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Coronavirus crisis effect on market returns, per sector and size

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The following paper explores the effect of the Covid-19 crisis on the returns of the U.S. Sector and Size indices. The analysis includes OLS models and an event study and utilizes daily return data from January 1st 2020 until May the 15th 2020. The epidemiological variables measuring the new Covid-19 deaths and total deaths per day were found to be insignificant for all indices. Only the market sentiments control had a significant effect on the returns of the indices. The second analysis is an event study, that shows that there were no abnormal returns for any sector or size index on the day of the first case of Covid-19 in the U.S. It also shows that on U.S. Federal Reserve announcements the indices (sectors and size) that did poorly over the period of interest had significant positive abnormal returns, which then reverted to negative abnormal returns over the next few days. The exact opposite was found for the indices that performed relatively well during the same period.

Preface

I would like to thank Dr. Tim Eisert for all the help and advice he provided throughout the process of the writing of the thesis. His guidance was invaluable from the conception phase throughout the whole four months of writing. I would also like to thank my friends and family for inspiring me through these uncertain times.

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1 Introduction

During the first quarter of 2020, the world faced a global pandemic. This world- wide health crisis later became a financial one, with the Dow Jones Industrial Average index experiencing its biggest plunge in a single day ever on the 16th of March (CNBC, 2020). The crisis also caused a liquidity problem for both consumers and small and medium capitalization companies, and investors started avoiding those types of investments. The stock market was severely affected during this health crisis with it being the main daily trading driver and volatility reaching or surpassing the levels of the great depression, the great recession, or Black Monday (Baker et al., 2020). Conversely, there has been a stark difference in the way each sector has been hit, Energy and Industrials being hit the worst while Communications were the least affected as shown by Fernandes (2020).

The aim of this paper is to analyze the stock market movement of U.S. sector and capitalization indices during the first four and a half months of the crisis to see if the effect varied depending on the variable of interest. With the U.S..A. being the country with the most cases in the world and being the biggest economy, it is interesting to investigate how its stock market reacted on key announcements such as the first confirmed case, the federal funds rate reductions, and the employment of government loans. The different sectors and market capitalizations will be investigated by analyzing the returns of the corresponding Standard & Poor's indices. This leads to the following main research question:

What is the effect of the Coronavirus crisis on equity market returns, per sector and size?

The Covid-19 crisis also leads to a reduction in consumption because of the policy of social distancing but also, the economy further faces a negative supply shock fueled by shutdowns, layoffs, and firm exits (Guerrieri et al., 2020). The social distancing also affected the global economy by the unemployment it caused, which in turn increased the economic costs non-linearly, which would imply there will not be a fast ”V-shaped’ market recovery (Bodenstein et al., 2020). This prolonged effect would imply that in the relevant period most sectors will face a

downward trend, if unless there is enough policy intervention for investors to regain their trust in the U.S. stock market.

The fact that the different sectors of the market will be affected to a different extent can be explained rationally. The health policies of travel banning, and social distancing overall affected the industries and the sectors unequally. Nonetheless, it is important to note that because of the lack of consumer spending all industries are affected. With most people working from home, it is clear why Communications Service and Information Technologies managed to go back to their initial prices in only four months. Conversely, with almost no traveling, the Energy sector went down almost 40% during the same period. However, the effect is not as clear for some of the other sectors, thereby the investigation of all those price movements is quite relevant, especially on the dates when fiscal policy was announced.

Small capitalization companies, on average, have higher growth potential than their large cap counterparts, nonetheless they are usually much riskier and possess lower liquidity (Fama and French, 1992). On average, the small caps have outperformed the large caps, but during the coronavirus crisis investors have become much more risk averse. The stock market was affected by the global health crisis and investors were affected by the so-called Covid uncertainty (Baker et al., 2020). Investors started valuing liquidity and became even more risk-averse, therefore, both small and medium capitalization equities were more affected during the crisis.

The equity index data is collected directly from the Standard and Poor's website, while the disease data is collected from the U.S. Center of Disease Control and Prevention. This paper is divided in several sections analyzing stock price movements. The first part is focused on the relationship between sector index returns and epidemiological variables, such as the new coronavirus cases and total coronavirus deaths, that are used as a measure of the development of the disease on the domestic level. The second part is similar to the first, but the variables of interest are the returns of capitalization indices. The third and fourth parts are event studies where the methodology advice of MacKinley (1997) was incorporated and the price of the stock is compared to estimation based on a market model, which is forecasted using data from the past 240 days. The first event study concerns the price movements of the Global Industry Classification

Standard (GICS) sector indices regarding crucial government announcements. The second event study is focused on the returns of the capitalization indices around the same announcements.

The testing carried out in this paper delivers the following results. For the first two hypotheses, there is no significance of the epidemiological variables (new cases and total death) in the ordinary least-squares (OLS) regression once relevant macroeconomic control variables are added. For all indices, the variable that measures market sentiments was found significant. Simultaneously, the exchange rate between the Yuan and the Dollar was not found to be significant for any of the indices. The carried-out event study found that none of the indices had significant abnormal returns on the day of the first case of Covid-19 in the U.S.A. Fundamentally, the sectors that had the largest negative returns for the relevant period had significant positive abnormal reactions on the days of government announcements concerning fiscal policy. In the next few days, significant abnormal negative returns were observed for the same sectors. The exact opposite is true for the sectors that had positive returns, they observed small negative abnormal returns on the day of the Federal Reserve (Fed) announcements, that were later compensated by significant positive abnormal returns in the following days. This exact behavior was also observed with the size indices.

The paper has the following structure. The second section consists of the literature review that contains the relevant topics and papers used for the research. Afterwards, the theoretical framework links said literature to the hypotheses that are tested. The next two sections represent the data and methodology explaining in detail the statistical methods employed for the analysis. The final sections are the results, in which the results of the analysis are presented, the discussion, where said results are commented upon, and the conclusion.

2 Literature review

2.1 The overall effect of the coronavirus crisis on the stock market and economy

The economic literature concerning the Covid-19 economic and financial effects is quite limited as the event itself is recent and skewed towards the effect of daily new cases on economic conditions. Nonetheless, because the topic is so relevant to our current way of living, there is a constant flow of new contemporary research concerning the economic effects of the Covid-19 crisis. On the other hand, there is past research concerning the sectoral effects of past economic crises. Historical research has found that no sectors are immune to negative economic shocks, but there is a significant difference in the magnitude of the effect. Therefore, the literature used in the paper will be a mixture of well-established, foundational, and seminal past research as well as contemporary and modern research.

In the last months, the economic effect of the current coronavirus crisis has been the topic of several research studies. The concept of Keynesian supply shocks (meaning supply shocks that exacerbate their effect through the reduction of aggregate demand) has been used to partially explain said effects (Guerrieri et al., 2020). The authors prove that these shocks are possible only in a multi-sector economy and that firm exit and job destruction further exacerbate these negative effects. Subsequently and resultantly, sectors that were initially unaffected by the supply shock can also suffer from unemployment and drop of output. Other papers such as (Bodenstein et al. , 2020) also discuss and analyze the direct (negative impact on the labor force) and indirect (the effect that the malfunctioning spreads over to other unaffected industries) effects of the disease from the supply side. The paper also concludes that the effect would move non-linearly and consequently the negative change will increase with time.

Zhang et al. (2020) found that Covid-19 had a significant impact on the stock market. The authors concluded that the severity of the spread of the disease in a country was correlated with the volatility of the stock market in each country. The increased risk caused a lot of investors to suffer big losses in a short amount of time. The research also conjectured that government policy such as the Federal Reserve's quantitative easing, only increased risk, and market volatility.

When it comes to the stock markets' reaction to COVID-19 cases and fatalities, Ashraf (2020) inquires deep into that topic. The paper uses data from 64 countries over the period of 22 January 2020 until 17 April 2020 to research the factors of the magnitude of the market reaction, and the number of new cases of infections or number of fatalities (deaths). The findings conclude that the market returns declined more in the early days of the infection, and that the reaction was stronger based on the number of new cases rather than the number of fatalities. The second relationship was further deemed insignificant. Ashraf (2020) also concludes that investors overall responded quickly to the health crisis, but this response varied depending on the stage of the crisis.

Ozili and Arun (2020) inquire deep into the spillover effects of the Covid-19 on the world economy. They find that the virus stifled economic activities through social distancing and the increased uncertainty because of the exponential growth of cases. They further conjectured that the number of lockdown days and the monetary policy influenced economic activity, while the number of confirmed new cases was deemed insignificant. Fiscal policy spending had a strong positive effect on economic activity.

Rameli and Wagner (2020) inquire into the manner in which investors valued the consequences of the Covid-19 crisis for individual companies. The research shows that the global health crisis became an economic one extrapolated through the financial channels. Exploring a truly exogenous shock such as a health crisis offers a unique cleaner perspective, compared to other financial or political shocks The paper also researches the way investors value specific firm characteristics during the Covid-19 crisis, especially exposure of U.S. firms to China, as well as cash holdings. An interesting finding of this study is that corporate meetings rarely discussed the event in January when the first case hit the U.S.A., but the disease was the topic of all corporate discussions by the end of March.

Baker et al. (2020) explore the economic uncertainty caused by the coronavirus disease. The paper shows that no previous infectious disease has ever impacted the stock market as much as Covid-19. The most interesting find of the study is that the Covid-19 crisis has been the main driver of the daily movements of the U.S. stock market. Uncertainty is being measured by stock

market volatility, news-paper-based economic uncertainty, and business-expectation surveys. The results find a possible 20% contraction of the economy until the last quarter of 2020 in a 90% confidence interval. This study shows the stark negative effect on the economy caused by the coronavirus uncertainty.

