.40)	(-1.14)	(1.37)
EBIT	0.0000544	0.0000553*	0.0000622	0.0000874**	0.0000138	0.000100*	0.0000121	0.0000144
	(1.86)	(2.56)	(1.67)	(2.94)	(0.61)	(2.61)	(0.88)	(0.92)
Age	-0.00106	0.000545	-0.000327	-0.00104	0.000917	-0.000640	-0.000189	0.000591
	(-0.92)	(0.63)	(-0.25)	(-0.82)	(1.03)	(-0.41)	(-0.37)	(0.65)
Quick Ratio	0.000525	0.000697	0.00444***	0.00246	0.00226	0.00448**	-0.000726	-0.00234
	(0.38)	(0.59)	(3.43)	(1.58)	(1.15)	(2.69)	(-0.87)	(-1.94)
R2	0.311	0.314	0.259	0.357	0.222	0.289	0.135	0.286
Degrees of Freedom	78	78	78	78	78	78	78	78
Industry Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

France

Table 45

Regression analysis France with liquidity with ACAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	ACAR EU [-1,2]	ACAR EU [-7,0]	ACAR CO [-1,2]	ACAR CO [-7,0]
Constant	-0.003	0.017	-0.031	0.005
	(-0.13)	(0.64)	(-1.31)	(0.18)
Size Treatment	0.008	-0.009	0.002	0.008
	(0.68)	(-0.61)	(0.23)	(0.49)
ROIC (W)	0.096*	0.101**	-0.011	0.059
	(1.74)	(2.43)	(-0.28)	(1.06)
Net Debt	0.000	-0.000***	-0.000	-0.000
	(0.23)	(-3.62)	(-1.60)	(-1.31)
Debt-to-Equity Ratio (W)	-0.00006	-0.00007	-0.000	-0.0001***
	(-1.04)	(-1.28)	(-0.14)	(-2.72)
Market-to-Book Ratio (W)	-0.00006	-0.001	0.0001	0.003
	(-0.03)	(-0.41)	(0.09)	(1.38)
EBIT	0.000	0.00001***	0.00001***	0.000
	(0.25)	(2.86)	(4.09)	(0.93)
Age	0.0003	-0.00006	-0.0002	0.001**
	(1.24)	(-0.21)	(-0.74)	(2.60)
Quick Ratio	0.0003	0.018**	0.001	0.0003
	(0.05)	(2.25)	(0.21)	(0.04)
R2	0.136	0.250	0.130	0.180
Degrees of Freedom	195	195	195	195
Industry Fixed effects	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

