Erasmus University Rotterdam

Erasmus School of Economics

Bachelor Thesis Finance

An Event Study on the Effects of COVID-19 on Stock Prices Across Industrial Sectors

Name Student: Bob de Jager

Student ID Number: 512316

Supervisor: Ricardo Barahona

Second assessor:

Date Final Version: July 10th, 2021

Table of Contents

Abstract

In this article, an event study method is used to empirically study the effects of the COVID-19 pandemic on the sector-specific stock prices in the United States and multiple European countries. This was done by distinguishing 3 different events which took place during the unfolding of the pandemic and analysing the abnormal returns during this period. It was found that the financial sector was negatively impacted by the pandemic, whilst the utility sector saw a positive impact. It also became evident that 5 out of the 6 markets have recovered from their initial drawdown due to the crisis. Lastly, a negative correlation was found between the amount of cases within a country and the abnormal returns of the energy sector, as well as a positive relation for the consumer discretionary sector.

1. Introduction

It has been over a year now since the Novel Coronavirus (COVID-19) turned from a small local crisis in the Hubei Province in China to a worldwide pandemic, leading to more than 181 million confirmed cases and over 3.9 million deaths worldwide (World Health Organization, 2021).[1] The outbreak of this pandemic has caused significant concerns regarding the health of people all around the world. These concerns have led to governments laying down restrictions on their citizens, mainly in the form of reduced social interactions or even requiring them to stay at home, to hopefully slow down the spread of the virus. This combination of concerns and increasing restrictions also had various effects on the worldwide economy, a topic on which previous research has been done.

One side of the story to look at is the side of the investors and the changes in their beliefs and behaviour following such a sudden crisis. The outbreak of the pandemic has been found comparable in many aspects to a sudden terrorist attack, as it is an exogenous shock that has a huge impact on the everyday life, causes public fear, and brings along significant (economic)

---

[1] These numbers are as of June 30th, 2021. The World Health Organization provides constantly updated information about confirmed cases, deaths and vaccinations on their website: https://covid19.who.int/

3

uncertainty (Goodell, 2020). Investor behaviour, following these kinds of events, changes to a more conservative way of investing. Reduced investment activity in general, and particularly in risky asset groups, is the most visible manifestation of this (Levy and Galili, 2006; Luo et al., 2020; Wang and Young, 2020). Burch et al (2016) display that during the crisis triggered by 9/11, there was a lot of retail investor selling, which propelled asset prices down.

This pattern is also noticeable as the financial markets suffered a massive decline at the start of 2020, due to the spread of the disease and the increase of uncertainty within the investor community. The FTSE100, the UK's main index, for example, fell more than 10% and had its worst day since Black Monday in 1987. This was also the case for the S&P 500 and the Dow Jones from the United States, which both plummeted around 9.5%. The main indices of Germany and France, the DAX30 and CAC40 respectively, suffered an even bigger hit, losing more than 12% of their value.[2] The AEX and the FTSE MIB also recorded the second worst performances to date, with the Dutch index falling almost 11% and the Italian index closing the day with a loss of approximately 17%.[3] While the indices as a whole have bounced back in quite spectacular fashion last year and even reached new all-time highs, only a few studies have been conducted on COVID-19 and its effect on the stock market at the sector level.

An example of one of these studies is from He, Sun and Zhang (2020), who focused on the impact of COVID-19 on the stock prices across different sectors within the Chinese stock market by using an event study methodology. They discovered that the pandemic had a negative effect on the transportation, mining, energy & heating, and environment industries, while the manufacturing, information technology, education, and health industries saw a rise in stock market trust. By widening the researched market from only China to the United States and several European countries, such as France, Germany, Italy, the Netherlands, and the United Kingdom, a broader picture can now be drawn and multiple comparisons can be made, further increasing this field of research.

In addition to this, Yan, Stuart, Tu & Zhang (2020) used a comparison with the Spanish Flu to analyse the market effect of COVID-19 in the long term. They take this approach for each separate

---

[2] https://www.bbc.com/news/business-51829852

[3] https://www.nu.nl/economie/6037037/aex-en-wall-street-beleven-door-coronavirus-slechtste-dag-sinds-1987.html

4

industry and determine whether or not it can recover in the future. In their conclusion, they find that pandemic outbreaks lead to a severe loss in value of various industries in the short run due to panic selling, but that in the long run, every one of the affected industries recover their losses. This paper could be a welcome addition to this part of the literature by providing more information on the markets a year later and whether they have recovered or not.