2.2 The effect of Financial crises crisis on the stock market and economy per sector

There has been evidence that the extent to which sectors are hit during a crisis varies, such as Lim (2008), which explores the Asian financial crisis, and Baur (2012) that inquires deep into the global financial crisis of 2007-2009. The latter explores the contagion effect of the financial sector during the global financial crisis. The paper finds that there was a contagion between countries but also between sectors as the crisis moved from the financial to the real sectors. The study proves that no sectors are immune to the adverse effects of a crisis, but some sectors are definitely better off. Sectors such as Healthcare, Telecommunications and Technology were significantly less affected than the Energy and Industrials sectors, which were the worst off.

Fernandes (2020) explores the economic effects of the Covid-19 outbreak on the world economy. The paper finds a potential 15% decrease in the GDP of some countries and further significantly, that the service-based economies such as Greece and Spain are bound to have a steeper decline. The main finding of interest in the paper is the asymmetric impact across sectors. The Energy sector was found to be affected the most, while the Media and Communications sector was the least affected. Another relevant finding is the policy suggestion that governments should help small and medium capitalization firms with their liquidity problems. The latter finding shows the potential of an equity size effect when it comes to the crisis.

Miyajima and Yafeh (2007) investigate the returns of companies in the Japanese market during the late 90's crisis. They found out that the companies that are the most sensitive to the banking crisis were the ones with the small, low-tech companies that were credit constrained. The authors further conjectured that some industries such as Electronics and Precision instruments fared much better than others like Real estate and Construction. Fundamentally, research and development-heavy industries were not affected as much by the banking crisis. The conclusion of the event study is that the effect of the banking crisis on companies was far from homogenous.

2.3 The effect of financial crises on the stock market and economy per firm size

Past research has theorized that risk premia comes from the possibility of endogenous shocks in the form of social, economic, or environmental disasters. Gabaix (2012) provides a framework where the premium is explained as a compensation for the risk that the asset will lose its fundamental value. In this framework these type of events is seen as a natural part of the business cycle, and its proponents claim that it solves several puzzles such as the equity premium puzzle. Furthermore, Koijen et al. (2017) show that value stocks have larger exposure to economic downturns because their cashflows are more sensitive to the business cycle. This is also consistent with the findings of Zhang (2005), where he shows the countercyclical price of risk, as in bad times risk is relatively expensive. Thus, value firms become especially riskier during economic downturns. The idea of countercyclical size risk premia is also proven in papers such as Gomes et al. (2003). The seminal paper and foundation of this research is in a lot of cases Fama and French (1992), as size is one of the factors in the presented three-factor empirical asset pricing model.

Other research has specifically focused on small capitalization equities as they have on average outperformed larger caps when they are held for long periods of time (Fama and French, 1992). Kim and Burnie (2002) use stock returns data from 1976 until 1995 and demonstrate how size effects are driven by the economic cycle. The authors outline how small capitalization stocks tend to outperform larger capitalization equities during economic peaks, but do not find significant evidence that the opposite is true during economic downturns. Nonetheless, the authors admit that smaller caps are more vulnerable to negative shocks as they have high financial leverage.

3 Theoretical framework

As it was discussed in the previous section, the coronavirus health crisis triggered a financial crisis. Past literature has used the number of new cases and new deaths to relate these epidemiological variables to stock market performance. Some research articles such as Ashraf (2020) and Zhang et al. (2020) conjectured that the epidemiological variables having a significant effect, while others only found macroeconomic variables and market sentiments significant (Ozili and Arun, 2020).

As it was shown in the previous section, past literature has provided evidence that during times of financial crisis different sectors have distinct reactions. Lim (2008) has provided evidence for this phenomenon during the Asian crisis, while Miyajima and Yafeh (2007) empirically prove that for the Japanese banking crisis. Baur (2012) has shown how some sectors were better off than other during the global financial crisis of 2007-2009. On the other hand, Fernandes (2020) has demonstrated that this asymmetric reaction across sectors also happened across the world for the Covid-19 crisis. Using the epidemiological variables as a measure of the progression of the health crisis, the following sub-question and hypothesis are formed:

Q1: What is the relationship between the coronavirus cases and deaths, and the stock returns of US firms from different sectors measured by the Global Industry Classification Standard (GICS)?

Other papers have provided solid evidence that economic downturns affect smaller companies that are credit constrained. The phenomenon led to the development of the idea that risk premia (meaning smaller companies that usually have higher returns than large ones, during good economic conditions) can be considered a compensation for the possibility of a disaster represented by an exogenous shock (Gabaix, 2012). Other papers have such as Kim and Burnie (2002) have showed that smaller stocks tend to outperform larger ones during economic peaks, but they do not find substantial evidence that the opposite is true during economic downturns. Nonetheless, Kim and Burnie (2002) admit that smaller caps are more vulnerable to negative shocks because of their high financial leverage, a claim that papers on the Covid-19 crisis such as Baker et al. (2020) and Fernandes (2020) have also presented. Repeatedly, using the spread of

the disease in the USA as a measure of progression of the crisis, the following sub-question is formed:

Q2: What is the relationship between the coronavirus cases and deaths, and the stock returns of US firms of different sizes measured by their market capitalization?

As seen in the literature review, many past research articles have been concerned with the effect of government policy on the stock market at sectoral and size level during times of economic downturn. Nevertheless, the results are not as clear as they might seem and can be contradictory. Some papers like Zhang et al. (2020) show that fiscal policy like the Federal Reserve's quantitative easing only increased risk and thus volatility on the market. Others, like Ozili and Arun (2020) found that both fiscal and monetary policy had significant positive effects on economic activity. Furthermore, the negative spillover effects mentioned by Baur (2012) could be lessened by adequate government policy while Fernandes (2012) suggests that the government should aid small and medium capitalization companies with their liquidity problems. In combination with the previously mentioned sectoral and size differences in market reaction, this leads to the formulation on the subsequent two sub-questions respective to each one:

Q3: Did the effect of key government coronavirus-related announcements on US stock returns differ by sector?

Q4: Did the effect of key government coronavirus-related announcements on US stock returns differ by size?

4 Data

The analysis of the following paper incorporates data from various reputable sources regarding the United States of America. The data is at a daily frequency and is divided in the several categories such as: Sector index returns, Change in sector index volume, Size index return, new Covid-19 cases, new Covid-19 deaths, total number of Covid-19 cases, total number of Covid-19 deaths and macroeconomic control variables. For the event study part of the paper, the dates are chosen based on the data from the Federal Reserve's history database.

4.1 Global Industry Classification Standard (GICS) sector indices

The chosen indices to measure sector performance are based on the Global Industry Classification Standard (GICS) developed by Standard and Poor's. They divide the economy in eleven sectors, namely: Energy, Materials, Industrials, Consumer Discretionary, Health care, Consumer Staples, Information Technology, Financials, Telecommunication Services, Real Estate, and Utilities. The data is collected from the official website of Standard and Poor's. The variables concerning these indices are daily close price and daily volume. From them, the daily returns and daily change in volume were obtained, whereas the method is further specified in the methodology section.

Table 4.1 (Appendix) shows the descriptive statistics of the GICS sector indices returns data for the relevant period. The table shows summarized descriptive data such as mean, standard deviation, variance, skewness, and kurtosis. Additionally, a correlogram between the sector returns has been provided in Table 4.2 in the Appendix. The lowest correlation is between the returns of the Energy and Utilities indices (0.64), while the highest is between the Communication and Technology indices (0.97). Nonetheless, there is no threat of multicollinearity because the returns of two different sectors are not used in the same regression. It is also interesting to look at which sector performed the best during the research period, and Table 4.3 (see below) demonstrates exactly that.

***Table 4.3 Sector returns form 1 January 2020 until 15 May 2020**.*

Sector Index	Period Return
Technology	0.022
Health Care	-0.013
Communication	-0.044
Consumer Discretionary	-0.077
Consumer Staples	-0.087
Utilities	-0.148
Materials	-0.169
Real Estate	-0.197
Industrials	-0.267
Financials	-0.313
Energy	-0.393

4.2 Capitalization indices data

The data of the capitalization indices is once again retrieved from the website of standard and Poor's. In total, 5 indices were chosen: S&P 500, S&P400, S&P 600, S&P 1500, and the Dow Jones Total Micro-cap index. The S&P 500 requires a market capitalization greater than 8.2 billion U.S. dollars, while S&P 400 is the mid-cap index that includes companies with capitalization between 2.4 billion and 8.2 billion U.S. dollars. The S&P 600 is a small-cap index that requires a capitalization between 600 million and 2.4 billion U.S. dollars. Furthermore, the S&P 1500 is a composite index combining the previous three, which will be used as an estimate of the U.S. economy. Lastly, the Dow Jones Total Micro-cap index has a mean capitalization of 150 million U.S. dollars.

Table 4.4 (Appendix) shows the descriptive statistics of capitalization indices returns data for the relevant period. The table shows summarized descriptive data such as mean, standard deviation, variance, skewness, and kurtosis. Additionally, a correlogram between the capitalization index returns has been provided in Table 4.5 in the Appendix. The lowest correlation is between the micro and the large index. The returns over the relevant period are presented in Table 4.6 (see below)

Table 4.6 Size index returns from 1 January 2020 until 15 May 2020.