Table 46

Regression analysis with liquidity for France with CAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	CAR CO Event 1 [-1,2]]	CAR CO Event 1 [-7,0]	CAR EU Event 2 [-1,2]	CAR EU Event 2 [-7,0]	CAR CO Event 3 [-1,2]	CAR CO Event 3 [-7,0]	CAR EU Event 4 [-1,2]	CAR EU Event 4 [-7,0]
Constant	-0.0538*	-0.00729	-0.0793*	-0.0572	-0.00754	0.0172	0.0728**	0.0908**
	(-1.98)	(-0.24)	(-2.10)	(-1.49)	(-0.19)	(0.34)	(3.09)	(2.79)
Size treatment	0.0156	-0.0126	0.0256	0.0238	-0.0112	0.0279	-0.00867	-0.0422*
	(1.04)	(-0.92)	(1.23)	(1.10)	(-0.57)	(1.17)	(-0.67)	(-2.44)
ROIC (W)	0.0578	0.0242	0.153*	0.138*	-0.0792	0.0930	0.0380	0.0650
	(1.40)	(0.42)	(2.03)	(2.20)	(-1.05)	(1.22)	(0.74)	(1.05)
Net Debt	-2.07e-09	-2.91e-09	5.33e-10	-4.63e-09*	-1.54e-09	-1.10e-10	-5.62e-11	-3.40e-09**
	(-1.39)	(-1.60)	(0.30)	(-2.29)	(-1.00)	(-0.05)	(-0.07)	(-3.14)
Debt-to-Equity Ratio (W)	-0.0000322	-0.000127	-0.000138	-0.0000841	0.0000223	-0.000148	0.0000158	-0.0000609
	(-0.39)	(-1.35)	(-1.32)	(-0.74)	(0.26)	(-1.37)	(0.31)	(-0.92)
Market-to-Book Ratio (W)	0.0000183	0.00460	0.00203	0.000738	0.000194	0.00131	-0.00214	-0.00296
	(0.01)	(1.74)	(0.61)	(0.22)	(0.06)	(0.40)	(-1.36)	(-0.91)
EBIT	0.00000350	0.00000859	0.00000103	0.0000110	0.0000177**	-0.00000205	0.000000460	0.00000914**
	(0.74)	(1.80)	(0.17)	(1.67)	(3.23)	(-0.31)	(0.17)	(2.99)
Age	0.000506*	0.000274	0.00123**	0.000412	-0.000834*	0.000977*	-0.000624***	-0.000523
	(2.06)	(1.25)	(2.75)	(1.24)	(-2.19)	(2.18)	(-3.57)	(-1.71)
Quick Ratio	0.0121*	0.00433	0.0132	0.0110	-0.00988	-0.00364	-0.0126	0.0259
	(2.53)	(0.58)	(1.63)	(1.52)	(-1.00)	(-0.31)	(-1.97)	(1.80)
R2	0.179	0.177	0.212	0.198	0.119	0.207	0.109	0.264
Degrees of Freedom	195	195	195	195	195	195	195	195
Industry Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

Germany

Table 47

Regression analysis Germany with liquidity with ACAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	ACAR EU [-1,2]	ACAR EU [-7,0]	ACAR CO [-1,2]	ACAR CO [-7,0]
Constant	0.025	0.064**	-0.028	0.028
	(1.00)	(2.38)	(-1.22)	(0.98)
Size Treatment	0.003	-0.002	0.022*	0.012
	(0.24)	(-0.13)	(1.71)	(0.76)
ROIC (W)	-0.106*	-0.145	0.002	-0.160
	(-1.76)	(-1.44)	(0.04)	(-1.40)
Net Debt	0.000	-0.000	0.000***	0.000
	(0.77)	(-0.20)	(3.42)	(0.10)
Debt-to-Equity Ratio (W)	-0.00003	-0.00007	0.00006	0.000
	(-0.65)	(-1.19)	(1.21)	(-0.34)
Market-to-Book Ratio (W)	-0.0002	-0.00002	0.003**	-0.001
	(-0.20)	(-0.01)	(2.35)	(-0.24)
EBIT	0.000	0.000	0.000***	0.000
	(0.46)	(0.57)	(-3.02)	(0.38)
Age	0.0001	-0.001*	0.00001	0.000
	(0.23)	(-1.97)	(0.03)	(-0.36)
Quick Ratio	-0.001	-0.005	0.009*	0.001
	(-0.17)	(-0.91)	(1.82)	(0.11)
R2	0.100	0.225	0.176	0.117
Degrees of Freedom	179	179	179	179
Industry Fixed effects	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