In this article, I will firstly examine how the COVID-19 outbreak affected stock returns across industrial sectors in the United States and multiple European markets. This can be accomplished by identifying key moments, such as the first outbreak or the first lockdown, and analysing changes in stock returns around these dates. To determine these dates, I will make use of the COVID-19 Stringency Index, which combines a set of indicators and produces a number between 0 and 100 to reflect the amount of government action against COVID-19 within a country.[4] We can compare the impact of COVID-19 during the same key moments in various markets by conducting an event analysis on all of these key moments within different countries. Secondly, I will perform a second set of analyses to look and see if the industrial sectors have recovered their previous values, or if any have fallen behind. This is accomplished by evaluating stock prices just before the outbreak of the pandemic to current stock prices. Lastly, the relationship between the number of COVID-19 cases and the abnormal returns will also be explored, using a regression.

The remainder of this paper will be organized as follows: The key moments will be described and specified in section 2. Section 3 shows and explains the data that was used in the research. The methodology will be discussed in Section 4 of this paper. The results of the analyses will be presented in section 5. The discussion of these findings will take place in Section 6. The final section will conclude the paper.

---

[4] The Stringency Index is continuously updated and can be seen on the following site: *https://ourworldindata.org/grapher/covid-stringency-index.*

All data for the Stringency Index is provided by Thomas Hale, Noam Angrist, Rafael Goldszmidt, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster, Emily Cameron-Blake, Laura Hallas, Saptarshi Majumdar, and Helen Tatlow. (2021). "A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)." Nature Human Behaviour.

2. Dates of interest and measurements

2.1. *Crucial points within the pandemic*

The event study is focused on a few key moments within the growth of the pandemic. I recognize 3 different crucial points within the pandemic, namely the first minor measurements, the first major measurements and the first lockdown. These 3 crucial points within the development of the pandemic will be defined using the Stringency Index, which has already been shortly described in the previous section. The Stringency Index is a research project organized by the University of Oxford to continuously track and compare policy responses throughout the world. A group of researchers developed a list of 20 indicators that range from social to financial steps taken by the government and result in a number between 1 and 100 when added together.

2.2. *Lockdown*

Certain levels of this Stringency Index have been chosen to indicate whether minor restrictions, major restrictions or a lockdown were in place. Firstly, an index level of 75 was chosen to distinguish a lockdown. This was determined by comparing news stories and press conferences from the different countries and their rising Stringency Index, as shown in figure 1. A clear pattern becomes recognizable in which the Stringency Index passes the 75-point mark at the date a lockdown is declared. For example, on March 9, 2020, Italy became the first country to extend the partial lockdown into a nationwide lockdown.[5] Following Italy, France declared a full lockdown on March 17th, shutting almost all shops and schools, and prohibiting people from being outside unless they could provide an official form stating the reason why they were outside.[6] Lastly, the so-called intelligent lockdown was introduced in the Netherlands on the 23rd of March, reducing

---

[5] On the 9th of March the partial lockdown was expanded to the entire country and all sporting events were cancelled. Opening of restaurants and cafes was limited and gyms, museums, and swimming pools were completely closed. Any public gathering was now also severely restricted. More details can be found via:
https://www.theguardian.com/world/2020/mar/09/coronavirus-italy-prime-minister-country-lockdown?utm_term=Autofeed&CMP=twt_gu&utm_medium&utm_source=Twitter#Echobox=1583793579

[6] On the 17th of March the lockdown became effective in France. Official forms were from now on needed when traversing outside with legitimate reason. Everyone was urged to work from home as much as possible, as well as study from home. More details provided here:
https://www.nytimes.com/2020/03/17/world/europe/paris-coronavirus-lockdown.html

the amount of social interactions and closing most of the retail industry.[7] For each of these instances the date of lockdown coincides with the Stringency Index passing the 75-point mark. For the countries of Germany, the United Kingdom, and the United States the date of lockdown was the 22nd of March, the 17th of March, and the 22nd of March, respectively. Despite the fact that the United States has never met the criteria for a lockdown, I will treat this date as though it were the start of the lockdown because it is the highest point the index has ever reached.