Index	Period Return
Dow Jones Micro-cap	-0.352
S&P 600	-0.302
S&P 400	-0.235
S&P 500	-0.114

4.3 Epidemiological data on the number of US coronavirus-related cases and deaths

The epidemiological data such as the number of daily new cases and the number of daily new deaths for the relevant period are taken from the Center of Disease Control and Prevention (CDC). The cumulative variables of total cases and total deaths until that moment in time are calculated from the previous two variables.

Table 4.7 shows the descriptive statistics of the epidemiological data for the relevant period. The table shows summarized descriptive data such as mean, standard deviation, variance, skewness, and kurtosis. Additionally, a correlogram between the 4 variables has been provided in table 4.8 in the Appendix. After doing several tests for multicollinearity explained in the methodology section, the two variables of choice are the number of new daily cases and the number of total cumulative deaths.

4.4 Macroeconomic control variables

Several macroeconomic variables were acquired from the Federal Reserve Economic Data (FRED). The chosen variables of interest are the federal funds rate, the yuan/US dollar exchange rate, the daily return of the CBOE Volatility Index (VIX), and the daily percentage change in trading volume.

The federal funds rate represents the target interest rate at which commercial banks lend and borrow their excess reserves to another overnight. It is set by the Federal Open Market Committee (FOMC), the monetary policy-making entity of the Federal Reserve, which gathers eight times per year to determine the federal funds rate. The federal funds rate is an important

macroeconomic variable and is the main way of the Federal Reserve to counteract economic shocks (Thornton, 1998). It can also be viewed as a proxy for the interest rates in the country as the two variables are inherently connected.

The foreign exchange rate variable of the yuan/U.S. dollar exchange rate provides key information on foreign trade, associated risk, and trade. China is one of the most important and crucial trade partners of the U.S.A., and the United States had travel bans to China during relevant period. Additionally, there has been significant tension between the Presidents of the U.S.A. and China, the latter being the country where the coronavirus was said to originate from (Business Insider, 2020).

The Volatility Index (VIX) created by the Chicago Board Operation Exchange (CBOE) is an index that represents the market's expectation of 30-day forward-looking volatility and is comprised from the price of the S&P 500 index options. In this paper, it is utilized as a measure of market risk and investor sentiments (Fernandes et al., 2014). A further measure of investor sentiment is the trading volume, which this paper analyses as the daily percentage change in volume.

4.5 Event study dates and related relevant announcements

This paper analyses and explores 5 main and crucial events regarding the U.S. government's response to the coronavirus crisis. The first event is the day of the first confirmed case in the USA on 21st of January 2020. The second event occurred on 28th of February 2020 and represents the Federal Reserve's announcement that it will be closely monitoring the U.S. coronavirus situation, as the US stock market had its largest single week decline since 2008. The Fed further elaborated that it would use all possible tools to return the economic activity back to normal if it is necessary. The third event concerns the Federal Open Market Committee (FOMC) holding an unscheduled meeting on 3rd of March 2020 after which it decreased the federal funds rate by 50 basis points. The fourth examined event occurred on 23rd of March 2020, where the Federal Reserve announced that it will use its full set of tools to support the economy. This included expansion of the previous lending programs, and 300 billion U.S. dollars of new financing to businesses and consumers. The final fifth events happened on 9th of April 2020 where the Federal Reserve announced that it will provide an additional 2.3 trillion U.S. dollars in new loans.

5 Methodology

5.1 Ordinary least-squares regression (OLS)

For the first 2 hypotheses of this research, an ordinary least-squares (OLS) will be the method of analysis whilst employing white standard errors. The robust standard errors are a necessary addition as the descriptive statistics showed minor problems with normality, heteroskedasticity, and skewness in the previous section. To ensure the quality of the OLS, two additional regression diagnostic tests have been done. The first is a post-regression diagnostic test called the Ramsey RESET test to test for omitted variable bias, namely when a statistical model excludes one or more relevant explanatory variables. A second post-regression diagnostic test is the variance inflation factor (VIF) test for multicollinearity, which is that an explanatory variable in a multiple regression model can be relatively precisely linearly predicted from the others. This is important as multicollinearity may lead to highly inflated standard errors. The models are chosen in a way to ensure that the VIF test value is below 10 as suggested by Tables 6.1.1 and 6.1.3 (see below) for all sectors and all capitalizations respectively, and that the models reject the Ramsey Reset test null hypothesis for the existence of omitted variables for most indices.

These tests led to the following independent variables being chosen for the regression. The sector return is the dependent variable. For the epidemiological data, only new daily cases and total deaths are chosen, as to avoid multicollinearity. Each index's daily percentage change in volume is also used as a control variable. Macroeconomic controls included are the daily federal funds rate and the exchange rate between the Yuan and the U.S. dollar (which also encapsulates the exposure to the Chinese market). The return on the market sentiment VIX index also known as a fear factor is another control variable. This leads to the following equation being formulated:

$$ReturnSectorIndex = constant + b_1 * NewCases + b_2 * TotalDeaths + b_3 * VolumePerChange + b_4 * FederalFundsRate + b_5 * YuanUSDollarRate + b_6 * VIX + \varepsilon$$

Furthermore, a similar multiple regression model is used for the four size indices. The dependent variable is the daily return of the capitalization index. Once again, the epidemiological explanatory variables are the new Covid-19 cases and total Covid-19 deaths. Furthermore, the additional control variables constitute the federal funds rate, the exchange rate between the yuan and the US dollar, returns and the return of the fear factor index VIX. This leads to the following formula:

$$ReturnCapitalizationIndex = constant + b_1 * NewCases + b_2 * TotalDeaths + +b_3 * FederalFundsRate + b_4 * YuanUSDollarRate + b_5 * VIX + \varepsilon$$

5.2 Event study

The second part of the analysis is an event study that investigates if the selected capitalization and sector indices had different reactions on dates with important Covid-19-related government announcements. As in the case of most event studies, the variables tested for significance will be Abnormal returns (AR) and Cumulative abnormal returns. What makes the returns abnormal is that they are different from the Expected returns. This paper follows the methodology proposed by MacKinley (1997), which requires the following.

Firstly, an event is necessary. The ones used in this paper are defined in the above-elaborated data section of this paper. Furthermore, an event window is required, which is the period over which the prices or in this case returns of the securities are investigated. Dates before and after the event of interest are examined as this allows for the whole period to be examined. It is important to note that more days included in the event window, the lesser the magnitude of the actual event. The smallest event window used in this study is the one that contains only the day of the announcement to capture the price effect of the new information until the close of the same day. Meaning that if the event of concern occurred on the 1 January 2000, the event window [0,0] includes only 1 January 2000. The event windows are chosen to be close to the

event day as that way the significance tests can be more accurate, as well as for the reason that the early days of the coronavirus crisis in the US were quite eventful and making the window wider will capture more of the other important events. The chosen event windows for this study are [0,0], [0, 1] [-1,1], [-3, 3] [-5, 5], and [-1, 5].

The second requirement is a computation of normal(expected) returns. This can be divided in two parts. The first part is the choice of the length of the estimation period. Let t_0 be the event day, T_0 is the day the estimation window starts, T_1 and T_2 are the two sides of the event window. There is no right choice of an estimation window and sometimes it includes or even surpasses the event of interest itself. Nonetheless, usually the estimation window predates the event and stops before the event window begins. For this study, the T_0 or start of the estimation window is 240 days before the event itself (there are 240 days between T_0 and t_0), while the end is 40 days before the event itself. Since our biggest [T_1-T_2] is [-5,5], there is no possibility of an overlap between the estimation window and the event window. The second part is concerned with the estimation of the expected (normal) returns- E(R). There are several different methods, but the Market model is chosen, which relates the return of security ($R_{i,t}$) to that of a market portfolio ($R_{m,t}$) as shown below:

$$E(R) = R_{i,t} = a + b * R_{m,t} + \varepsilon_{i,t}$$

Furthermore, the abnormal returns and cumulative abnormal need to be calculated. This is done by the following formulas where "AR" denotes the abnormal return, "i" signifies the relevant index, and "t" represents the event time window:

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

The cumulative abnormal return ($CAR_i(t_1, t_2)$ is the following summation of the individual abnormal returns:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t}$$

The average abnormal return (AAR) is the average of the individual abnormal returns for each period, as below:

$$AAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{i,t}$$

The Cumulative average abnormal return (CAAR) is the summation of the individual average abnormal returns demonstrated in this subsequent equation:

$$CAAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t$$

Finally, the statistical significance of the found values must be determined. There are many methods such as a basic normality test, or test that do not rely on the data being normally distributed. Nonparametric test outperforms parametric tests when it comes to event studies (Kolari and Pynnonen, 2011). Kolari and Pynnonen (2011) create the so-called Generalized rank test (GRANK test) that surpasses other rank tests and parametric tests. The test is also robust to AR serial correlation and event-induced volatility. The GRANK test is finally employed in this research to determine the statistical significance.

6 Results

This section provides the results of the analyses described in depth in the methodology section.