Table 48

Regression analysis with liquidity for Germany with CAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	CAR EU Event 1 [-1,2]	CAR EU Event 1 [-7,0]	CAR CO Event 2 [-1,2]	CAR CO Event 2 [-7,0]	CAR CO Event 3 [-1,2]	CAR CO Event 3 [-7,0]	CAR EU Event 4 [-1,2]	CAR EU Event 4 [-7,0]
Constant	0.0865*	0.0303	-0.0603	0.0786	-0.0210	0.00630	0.0141	0.0797***
	(2.10)	(0.81)	(-1.64)	(1.67)	(-0.85)	(0.20)	(0.86)	(3.57)
Size treatment	0.0211	-0.0154	-0.0115	0.0202	-0.00856	0.0247	0.0336	-0.0111
	(0.95)	(-0.64)	(-0.56)	(0.78)	(-0.59)	(1.28)	(1.81)	(-0.60)
ROIC (W)	-0.168	0.0368	-0.0768	-0.280	0.0540	-0.292***	-0.0123	-0.0642
	(-1.84)	(0.25)	(-0.80)	(-1.55)	(0.73)	(-3.40)	(-0.28)	(-0.87)
Net Debt	9.19e-12	2.20e-10	8.88e-10**	-4.48e-10	4.92e-10*	2.23e-10	2.48e-10	-4.46e-11
	(0.02)	(0.52)	(2.81)	(-0.67)	(1.99)	(0.51)	(0.70)	(-0.16)
Debt-to-Equity Ratio (W)	-0.000134	-0.0000746	0.000125	-0.000150	0.0000806	0.0000293	-0.00000840	-0.00000894
	(-1.41)	(-0.85)	(1.23)	(-1.17)	(1.78)	(0.39)	(-0.24)	(-0.20)
Market-to-Book Ratio (W)	-0.00115	-0.00718	0.00486*	0.000209	0.00103	0.00438	-0.0000375	0.000757
	(-0.50)	(-1.92)	(2.14)	(0.05)	(0.61)	(1.95)	(-0.03)	(0.42)
EBIT	0.00000152	0.00000402	-0.00000490	0.00000403	-0.00000559*	-0.00000362	-0.00000282	0.000000818
	(0.39)	(0.98)	(-1.49)	(0.73)	(-2.49)	(-0.97)	(-0.95)	(0.31)
Age	-0.000556	-0.000325	0.000664	-0.000461	0.000962*	0.000106	-0.000601	-0.00146**
	(-0.76)	(-0.46)	(1.07)	(-0.53)	(2.19)	(0.18)	(-1.27)	(-2.81)
Quick Ratio	-0.00600	-0.000978	0.0113	-0.00791	0.00967*	0.00461	-0.00146	-0.00746
	(-0.92)	(-0.11)	(1.83)	(-0.98)	(2.12)	(0.65)	(-0.38)	(-1.56)
R2	0.222	0.171	0.157	0.208	0.144	0.205	0.132	0.162
Degrees of Freedom	179	179	179	179	179	179	179	179
Industry Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

Italy

Table 49

Regression analysis Italy with liquidity with ACAR as the dependent variable with industry fixed effects. EU stand for European Union and CO for Country measure.s

	ACAR EU [-1,2]	ACAR EU [-7,0]	ACAR CO [-1,2]	ACAR CO [-7,0]
Constant	-0.058*	-0.024	0.005	-0.048
	(-1.98)	(-0.57)	(0.17)	(-1.38)
Size Treatment	0.003	0.019	0.018	0.006
	(0.17)	(0.90)	(1.00)	(0.28)
ROIC (W)	0.001	-0.006	-0.006	0.055
	(0.02)	(-0.13)	(-0.15)	(1.11)
Net Debt	0.000	-0.000	0.000	-0.000
	(1.12)	(-1.33)	(0.88)	(-1.34)
Debt-to-Equity Ratio (W)	-0.000	-0.0001	-0.0004	-0.0001
	(-0.43)	(-1.30)	(-0.48)	(-0.91)
Market-to-Book Ratio (W)	0.003*	0.007***	0.0002	0.003
	(1.83)	(3.21)	(0.10)	(1.46)
EBIT	-0.000	0.000	-0.000	0.0001*
	(-1.36)	(0.54)	(-1.65)	(1.72)
Age	0.00001	-0.0001	0.0001	0.0003
	(0.03)	(-0.14)	(0.17)	(0.34)
Quick Ratio	0.008	0.001	-0.004	0.012
	(0.74)	(0.04)	(-0.32)	(0.93)
R2	0.113	0.199	0.056	0.188
Degrees of Freedom	108	108	108	108
Industry Fixed effects	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

Table 50

Regression analysis with liquidity for Italy with CAR as the dependent variable and industry fixed effects. EU stand for European Union and CO for Country measures.