2.3. *Major restrictions*

Secondly, the major restrictions were classified as an index level greater than 40. This was chosen as it is approximately halfway between no restrictions and a complete lockdown. By choosing this benchmark the event study for these dates gives a good insight in the effects of the development of the virus as it becomes more prominent. The first country to apply major restrictions was Italy, doing this on February 22nd, 2020. On the 2nd of March France followed Italy and also applied major restrictions. The Netherlands, the United States, and Germany all imposed significant restrictions within days of each other on March 12th, 15th, and 16th, respectively. The United Kingdom was the last to do so, doing so on March 20th.The United Kingdom was the last to do this, doing so on the 20th of March.

2.4. *Minor restrictions*

At last, the threshold for minor restrictions was set at 10 index points. This has been set to such a low level on purpose in order to detect the effects of the first minor signs of an impending lockdown. As seen in figure 1, Italy is yet again the first country to introduce minor restrictions, which were introduced on January 30th, 2020. Shortly behind Italy were the United Kingdom, who laid down minor restrictions on the 2nd of February. About one and a half weeks later, on February 12th, Germany applied the first minor restrictions. Over a span of about three weeks France, the

---

[7] The government of the Netherlands provided a timeline on all measures implemented. On 23rd of March the intelligent lockdown was introduced and gatherings of more than 100 people were prohibited. All hotels, restaurants, and cafés were closed as well as barbers and beauty salons. Everyone urged to stay at home when possible.
This is viewable on: https://www.rijksoverheid.nl/onderwerpen/coronavirus-tijdlijn/maart-2020-maatregelen-tegen-verspreiding-coronavirus

United States and the Netherlands also imposed minor restrictions, doing so on the 25th of February, the 2nd of March, and the 6th of March, respectively.

Figure 1: COVID-19 Stringency Index
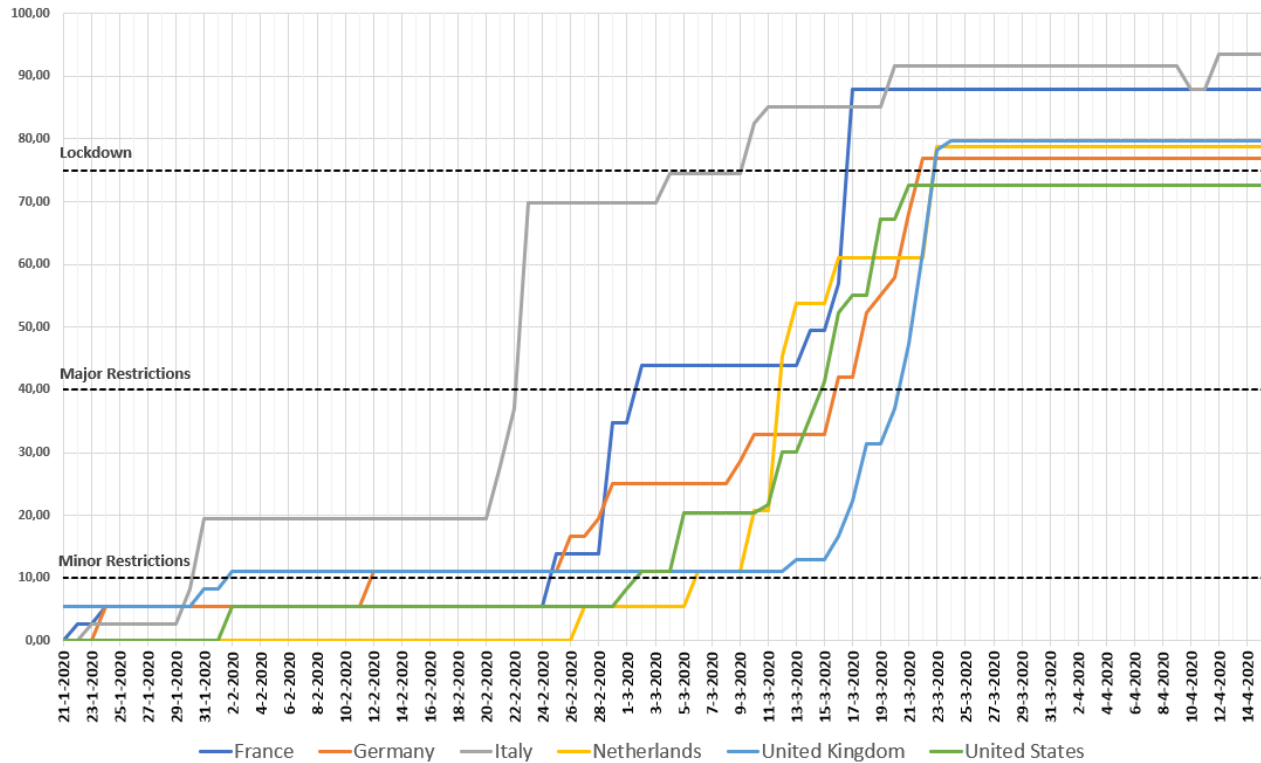
This figure shows the progression of the Stringency Index within the countries of France, Germany, Italy, the Netherlands, the United Kingdom and the United States. The dashed lines indicate the level of minor restrictions, major restrictions and the lockdown, respectively at 10, 40 and 75 index points. The x-axis depicts the timeline, ranging from January 21st, 2020 up until April 15th, 2020. Source: *https://ourworldindata.org/grapher/covid-stringency-index.*