6.1 OLS

The first part of the analysis of this paper consists of an OLS model. As mentioned in the methodology section there were several regression diagnostics tests done to ensure the quality of the regression model. The results of the two tests done on the first OLS are the following below:

Table 6.1.1 GICS Sector index regression results for Ramsey RESET test and Various Inflation Factors summary table. *The Ramsey reset test is done to check for omitted variables, the null hypothesis that of no omitted variables. The Various inflation factor is used to check for multicollinearity, if the average Vif is above 10, multicollinearity is present*

Sector Index	*Reset P-value*	*Average Vif*
Communication	0.3965	3.60
Consumer disc.	0.4705	3.55
Consumer staples	0.0018	3.57
Energy	0.9593	3.63
Financials	0.1707	3.58
Health care	0.1654	3.57
Industrials	0.9639	3.59
Materials	0.9118	3.56
Real Estate	0.1464	3.56
Technology	0.0626	3.58
Utilities	0.7049	3.58

As it can be seen above in Table 6.1.1 for all eleven regressions the mean Variance Inflator Factor (VIF) has a value that is below the threshold of 10, thus the variables in all the regressions show no evidence of multicollinearity. The individual regression Ramsey RESET tests can be found in

the appendix (tables 6.1.18 through 6.1.28). Only one out of the eleven regressions have a p-value of the Ramsey reset test that is below the 5% significance level. Thus, the null hypothesis of no omitted variable bias is only rejected for the regressions on the sectors of Consumer Staples. Nonetheless, the model for this sector was not changed as to keep the consistency of the comparison of the sectors.

The eleven individual regressions can be found in the Appendix (Table 6.1.3 to Table 6.1.13) where the coefficients can also be found. The epidemiological variables New cases and Total deaths were found to be significant for some sectors only in a regression with no control variables. Once the macroeconomic controls were added, the epidemiological data was found to not be of significance. The controls for the federal fund rate and the exchange rate between China and the U.S.A did not show any significance for any single sector. The return of the VIX index was significant in explaining every single Sector at a 99% confidence interval. While that may seem odd, the Ramsey reset test found evidence of omitted variable bias in only two of the regressions, thus the results can be interpreted normally. It also makes economic sense for the market sentiments to play a key role in determining returns in a time of a global pandemic. The most sensitive sectors were the Financials, Technology and Energy with a negative relationship of-22%, -22% and -24% respectively, while the least sensitive were the Consumer staples and Utilities sector, with a coefficient of -13% and -14% respectively.

The size indices presented further interesting results. Once again first the regression diagnostics tests are presented in Table 6.1.2 . One can clearly see in the results of the Ramsey test, that with the chosen model, none of the regressions show signs for omitted variables in the 95% confidence interval. The variance inflation factors also show no signs of multicollinearity between the independent variables. Thus, the regression model can be deemed satisfactory.

Table 6.1.2 Size index regression results for Ramsey RESET test and Various Inflation Factors summary table*. The Ramsey reset test is done to check for omitted variables, the null hypothesis that of no omitted variables. The Various inflation factor is used to check for multicollinearity, if the average Vif is above 10, multicollinearity is present*

	Reset	
Index	*P-value*	*Vif*
S&P 500	0.2188	4.04
S&P 600	0.8891	4.04
S&P 400	0.7545	4.04
D&J micro	0.7598	4.04

The full regression tables can be found in the Appendix (Tables 6.1.14 to 6.1.17). The individual regression diagnostic tests that comprise Table 6.1.2 can also be found in the appendix (Tables 6.1.29 to 6.1.32.). As in the case with the sector indices regressions, for the size indices regression there is no significant relationship found between the epidemiological variables and the index returns for none of the indices. Furthermore, no significant relationship was found between the Federal Funds rate and the returns of the indices. Once again, the Yuan/U.S. Dollar exchange rate was found to not be significant at the 95% confidence level for all the indices. As in the case with the previous model, the returns on the VIX index were significant at a 99% confidence level for all indices and had a coefficient of around -20%. Once again, this is not deemed worrisome because of the Ramsey RESET test's null hypothesis of no omitted variable bias is not rejected for all 4 regressions.

6.2 Event study

6.2.1 Sectors

In this research, the stock returns of the indices for GICS sectors around key government announcements area analyzed. The following time intervals around the event date are used: [0,0], [0, 1] [-1,1], [-3, 3] [-5, 5] and [-1, 5]. They are chosen to be purposefully narrow around the event date, as to not get affected by other important events in the turbulent time that is being investigated. Two of the time intervals are more forward-looking as it makes sense that the effect of the announcement will have a bigger effect on returns after it has happened. In this case there is a smaller possibility of insider information, so the dates before the event were treated with lesser importance.

The first event that is investigated is the announcement of the first confirmed case of Covid-19 in the U.S.A. That happened on the 21st of January 2020. As it can be seen from Table 6.2.1 in the Appendix, there were almost no significant CAARS for none of the sectors in none of the specified time intervals. The only significant detected abnormal Returns, at the 95% significance level, are for the Industrials sector with a CAARS of -1.35% at the [0,1] window, but they do appear in none of the other event windows. These results show, on average, no abnormal market reaction on around the date of the first confirmed case on a sectoral level.

On the 28th of February 2020, the Federal Reserve announced that it is closely monitoring the economic impact of the Covid-19 pandemic. This came after the biggest single week decline on the market since 2008. The analysis found significant CAAR for almost all sectors, which is demonstrated by the results in Table 6.2.2. As it is evident, the only Sector that did not experience any Abnormal returns was the Materials Sector. When looking at the [1,5] interval, that should be the one best estimating reality, there were some winners and losers on a sectoral level. The biggest winner was the Utilities Sector with a positive CAARs of 7.6% followed by Consumer Staples that had a positive CAARs of 5.7%. The biggest losers were the Energy and Financials sectors with respective negative CAARs of -7.7% and – 4.6%. Overall, there were significant cumulative abnormal returns, that differed between industries with the difference between the biggest winner and loser being 15.3%.

Table 6.2.2 CAARs of the GICS sector indices on the 28th of February 2020. *The table shows the Cumulative Average Abnormal Returns of the GICS sector indices following the FED's announcement of closely monitoring the situation on the 28th of February. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
Communication	1.29%**	-0.17%	-1.46%**	-0.87%	0.14%	-2.50%**
Consumer Disc.	0.13%	-0.93%*	-1.06%***	-0.80%**	0.30%	-1.49%*
Consumer staples	-1.60%***	1.29%*	2.90%***	2.51%***	0.16%	5.66%***
Energy	2.21%**	0.37%	-1.84%*	-2.19%**	-3.78%***	-7.66%***
Financials	-1.53%***	-1.65%**	-0.12%	-1.33%***	-1.39%***	-4.57%***
Health	-0.67%	0.54%	1.21%**	2.46%***	0.86%	4.54%***
Industrials	-0.13%	-2.31%***	-2.17%***	-0.37%	1.02%**	-2.06%**
Materials	-0.22%	-0.50%	-0.28%	-0.08%	-0.94%	0.87%
Real	-2.18%***	1.02%	3.20%***	2.26%***	-1.02%	4.46%***
Technology	1.95%***	1.78%***	-0.17%	-1.15%***	0.17%	-0.19%
Utilities	-3.19%***	1.71%*	4.91%***	4.79%***	-0.46%	7.63%***
Portfolio of all	-0.36%***	0.10%	0.46%***	0.48%***	-0.45%***	0.43%

The next event that is investigated is the lowering of the Federal Funds rate by 50 basis points on the 3rd of March 2020 and the results can be seen in table 6.2.3 in the Appendix. There were significant CAARs only for Materials by the end of the trading day itself. But when looking at the forward looking [-1,5] interval, most sectors have significant CAARs. As in the case with the previous event date Energy is by far the biggest loser, having a negative CAARs of almost -17.8%, followed by Financials (-5.4%). In this event sectors that did the most abnormally well were Health Care with a positive CAARs of 4% and Technology (3%).

On the 23rd of March 2020, the Federal Reserve announced new measures to support the U.S. economy. This time around the policies were quite extensive, including programs that provided in total 300 billion U.S. dollars in new financing. The overall market reacted positively to this news, with the Dow Jones Industrial Average Index having the largest 1-day percentage gain since 1933. On the day of the event all sectors had a significant reaction, with Communication,

Consumer Discretionary and Technology being the only ones that had a significant positive reaction as it can be seen in table 6.2.4 in the Appendix. The overall average of returns for all Sector indices was -1.2%. Looking at the [-1,5] event window we see the there was a significant CAARs for almost every industry. There was an enormous abnormal gain for the utilities and Real estate sectors with CAARs of 22% and 17% respectively. The Sectors that did the worst were Communication and Technology, with CAARs of -9% and -6%.

On the 9th of April 2020, the Federal Reserve announced that it will provides 2.3 trillion U.S. dollars in loans to support the U.S. economy. On the day of the announcement, there was an overall positive abnormal return of 0.7%. As it is evident from Table 6.2.5 (see Appendix), looking at the [-1,5] event window, an average negative abnormal return of -0.9% is observed. The winners were Consumer Discretionary (3.3%) and Health Care (3.7%), while the biggest losers were Financials (-6.7%) and Materials (-4.5%) and Real Estate. It is important to note how these exact sectors reacted on the day of the announcement. The CAARs in the [0,0] event window is the following: Consumer Discretionary (0.2%), Health Care (-0.8%), Financials (3.4%), Materials (2. 7%) and Real Estate (4.4%). As it can be observed, the effect of the event completely changed direction five days after the event itself. Furthermore, the industries that did relatively well in the [-1,5] event window, while relatively bad in the [0,0] event window are those that did well for the whole crisis period and vice-versa.

6.2.2 Size indices

The fourth and final part of this paper is the event studies analysis on the size indices. As in the case with the sector indices, the same dates specified in the data section are used for the event dates and the event windows that are tested are the following [0,0], [0, 1] [-1,1], [-3, 3] [-5, 5] and [-1, 5].