	CAR EU	CAR EU	CAR CO	CAR CO	CAR CO	CAR CO	CAR EU	CAR EU
	Event 1	Event 1	Event 2	Event 2	Event 3	Event 3	Event 4	Event 4
	[-1,2]	[-7,0]	[-1,2]	[-7,0]	[-1,2]	[-7,0]	[-1,2]	[-7,0]
Constant	-0.0839	-0.138*	-0.0569	-0.143*	0.0451	0.0644	-0.0108	0.0726
	(-1.77)	(-2.35)	(-0.91)	(-2.29)	(1.92)	(1.67)	(-0.50)	(1.86)
Size treatment	0.00980	0.0384	0.0340	0.0283	0.00143	-0.00958	-0.00317	-0.00673
	(0.36)	(1.25)	(1.11)	(0.76)	(0.08)	(-0.39)	(-0.24)	(-0.32)
ROIC (W)	0.00607	0.0376	-0.0413	-0.0201	0.0126	0.104**	0.0106	-0.0268
	(0.06)	(0.49)	(-0.43)	(-0.18)	(0.69)	(3.03)	(0.46)	(-0.73)
Net Debt	-9.08e-11	-4.37e-09*	6.50e-09*	-2.66e-09	-8.03e-11	-1.22e-10	2.90e-10	-1.84e-10
	(-0.04)	(-2.06)	(2.01)	(-0.90)	(-0.06)	(-0.05)	(0.29)	(-0.10)
Debt-to-Equity Ratio (W)	-0.0000673	-0.000218*	-0.0000828	-0.000171	-0.000000389	0.0000220	0.0000106	0.0000272
	(-0.70)	(-2.59)	(-0.66)	(-1.34)	(-0.00)	(0.21)	(0.28)	(0.32)
Market-to-Book Ratio (W)	0.00589	0.00939**	0.00163	0.0103*	-0.00190	-0.00616*	0.00118	0.00590
	(1.77)	(3.12)	(0.50)	(2.57)	(-1.18)	(-2.17)	(1.00)	(1.91)
EBIT	-0.000000127	0.0000242*	-0.0000313**	0.0000120	-0.00000224	-0.000000893	-0.000000658	-0.00000742
	(-0.02)	(2.49)	(-2.71)	(1.11)	(-0.45)	(-0.11)	(-0.16)	(-1.17)
Age	-0.0000353	0.0000325	0.000832	0.000395	-0.000332	-0.0000928	-0.000208	-0.00000185
	(-0.03)	(0.03)	(0.71)	(0.26)	(-0.98)	(-0.15)	(-0.43)	(-0.00)
Quick Ratio	0.0123	0.0294	0.000629	0.0176	-0.00509	-0.000661	0.000193	-0.0205
	(0.76)	(1.44)	(0.03)	(0.77)	(-0.51)	(-0.05)	(0.02)	(-1.59)
R2	0.075	0.226	0.187	0.156	0.145	0.234	0.059	0.205
Degrees of Freedom	108	108	108	108	108	108	108	108
Industry Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01.*
Coefficients of 0.000 are not 0 but so small that they are denoted as 0.000 at three decimals.
t statistics in parentheses.

7.11 Difference-in-differences results

Table 51

Difference-in-difference analysis for the Netherlands with AR as the dependent variable and Size treatment, industry fixed effects and control variables as the explanatory variables.