2.5. Long-term recovery

To assess whether the markets have restored after the crash, the date the lockdown was introduced will be compared to the same date, but now a year later. This will mean that for Italy, for example, March 9th, 2021 will be used for the second set of analyses. For France this will be March 17th, 2021. Germany and the United States first entered lockdown on the 22nd of March, 2020, and therefore the 22nd of March, 2021 will be used. Lastly, for the Netherlands, as well as

for the United Kingdom, this date will be March 23th, 2021. The date to which all these dates will be compared is set at the 24th of January, 2020, as this is a week before the first minor restrictions were introduced by Italy.

3. Data

To conduct my regressions, I will be using cross sectional stock market data from 6 different countries, namely France, Germany, Italy, the Netherlands, the United Kingdom and the United States, as mentioned before. All companies that make up the main market index in France (CAC40), Germany (DAX30), Italy (FTSE MIB), and the Netherlands (AEX) were included in the database. Unfortunately, data on Peugeot from the CAC40 was unavailable and is therefore not included in the dataset. This is the same for UBI Banca from the FTSE MIB, which therefore is also missing in this dataset. Unilever had to be removed from the AEX database as data on the stock prices didn't go back far enough, while Prosus only had data onward from November 11th, 2019 and is therefore only partly included into the dataset. From the main market indices of the United States (S&P 500) and the United Kingdom (FTSE 100) only the top 50 companies based on market capitalization were put into the database.[8] The database contains daily stock data for these companies from July 1st, 2019 to May 24th, 2021. This data includes the date, the ticker symbol, the close price at the end of the day and the industrial sector the company operates in, according to the Global Industry Classification Standard (GICS). All the data was collected with Yahoo Finance, except for the data on the S&P 500, which was retrieved from Compustat and Yahoo Finance. In total, I have collected 110,565 daily stock prices from 233 different companies.

The data on the number of COVID-19 cases is provided by the European Centre for Disease Prevention and Control. The dataset consists of the date, the amount of new cases, the amount of deaths, and the cumulative number of cases per 100,000 inhabitants for the last 14 days. This last variable is especially useful in determining how quickly the virus was spreading. The dataset provides daily data from the 31st of December, 2019 until the 14th of December, 2020. Beyond this last date only weekly data is provided.

---

[8] The full list of all companies that were used in the study can be found in the appendix.

9

4. Methodology

4.1. Event study

An event study aims to examine the unusual changes in stock prices in the period in which a specific event is happening. The most common way to perform such a study is a market model, which uses the relationship between an individual stock's return and the total market return to determine any abnormal returns (Armitage, 1995). This is done by first calculating the normal rate of return:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \tag{1}$$

Then calculate the average abnormal rate of return:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t}) \tag{2}$$

At last, the cumulative abnormal rate of return can be calculated:

$$CAR_{i(t_1,t_2)} = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{3}$$

Where $R_{i,t}$ is the rate of return of stock i on day t, $R_{m,t}$ is the return of the trading market on day t, α_i and β_i are the coefficients from the regression of the daily return rate of stock i and the market return rate. $AR_{i,t}$ is the average abnormal return rate that belongs to stock i on trading day t. This is calculated by subtracting the expected rate of return of stock i from the actual return. $CAR_{i(t_1,t_2)}$ is the cumulative abnormal return rate of stock i during the period of the event, which spans from t_1 to t_2.