The first event date once again is the 21st of January 2020. As in the case with the sector indices there is no significant Cumulative Average Abnormal Returns (CAARS) for none of the of the capitalization indices, with none of the event windows. Thus, there was no unexpected market reaction around the date, as it can be seen in Table 6.2.6 (see Appendix).

On the 28th of February 2020, the Large and Mid-cap indices had a significant CAARs of 0.08% and 1% respectively, as it is evident from Table 6.2.7 (see below). But looking at the [-1,5] event window, we see that for the wider forward-looking interval the micro and small capitalization indices have the significant CAARs of -5.2% and -2.5% respectively. The CAARs of the portfolio of all four indices is -2.2% and is significant. The results of the analysis of the dates around the event show how the smaller indices are much more sensitive, showing a positive relationship between returns and size for the windows [0, 1] [-1,1], [-3, 3].

Table 6.2.7 CAARs of the Size indices on the 28th of February 2020. *The table shows the Cumulative Average Abnormal Returns of the Size indices following the FED's announcement of closely monitoring the situation on the 28th of February. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
Micro	-0.08%	-2.78%***	-2.69%***	-2.25%***	-0.35%	-5.27%***
Mid	-1.00%***	-2.53%***	-1.53%***	-1.04%***	0.13%	-1.36%*
Large	0.08%**	0.26%***	0.17%***	0.12%***	-0.01%	0.16%*
Small	-0.57%	-3.12%***	-2.54%***	-1.64%***	0.16%	-2.51%**
Portfolio of all	-0.39%	-2.04%***	-1.65%***	-1.20%***	-0.02%	-2.25%***

On the 3rd of March 2020, the Federal Reserve lowered the federal funds rate. On the day itself, there was a significant positive reaction for the small and mid-capitalization indices with CAARs of 1.0% and 0.9%, as it can be seen from Table 6.2.8 in the Appendix. There are significant negative abnormal returns observed in the [-1,1] and [-5,5] event windows for all indices except the Large cap index. This trend is also observed for the [-1,5] event window where the Micro, Small and Mid-capitalization indices have CAARs of -9.0%, -4.4% and -2.8% respectively, while the Large cap index has a positive CAAR of 0.3%.

On 23rd of March 2020, the Federal Reserve's new measures to support the U.S. economy were announced, immediately causing an abnormal return for the Micro and Small cap indices of 1.9% and 1.4% respectively (see Table 6.2.9 in the Appendix). The previously observed behavior of the micro, small and Mid-cap sectors to have significant negative abnormal returns, while the Large

is having small significant positive returns in the [-5,5] event window is once again observed. For the [-1,5] window, significant negative CAARs of -4.8% and 4.0% are observed for the Micro and Small indices, respectively.

The final event date is the 9th of April, when the FED announced a $2.3 trillion of loans to support the economy. The effects of the event are presented in table 6.2.10. On the day of the announcement there were significant positive abnormal returns for the Micro (4.4%), Small (3.3%) and Mid (1.6%) cap sectors, while the Large cap index had a significant negative abnormal return of 0.2%. For the event windows [-1,1], [-3, 3] [-5, 5] and [-1, 5] the previously observed pattern of the Micro, Small and Mid-cap indices having negative CAARs is consistent. The Large cap index shows small positive CAARs (less than 0.4%) for all time windows except [-5, 5] where it had a small negative CAARs of 0.08%.

An interesting observation for the Capitalization indices is that on the dates of an economic policy announcement, the Micro, Small and Mid-cap show significantly high positive abnormal returns, but exactly the opposite is shown when the event window period is extended. When more dates are included, the CAARs become significantly negative. On the other hand, the Large cap index has a small abnormal reaction on the event date, which never goes beyond 1.0% in none of the tested event windows.

7 Conclusions and Discussion

7.1 Conclusions

This paper explores the effects of the Covid-19 pandemic on the United States stock market at a sectoral (differentiated by the GICS indices) and size (differentiated by the S&P capitalization indices) level. This is done by constructing models that link the returns of sector and size indices in the United States of America with epidemiological variables such as the number of new cases and number of cumulative deaths. The second part of the research consist of an event study that explores the abnormal returns of said indices around important government announcements during the period between the 1st of January 2020 to 15th of May 2020.

The first sub-question of the research was whether the epidemiological variables affected every sector. As seen in the results section, the epidemiological variables were not significant for a single sector, after controlling for other factors. This is consistent with prior research, as most other papers did not find a significant relationship between stock market returns and epidemiological variables. The control that had a significant effect on the sector index returns was the return of the VIX index, which makes sense in the established framework. Other papers on the financial effects of the Covid-19 crisis found that investment decisions during the relevant period were affected by the so-called Covid-induced uncertainty. The explanatory power of the market sentiments index also makes economic sense, as the VIX index measures risk and fear on the market. It is expected that fear played a significant investment role during an economic crisis.

The second sub-question concerned with whether the epidemiological variables affected each cap. As in the case with the previous sub-question no significant relationship was found. It is also interesting to note that the exchange rate between the yuan and the U.S. dollar was not significant for none of the indices. The federal funds rate was also insignificant for all capitalization indices. The only significant independent variable was once again the return on the market sentiments index in the name of VIX.

The third sub-question was whether the effect differed by sector on key government announcements. Just as the epidemiological variables were not significant for the previous two

sub questions, there was no abnormal reaction on and around the date of the first case in the U.S.A. This is consistent with past literature findings, that claim that the business world was not concerned with Covid-19 in January 2020. The sectors had very different CAARs in the event windows that had significant results. It is evident that some sectors like Energy and Financials had consistently big abnormal negative reactions in the event window that included 1 day before and 5 days after the event, even thought they had mostly positive abnormal returns on the day of the economic policy announcement. In contrast the Health Care sector exhibited the exactly opposite behavior by having a small abnormal negative return on the day of the announcement, but a big positive abnormal returns in the event window that included 1 day before and 5 days after the event. Overall, the event study showed that the sectors had significant CAARs around events that were concerned with Federal Reserve's announcements, with the sectors that did poorly having a positive reaction on the event date itself that reversed in the next few days, while the sectors that did good exhibited the exactly opposite behavior.

The fourth and final sub-question was whether the effect differed by capitalization on key government announcements. The findings were quite consistent with past literature. During economic downturns, investors tend prefer companies with large capitalizations, and the returns of the four indices show that. As in the case with the sector indices, there were no significant abnormal returns around the date of the first case in the U.S.A., but there were significant CAARs around the days of economic and fiscal announcements. On the day of the event the micro and small cap indices always exhibited positive abnormal returns, but on the event windows that included the subsequent dates, they showed significant negative CAARs. The large cap index consistently showed the exactly opposite behavior, while the mid index behaved more in line with the micro and small cap indices. Overall, there is evidence that the large cap index outperformed the smaller ones after government announcements, even though it had a smaller initial reaction.

7.2 Limitations

One of the limitations of this paper is the relatively low number of observations for the statistical methodology, specifically the ordinary least-squares regression. The reason for this is the

relatively recent event of interest, that is the Covid-19 crisis. Nonetheless, other research papers have already done similar types of research for even shorter time frames and have been published in reputable scientific journals such as the Journal of Finance and others.

Another possible limitation is that the indices of Standard and Poor's are used as a measure of size and sector performance. Those indices are comprised of the very best companies in the market and may give a biased outcome, due to survivorship bias, for example. On the other hand, there is no other viable way to do a similar research, without using index returns as a measure of performance.

A third limitation is the relatively limited literature on the issue, because the Covid-19 pandemic is quite recent, and the economic and financial consequences are even more recent. Whilst, this financial crisis has not been the topic of many scientific papers, there is an abundance of past papers inquiring into the same issue for previous financial crises.

7.3 Recommendations for future research

A suggestion for future research would be to extend the research period to include the subsequent months of the crisis, or even a second potential wave that is usually observed in this type of viral infections.

Secondly, this framework could be applied for other countries or economic areas around the world. One can suggest China (where the coronavirus was allegedly incepted) or the European Union (where the coronavirus was the most widespread during the relevant examined period).

Lastly, a research that is focused on the individual regions or states in the U.S.A. and the behavior of the corporations that relate to them can be a further scientific contribution, relevant to this research.