	Coefficient
Constant	0.0000933
	(0.03)
Size Treatment	0.00207
	(0.64)
Post	0.00408
	(1.38)
Size Treatment x Post	-0.00425
	(-1.23)
ROIC (W)	-0.00192*
	(-2.17)
Net Debt	-5.13e-10**
	(-3.02)
Debt-to-Equity Ratio (W)	-0.00000203**
	(-2.81)
Market-to-Book Ratio (W)	0.00000235**
	(2.94)
EBIT	0.000144*
	(2.22)
Age	0.0000227
	(0.78)
Quick Ratio (W)	-0.000116*
	(-2.15)
Sick per Million	0.000000112*
	(2.34)
Deaths per Million	0.000000826*
	(2.35)
Reproduction Rate	-0.00343***
	(-4.67)
R2	0.016
Degrees of Freedom	22
Number of observations	3555

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01*

Table 52

Difference-in-difference analysis for France with AR as the dependent variable and Size treatment, industry fixed effects and control variables as the explanatory variables.

	Coefficient
Constant	0.0836*
	(2.11)
Size Treatment	-0.00363*
	(-2.00)
Post	-0.0161***
	(-5.00)
Size Treatment x Post	0.00680**
	(3.10)
ROIC (W)	-0.00114
	(-0.33)
Net Debt	-2.11e-10
	(-1.88)
Debt-to-Equity Ratio (W)	-0.0000115**
	(-2.93)
Market-to-Book Ratio (W)	0.000412*
	(2.35)
EBIT	0.000000866**
	(3.29)
Age	0.0000344
	(1.73)
Quick Ratio (W)	0.0000692
	(0.10)
Sick per Million	-0.000000716
	(-1.26)
Deaths per Million	-0.00000294
	(-1.07)
Reproduction Rate	-0.0268*
	(-2.01)
R2	0.016
Degrees of Freedom	24
Number of observations	4000

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01*

Table 53

Difference-in-difference analysis for Germany with AR as the dependent variable and Size treatment, industry fixed effects and control variables as the explanatory variables.

	Coefficient
Constant	0.0162***
	(4.70)
Size Treatment	-0.000196
	(-0.09)
Post	-0.00336
	(-1.78)
Size Treatment x Post	-0.000363
	(-0.16)
ROIC (W)	-0.0147***
	(-4.43)
Net Debt	-1.13e-11
	(-1.19)
Debt-to-Equity Ratio (W)	-0.00000255
	(-0.95)
Market-to-Book Ratio (W)	0.000000126
	(1.09)
EBIT	0.000120
	(1.89)
Age	-0.0000747*
	(-2.55)
Quick Ratio (W)	-0.00000414
	(-0.02)
Sick per Million	2.91e-08
	(1.81)
Deaths per Million	-0.000000902*
	(-1.98)
Reproduction Rate	-0.00399***
	(-3.56)
R2	0.0052
Degrees of Freedom	24
Number of observations	8792

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01*

Table 54

Difference-in-difference analysis for Italy with AR as the dependent variable and Size treatment, industry fixed effects and control variables as the explanatory variables.

	Coefficient
Constant	-0.0142*
	(-2.31)
Size Treatment	-0.000330
	(-0.12)
Post	0.0109*
	(2.22)
Size Treatment x Post	-0.000278
	(-0.09)
ROIC (W)	-0.000774
	(-0.25)
Net Debt	-5.34e-11
	(-0.85)
Debt-to-Equity Ratio (W)	-0.00000544
	(-1.48)
Market-to-Book Ratio (W)	0.000306***
	(3.52)
EBIT	0.000000239
	(1.08)
Age	0.0000238
	(0.59)
Quick Ratio (W)	0.000551
	(0.84)
Sick per Million	2.31e-08
	(0.69)
Deaths per Million	0.000000237
	(1.51)
Reproduction Rate	0.00174
	(0.81)
R2	0.019
Degrees of Freedom	22
Number of observations	5321

*Note: * p-value < 0.10 ** p-value < 0.05 *** p-value < 0.01*

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