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9 Appendix

Table 4.1 Descriptive statistics GICS sectors

	Communication	Consumer Disc.	Consumer Staples	Energy	Financial	HealthCare	Industrial	Materials	RealEstate	Technology	Utilities
mean	-0.0000578	-0.0003677	-0.000624	-0.004	-0.0032	0.0002635	-0.0027	-0.0014	-0.001625	0.000899	-0.001
Std.	0.0290414	0.0309915	0.0264037	0.05006	0.04065	0.028337	0.03496	0.03443	0.037212	0.036658	0.03709
Variance	0.0008434	0.0009605	0.0006972	0.00251	0.00165	0.000803	0.00122	0.00119	0.001385	0.001344	0.00138
Skewness	-0.4940473	-0.6256046	0.1984605	-0.5401	0.05149	0.0038305	-0.0076	-0.1288	-0.640649	-0.097276	0.31789
Kurtosis	5.897146	6.82681	6.077367	6.65383	5.79242	4.92289	5.81064	5.1919	6.593405	6.056627	5.63704

Table 4.2 correlation between CIGS sector returns

	Communication	Consumer Disc	Consumer Staples	Energy	Financial	HealthCare	Industrial	Materials	RealEstate	Technology	Utilities
Communication	1										
Consumer Disc	0.9401	1									
Consumer Staples	0.8376	0.8157	1								
Energy	0.7757	0.8226	0.6382	1							
Financial	0.8853	0.925	0.8348	0.8756	1						
HealthCare	0.8933	0.8838	0.9154	0.7349	0.8842	1					
Industrial	0.8785	0.9358	0.8379	0.8719	0.9613	0.8989	1				
Materials	0.8841	0.9326	0.8363	0.8653	0.9636	0.8926	0.9561	1			
RealEstate	0.8304	0.8864	0.8682	0.7519	0.92	0.894	0.9136	0.9153	1		
Technology	0.9693	0.9458	0.8728	0.7804	0.9098	0.9252	0.9059	0.9027	0.8641	1	
Utilities	0.763	0.8035	0.9098	0.6421	0.8422	0.8855	0.8501	0.8668	0.9181	0.8116	1

Table 4.4 Descriptive size sectors

	DJ micro	S&P 600	S&P 400	S&P500
Mean	-0.0018141	-0.0030218	-0.0020873	-0.0007699
Std.	0.0353889	0.0382198	0.0368847	0.0320498
Variance	0.0012524	0.0014608	0.0013605	0.0010272
Skewness	-0.9492248	-0.505689	-0.5089949	-0.2248177
Kurtosis	6.258425	4.883052	5.505594	5.923903

Table 4.5 Correlogram of the size indices

	S&P 500	S&P 600	S&P 400	Dj micro
S&P 500	1			
S&P 600	0.9298	1		
S&P 400	0.9547	0.9853	1	
Dj micro	0.883	0.9686	0.9547	1

Table 4.7 Descriptive statistics of epidemiological variables

	Newcases	Total cases	New deaths	Total deaths
Mean	10867.15	303428.6	648.363	16089.14
Std.	13298.07	461919.3	924.0493	26831.73
Variance	17700M	213000M	853867.1	720M
Skewness	0.607155	1.248521	1.066829	1.433297
Kurtosis	1.677995	3.044025	2.79996	3.538907

Table 4.8 Correlogram of the epidemiological variables

	Ne wcases	Total cases	New deaths	Total deaths
New cases	1			
Total cases	0.7907	1		
New deaths	0.9029	0.8082	1	
Total deaths	0.7207	0.9936	0.7549	1

Table 6.1.3 Regression of epidemiological variables, control variables, change in index volume and market sentiments on Communication sector index returns.

Linear regression				Number of obs .		94
				F(6.87)		11.31
				Prob > F		0
				R-squared		0.575
				Root MSE		0.01957
Communication	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	3.46E-07	4.97E-07	0.7	0.488	6.42E-07	1.33E-06
Total deaths	1.78E-08	1.06E-07	0.17	0.867	1.94E-07	2.29E-07
dvComunic	-0.0104562	0.011699	-0.89	0.374	0.0337092	0.0127968
DFFR	0.0081073	0.0103341	0.78	0.435	0.0124328	0.0286474
DEXCHUS	0.0019772	0.0455296	0.04	0.965	0.0885178	0.0924723
RVix	-0.1665642	0.0251829	-6.61	0	0.2166178	-0.1165105
_cons	-0.0218990	0.3205869	-0.07	0.946	0.6591001	0.6153021

Table 6.1.4 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Consumer Discretionary sector index returns.

Linear regression	Number of obs .	94
	F(6.87)	9.2
	Prob > F	0
	R-squared	0.5227
	Root MSE	0.0221

Consumer Discretionary	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	3.06E-07	5.83E-07	0.52	0.601	-8.52E-07	1.46E-06
Total deaths	-2.32E-08	1.31E-07	-0.18	0.86	-2.83E-07	2.37E-07
dvCdisc	0.0139917	0.0123516	1.13	0.26	-0.010559	0.0385418
DFFR	0.0055044	0.0124679	0.44	0.66	-0.019277	0.0302856
DEXCHUS	0.0068073	0.0496875	0.14	0.891	-0.091952	0.1055666
RVix	-0.1763265	0.0242544	-7.27	0	-0.224535	-0.1281183
_cons	-0.0532338	0.3510922	-0.15	0.88	-0.751068	0.6445999

Table 6.1.5 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Consumer Staples sector index returns.

Linear regression	Number of obs .		94
	F(6.87)		7.34
	Prob > F		0
	R-squared		0.4284
	Root MSE		0.02064

Consumer staples	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	4.33E-07	6.66E-07	0.65	0.517	-8.91E-07	1.76E-06
Total deaths	-8.67E-08	9.92E-08	-0.87	0.385	-2.84E-07	1.10E-07
dvCStap	0.0021132	0.0123178	0.17	0.864	-0.02237	0.0265961
DFFR	0.0008197	0.013419	0.06	0.951	-0.025852	0.0274914
DEXCHUS	-0.0798877	0.0561456	-1.42	0.158	-0.191483	0.0317078
RVix	-0.1316696	0.0252619	-5.21	0	-0.18188	-0.0814589
_cons	0.5575381	0.3951194	1.41	0.162	-0.227805	1.342881

Table 6.1.6 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Energy sector index returns.

Linear regression				Number of obs .		94
				F(6.87)		12.75
				Prob > F		0
				R-squared		0.4198
				Root MSE		0.03943

Energy	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	1.20E-06	1.10E-06	1.09	0.279	-9.89E-07	3.38E-06
Total deaths	-1.54E-07	2.13E-07	-0.72	0.473	-5.77E-07	2.70E-07
dvEnergy	0.0070798	0.0303356	0.23	0.816	-0.053216	0.0673751
DFFR	0.0221125	0.0213833	1.03	0.304	-0.020389	0.064614
DEXCHUS	0.1094323	0.0819189	1.34	0.185	-0.05339	0.272255
RVix	-0.2407694	0.0322011	-7.48	0	-0.304773	-0.1767662
_cons	-0.7968193	0.5740466	-1.39	0.169	-1.937799	0.3441606

Table 6.1.7 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Financials sector index returns.

Linear regression				Number of	obs .	94
				F(6.87)		8.04
				Prob > F		0
				R-squared		0.4534
				Root MSE		0.03108

Financials	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	4.75E-07	8.25E-07	0.58	0.567	-1.17E-06	2.12E-06
Total deaths	-9.03E-08	1.75E-07	-0.52	0.606	-4.37E-07	2.57E-07
dvFin	0.0160254	0.0150441	1.07	0.29	-0.013876	0.0459273
DFFR	0.0104612	0.0167028	0.63	0.533	-0.022737	0.0436597
DEXCHUS	0.0177046	0.0679928	0.26	0.795	-0.117439	0.1528477
RVix	-0.218279	0.0352351	-6.19	0	-0.288313	-0.1482455
_cons	-0.1366404	0.477602	-0.29	0.775	-1.085926	0.8126452

Table 6.1.8 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Health Care sector index returns

Linear regression	Number of obs .	94	
	F(6.87)	10.49	
	Prob > F	0	
	R-squared	0.4707	
	Root MSE	0.02132	

Health Care	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	4.77E-07	5.95E-07	0.8	0.425	-7.05E-07	1.66E-06
Total deaths	-8.87E-08	1.19E-07	-0.75	0.457	-3.25E-07	1.47E-07
dvHealth	0.0124946	0.0119296	1.05	0.298	-0.011217	0.036206
DFFR	0.0028782	0.012393	0.23	0.817	-0.021754	0.0275106
DEXCHUS	-0.041255	0.0522519	-0.79	0.432	-0.145111	0.0626014
RVix	-0.1501075	0.0220252	-6.82	0	-0.193885	-0.1063301
_cons	0.2854572	0.367709	0.78	0.44	-0.445404	1.016319

Table 6.1.9 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Industrials sector index returns.

Linear regression				Number of obs .		94
				F(6.87)		10.62
				Prob > F		0
				R-squared		0.4362
				Root MSE		0.02714

Industrials	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	5.29E-07	6.98E-07	0.76	0.45	-8.57E-07	1.92E-06
Total deaths	-9.57E-08	1.51E-07	-0.63	0.529	-3.96E-07	2.05E-07
dvIndustrials	0.0075977	0.0128043	0.59	0.554	-0.017852	0.0330476
DFFR	0.0091165	0.0150615	0.61	0.547	-0.02082	0.0390529
DEXCHUS	-0.0006925	0.0604983	-0.01	0.991	-0.120939	0.1195544
RVix	-0.1815161	0.0271357	-6.69	0	-0.235451	-0.1275809
_cons	-0.0070021	0.4236098	-0.02	0.987	-0.848972	0.8349682

Table 6.1.10 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Materials sector index returns.

Linear regression	Number of obs .		94
	F(6.87)		8.99
	Prob > F		0
	R-squared		0.4566
	Root MSE		0.02624

Materials	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	4.83E-07	7.11E-07	0.68	0.499	-9.30E-07	1.90E-06
Total deaths	-7.65E-08	1.53E-07	-0.5	0.618	-3.80E-07	2.27E-07
dvMat	0.0047557	0.0128551	0.37	0.712	-0.020795	0.0303065
DFFR	0.0059526	0.0149372	0.4	0.691	-0.023737	0.0356418
DEXCHUS	-0.0052606	0.0616311	-0.09	0.932	-0.127759	0.1172378
RVix	-0.1805232	0.0270369	-6.68	0	-0.234262	-0.1267845
_cons	0.0292451	0.4347791	0.07	0.947	-0.834925	0.8934155

Table 6.1.11 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Real Estate sector index returns.

Linear regression				Number of obs .		94
				F(6.87)		7.05
				Prob > F		0
				R-squared		0.3966
				Root MSE		0.02989
Real Estate	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	1.08E-06	8.37E-07	1.29	0.202	-5.87E-07	2.74E-06
Total deaths	-1.86E-07	1.67E-07	-1.12	0.266	-5.18E-07	1.45E-07
dvRE	0.0002286	0.0193932	0.01	0.991	-0.038318	0.0387747
DFFR	0.0178454	0.0183087	0.97	0.332	-0.018545	0.0542359
DEXCHUS	-0.0085836	0.0775431	-0.11	0.912	-0.162709	0.1455418
RVix	-0.1740659	0.0365714	-4.76	0	-0.246756	-0.1013762
_cons	0.0376771	0.5512752	0.07	0.946	-1.058042	1.133396

Table 6.1.12 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Technology sector index returns.

Linear regression				Number of obs .		94
				F(6.87)		10.18
				Prob > F		0
				R-squared		0.5653
				Root MSE		0.02499

Technology	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	9.25E-08	6.60E-07	0.14	0.889	-1.22E-06	1.40E-06
Total deaths	1.51E-08	1.38E-07	0.11	0.914	-2.60E-07	2.90E-07
dvItech	0.0038946	0.019428	0.2	0.842	-0.034721	0.0425098
DFFR	0.0045561	0.0143968	0.32	0.752	-0.024059	0.0331713
DEXCHUS	-0.0098962	0.0567771	-0.17	0.862	-0.122747	0.1029545
RVix	-0.2199411	0.030704	-7.16	0	-0.280969	-0.1589136
_cons	0.0686716	0.4012429	0.17	0.865	-0.728842	0.8661854

Table 6.1.13 Regression of epidemiological variables, macroeconomic control variables, change in index volume and market sentiments on Utilities sector index returns.

Linear regression	Number of obs .		94
	F(6.87)		5.62
	Prob > F		0.0001
	R-squared		0.2913
	Root MSE		0.03228

Utilities	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	6.64E-07	1.06E-06	0.63	0.533	-1.44E-06	2.77E-06
Total deaths	-9.95E-08	1.82E-07	-0.55	0.586	-4.61E-07	2.62E-07
dvUtilities	-0.0235179	0.0222563	-1.06	0.294	-0.067755	0.0207189
DFFR	0.0015925	0.0225353	0.07	0.944	-0.043199	0.0463838
DEXCHUS	-0.1288004	0.0839198	-1.53	0.128	-0.2956	0.0379992
RVix	-0.1363581	0.0358397	-3.8	0	-0.207593	-0.0651229
_cons	0.8978534	0.5977286	1.5	0.137	-0.290197	2.085904

Table 6.1.14 Regression of epidemiological variables, macroeconomic control variables and market sentiments on S&P 500 index returns.

Linear regression				Number of obs .		94
				F(6.87)		11.32
				Prob > F		0
				R-squared		0.5319
				Root MSE		0.02254
S&P 500	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	4.02E-07	6.07E-07	0.66	0.509	-8.05E-07	1.61E-06
Total deaths	-4.76E-08	1.22E-07	-0.39	0.698	-2.91E-07	1.95E-07
DFFR	0.0065451	0.0132368	0.49	0.622	-0.01976	0.0328505
DEXCHUS	-0.0145978	0.0531367	-0.27	0.784	-0.120196	0.0910002
RVix	-0.1821841	0.0262696	-6.94	0	-0.234389	-0.1299788
_cons	0.0953943	0.3753229	0.25	0.8	-0.650481	0.8412697

Table 6.1.15 Regression of epidemiological variables, macroeconomic control variables and market sentiments on S&P 600 index returns.

Linear regression				Number of obs .		94
				F(6.87)		9.64
				Prob > F		0
				R-squared		0.4384
				Root MSE		0.02945
S&P 600	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	5.25E-07	8.79E-07	0.6	0.552	-1.22E-06	2.27E-06
Total deaths	-5.86E-08	1.67E-07	-0.35	0.726	-3.90E-07	2.73E-07
DFFR	0.0103697	0.0170213	0.61	0.544	-0.023457	0.0441959
DEXCHUS	0.0154741	0.0698835	0.22	0.825	-0.123405	0.1543528
RVix	-0.1960382	0.0313469	-6.25	0	-0.258334	-0.1337428
_cons	-0.1218517	0.4910741	-0.25	0.805	-1.097758	0.854055

Table 6.1.16 Regression of epidemiological variables, macroeconomic control variables and market sentiments on S&P 400 index returns.

Linear regression				Number of obs .		94
				F(6.87)		9.48
				Prob > F		0
				R-squared		0.4469
				Root MSE		0.0282
S&P 400	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	5.91E-07	8.24E-07	0.72	0.475	-1.05E-06	2.23E-06
Total deaths	-5.43E-08	1.54E-07	-0.35	0.726	-3.61E-07	2.52E-07
DFFR	0.0120094	0.0168161	0.71	0.477	-0.021409	0.045428
DEXCHUS	0.02476	0.0661289	0.37	0.709	-0.106657	0.1561772
RVix	-0.1898057	0.0297351	-6.38	0	-0.248898	-0.1307134
_cons	-0.188297	0.4650859	-0.4	0.687	-1.112557	0.7359635

Table 6.1.17 T Regression of epidemiological variables, macroeconomic control variables and market sentiments on Dow Jones micro capitalization index returns.

Linear regression	Number of obs .		94
	F (6.87)		8.59
	Prob > F		0
	R-squared		0.4191
	Root MSE		0.02773

Dow Jones micro	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
New cases	4.16E-07	9.63E-07	0.43	0.667	-1.50E-06	2.33E-06
Total deaths	7.41E-09	1.44E-07	0.05	0.959	2.79E-07	2.93E-07
DFFR	0.0108965	0.0187423	0.58	0.562	0.0263498	0.0481428
DEXCHUS	0.0456808	0.0708718	0.64	0.521	0.0951621	0.1865237
RVix	-0.1761896	0.0294794	-5.98	0	0.2347736	-0.1176056
_cons	-0.3330983	0.4984328	-0.67	0.506	1.323629	0.6574322

Table 6.1.18 Ramsey RESET test on Table 6.1.3

Ramsey RESET test using powers of the fitted values of Communication	
Ho: model has no omitted variables	
F(3, 84) =	1
Prob > F =	0.3965

Table 6.1.19 Ramsey RESET test on Table 6.1.4

Ramsey RESET test using powers of the fitted values of Consumer Discretionary	
Ho: model has no omitted variables	
F (3, 84) =	0.85
Prob > F =	0.4705

Table 6.1.20 Ramsey RESET test on Table 6.1.5

Ramsey RESET test using powers of the fitted values of Consumer staples	
Ho: model has no omitted variables	
F (3, 84) =	5.47
Prob > F =	0.0018

Table 6.1.21 Ramsey RESET test on Table 6.1.6

Ramsey RESET test using powers of the fitted values of Energy	
Ho: model has no omitted variables	
F (3, 84) =	0.1
Prob > F =	0.9593

Table 6.1.22 Ramsey RESET test on Table 6.1.7

Ramsey RESET test using powers of the fitted values of Financials	
Ho: model has no omitted variables	
F (3, 84) =	1.71
Prob > F =	0.1707

Table 6.1.23 Ramsey RESET test on Table 6.1.8

Ramsey RESET test using powers of the fitted values of Health Care	
Ho: model has no omitted variables	
F (3, 84) =	1.74
Prob > F =	0.1654

Table 6.1.24 Ramsey RESET test on Table 6.1.9

Ramsey RESET test using powers of the fitted values of Industrials	
Ho: model has no omitted variables	
F (3, 84) =	0.09
Prob > F =	0.9639

Table 6.1.25 Ramsey RESET test on Table 6.1.10

Ramsey RESET test using powers of the fitted values of Materials	
Ho: model has no omitted variables	
F (3, 84) =	0.18
Prob > F =	0.9118

Table 6.1.26 Ramsey RESET test on Table 6.1.11

Ramsey RESET test using powers of the fitted values of Real Estate	
Ho: model has no omitted variables	
F (3, 84) =	1.84
Prob > F =	0.1464

Table 6.1.27 Ramsey RESET test on Table 6.1.12

Ramsey RESET test using powers of the fitted values of Technology	
Ho: model has no omitted variables	
F (3, 84) =	2.53
Prob > F =	0.0626

Table 6.1.28 Ramsey RESET test on Table 6.1.13

Ramsey RESET test using powers of the fitted values of Utilities	
Ho: model has no omitted variables	
F (3, 84) =	0.47
Prob > F =	0.7049

Table 6.1.29 Ramsey RESET test on Table 6.1.14

Ramsey RESET test using powers of the fitted values of S&P 500	
Ho: model has no omitted variables	
F (3, 84) =	1.51
Prob > F =	0.2188

Table 6.1.30 Ramsey RESET test on Table 6.1.15

Ramsey RESET test using powers of the fitted values of S&P 600	
Ho: model has no omitted variables	
F(3, 84) =	0.21
Prob > F =	0.8891

Table 6.1.31 Ramsey RESET test on Table 6.1.16

Ramsey RESET test using powers of the fitted values of S&P 400	
Ho: model has no omitted variables	
F (3, 84) =	0.4
Prob > F =	0.7545

Table 6.1.32 Ramsey RESET test on Table 6.1.17

Ramsey RESET test using powers of the fitted values of Dow Jones micro	
Ho: model has no omitted variables	
F (3, 84) =	0.39
Prob > F =	0.7598

Table 6.2.1 CAARs of the GICS sector indices on the 21st of January 2020. *The table shows the Cumulative Average Abnormal Returns of the GICS sector indices following the Government's announcement of a first domestic case of Covid-19 in the U.S. on the 21st of January. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
Communication	0.22%	0.15%	-0.08%	-0.17%	0.09%	-0.59%
Consumer Disc.	0.02%	-0.09%	-0.11%	-0.40%	-0.05%	-0.46%
Consumer staples	0.40%	0.44%	0.04%	-0.17%	-0.49%	-0.35%
Energy	-1.47%	-2.29%*	-0.83%	-0.06%	-0.54%	-2.80%
Financials	-0.53%	-0.30%	0.23%	-0.33%	0.03%	-0.27%
Health care	0.30%	0.42%	0.12%	-0.90%*	-0.35%	-1.18%
Industrials	-0.75%*	-1.35%**	-0.60%	0.54%	-0.46%	0.32%
Materials	-0.77%	-1.18%	-0.41%	0.23%	-0.01%	-1.00%
Real Estate	1.15%	0.30%	-0.84%	0.10%	-0.13%	0.14%
Technology	0.26%	0.55%	0.29%	0.70%*	0.53%	1.39%
Utilities	0.83%	1.05%	0.22%	0.44%	0.11%	1.51%
Portfolio of all	-0.03%	-0.21%	-0.18%	0.00%	-0.12%	-0.30%

Table 6.2.3 CAARs of the GICS sector indices on the 3rd of March 2020. *The table shows the Cumulative Average Abnormal Returns of the GICS sector indices following the day that the Federal Open Market Committee cut the federal funds rate by 50 basis points on the 3rd of March. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
Communication	-0.27%	-1.16%	-0.89%	0.14%	-0.33%	0.72%
Consumer Disc.	0.47%	-0.33%	-0.80%**	0.31%	0.52%	1.24%
Consumer staples	0.17%	2.72%***	2.55%***	0.15%	0.21%	2.55%**
Energy	-0.01%	-2.17%*	-2.17%**	-3.79%***	0.05%	-17.80%***
Financials	-0.67%	-2.00%***	-1.33%***	-1.39%***	0.67%	-5.41%***
Health Care	-0.32%	2.14%***	2.46%***	0.87%	-0.43%	4.31%***
Industrials	0.63%	0.25%	-0.38%	1.01%**	-0.10%	-1.30%
Materials	1.97%***	1.92%**	-0.05%	-0.93%	-0.79%	-3.19%**
Real Estate	0.95%	3.27%***	2.32%***	-1.05%	3.06%***	-0.82%
Technology	-0.22%	-1.40%**	-1.18%***	0.18%	0.24%	3.00%***
Utilities	-0.67%	4.16%***	4.83%***	-0.48%	0.03%	-0.76%
Portfolio of all	0.18%	0.67%***	0.49%***	-0.45%***	0.28%**	-1.59%***

Table 6.2.4 CAARs of the GICS sector indices on the 23rd of March 2020. *The table shows the Cumulative Average Abnormal Returns of the GICS sector indices following the day that the Federal Reserve announced that it will use its full set of tools to support the economy on the 23rd of March. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
Communication	3.89%***	-0.59%	-4.47%***	-0.95%	0.15%	-8.70%***
Consumer Disc.	3.02%***	2.88%***	-0.14%	-1.96%***	-1.25%***	-3.00%***
Consumer staples	-1.48%***	-1.76%**	-0.28%	2.14%***	2.03%***	4.13%***
Energy	-3.51%***	3.00%**	6.50%***	-0.06%	-2.33%**	4.21%*
Financials	-2.90%***	-0.58%	2.32%***	-0.46%	-1.59%***	1.97%
Health Care	-2.63%***	-2.70%***	-0.07%	1.94%***	2.01%***	4.43%***
Industrials	-1.29%***	1.14%	2.43%***	-0.40%	-2.05%***	3.32%***
Materials	-2.11%***	0.41%	2.52%***	-1.04%	0.15%	2.20%
Real Estate	-4.43%***	0.32%	4.76%***	5.29%***	1.47%*	16.72%***
Technology	2.79%***	0.67%	-2.11%***	-1.88%***	-0.12%	-6.28%***
Utilities	-4.78%***	4.05%***	8.83%***	6.96%***	2.95%***	22.39%***
Portfolio of all	-1.22%***	0.62%***	1.84%***	0.87%***	0.13%	3.76%***

Table 6.2.5 CAARs of the GICS sector indices on the 9th of April 2020. *The table shows the Cumulative Average Abnormal Returns of the GICS sector indices on 9 April 2020 when the Federal Reserve announced that it will provide an additional 2.3 trillion US dollars in new loans. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
Communication	-1.02%*	0.40%	1.41%***	1.50%***	-1.64%***	0.93%
Consumer Disc.	0.19%	1.27%**	1.08%***	0.09%	0.27%	3.25%***
Consumer staples	-0.02%	-0.17%	-0.15%	-0.32%	0.01%	2.46%**
Energy	-2.61%***	-1.57%	1.04%	-2.05%**	7.63%***	-1.49%
Financials	3.42%***	1.13%*	-2.29%***	-1.77%***	2.55%***	-6.71%***
Health Care	-0.81%*	-0.86%	-0.05%	1.37%***	-0.24%	3.72%***
Industrials	-0.34%	-1.89%***	-1.55%***	-0.23%	1.72%***	-2.80%***
Materials	2.67%***	1.75%**	-0.92%	-2.13%***	1.35%**	-4.51%***
Real Estate	4.44%***	0.32%	-4.12%***	-2.92%***	2.05%***	-3.82%**
Technology	-2.22%***	-0.48%	1.74%***	0.93%**	-2.38%***	0.92%
Utilities	4.33%***	1.20%	-3.13%***	-2.95%***	2.66%***	-1.26%
Portfolio of all	0.73%***	0.10%	-0.63%***	-0.77%***	1.27%***	-0.85%***

Table 6.2.6 CAARs of the Size indices on the 21st of January 2020. *The table shows the Cumulative Average Abnormal Returns of the Size indices following the Government's announcement of a first domestic case of Covid-19 in the U.S. on the 21st of January. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
rMicro	-0.72%	-1.02%	-0.30%	-0.51%	-0.34%	-0.40%
rMid	-0.24%	-0.25%	-0.01%	0.01%	-0.06%	0.36%
rLarge	0.03%	0.03%	0.00%	0.01%	0.01%	-0.03%
rSmall	-0.52%	-0.51%	0.01%	-0.37%	-0.28%	0.12%
Portfolio of all	-0.36%	-0.44%	-0.08%	-0.22%	-0.17%	0.01%

Table 6.2.8 CAARs of the Size indices on the 3rd of March 2020. *The table shows the Cumulative Average Abnormal Returns of the Size indices following the day that the Federal Open Market Committee cut the federal funds rate by 50 basis points on the 3rd of March. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
rMicro	0.32%	-1.87%*	-2.19%***	-0.38%	-3.70%***	-9.08%***
rMid	0.90%***	-0.11%	-1.01%***	0.12%	-1.41%***	-2.78%***
rLarge	-0.09%**	0.02%	0.11%***	-0.01%	0.16%***	0.29%***
rSmall	1.07%**	-0.52%	-1.59%***	0.14%	-2.63%***	-4.46%***
Portfolio of all	0.55%	-0.62%	-1.17%***	-0.03%	-1.89%***	-4.00%***

Table 6.2.9 CAARs of the Size indices on the 23rd of March 2020. *The table shows the Cumulative Average Abnormal Returns of the Size indices following the day that the Federal Reserve announced that it will use its full set of tools to support the economy on the 23rd of March. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
rMicro	1.44%**	-0.04%	-1.48%*	0.74%	-1.35%*	-4.75%**
rMid	-0.01%	0.54%	0.55%	-0.74%*	-0.96%***	0.88%
rLarge	-0.05%	-0.03%	0.02%	0.05%	0.09%**	0.07%
rSmall	1.85%***	0.25%	-1.59%**	-0.08%	-1.35%**	-3.99%***
Portfolio of all	0.81%**	0.18%	-0.63%	-0.01%	-0.89%**	-1.95%**

Table 6.2.10 CAARs of the Size indices on the 9th of April 2020. *The table shows the Cumulative Average Abnormal Returns of the Size indices on 9 April 2020 when the Federal Reserve announced that it will provide an additional 2.3 trillion US dollars in new loans. The star symbols "*", "**" and "***" show significance on the 10%, 5% and 1% level, respectively.*

SECURITY	CAAR[0,0]	CAAR[0,1]	CAAR[1,1]	CAAR[3,3]	CAAR[5,5]	CAAR[1,5]
rMicro	4.41%***	3.02%***	-1.39%**	-2.35%***	3.09%***	-5.50%***
rSmall	3.34%***	1.36%*	-1.99%***	-2.17%***	1.47%***	-5.32%***
rMid	1.61%***	-0.17%	-1.79%***	-1.38%***	0.79%**	-4.07%***
rLarge	-0.18%***	-0.02%	0.16%***	0.13%***	-0.08%**	0.38%***
Portfolio of all	2.30%***	1.05%**	-1.25%***	-1.44%***	1.32%***	-3.63%***