4.2. Analysis on different industrial sectors and countries

The analysis is expanded into a range of industrial sectors and countries, containing all six markets. For each of the 3 key events (first minor restrictions, first major restrictions, and lockdown) the cumulative abnormal returns will be calculated for each separate industrial sector within each separate country. This way, I will end up with plenty of results, which I can use to assess the change in abnormal returns for each sector within each country. In addition to this, comparing the reactions of the same industrial sector in different countries becomes much easier using this method, as well as comparing different countries as a whole to each other.

The companies were divided into sectors according to the Global Industry Classification Standard (GICS).[9] The GICS classifies 11 different sectors, which are shown in table 1.

Table 1: GICS sector classification

Sector Code	Sector classification	Example company
10	Energy	Shell & BP
15	Materials	Anglo American plc & ArcelorMittal SA
20	Industrials	Boeing Co & UPS
25	Consumer Discretionary	Amazon & Home Depot
30	Consumer Staples	Walmart & Ahold Delhaize
35	Health Care	Pfizer & Johnson and Johnson
40	Financials	Bank of America & JPMorgan Chase & Co.
45	Information Technology	Apple & Microsoft
50	Communication Services	Netflix & Verizon
55	Utilities	National Grid & Snam SpA
60	Real Estate	Segro plc & Deutsche Wohnen SE

This table shows the sector code and the sector classification according to the Global Industry Classification Standard. An example has also been given to illustrate what kind of companies fall within certain sectors. Source: *https://www.msci.com/documents/1296102/11185224/GICS+Methodology+2020.pdf/9caadd09-790d-3d60-455b-2a1ed5d1e48c?t=1578405935658*

4.3. Event window

In section 2, the most essential event dates have already been defined. The effects of these essential events on the stock prices are of course not concentrated on one single day, but spread across several days surrounding the event. This is why the event window has been set to span from 3 trading days before until 3 trading days after the event.

Before the event window, an estimation period has to be established, in which the α_i and the β_i can be calculated . The selection of the length of the estimation period is a difficult choice, where a longer period brings more accuracy within the prediction model on one side but, however

---

[9] The Global Industry Classification Standard was created in 1999 by Morgan Stanley Capital International and Standards & Poor's. The full guide regarding the GICS can be found here:
https://www.msci.com/documents/1296102/11185224/GICS+Methodology+2020.pdf/9caadd09-790d-3d60-455b-2a1ed5d1e48c?t=1578405935658

also increases model parameter instability on the other hand. (Peterson, 1989). The typical lengths of such estimation periods range from 100 up to 300 days. For this particular research, the parameter stability is most important, as these parameters are mainly used to determine the normal- and abnormal returns of the market and individual stocks. This is why a relatively short estimation period of just 120 days is chosen.

The timeline that has been used for this analysis can be represented as follows:

Estimation Period		Event Period	
150 days		3 days	3 days
t_s		t_{pre}	t_e t_{post}
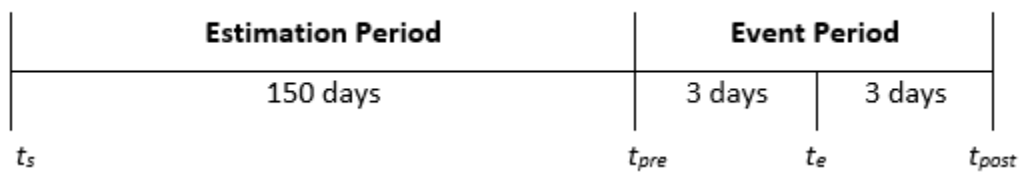
Where t_s stands for the first trading day used for the estimation of the normal rate of return, t_{pre} equals the last trading day used to estimate the normal rate of return, as well as the first trading day used in the calculation of the abnormal returns, t_e is the date of the event, and t_{post} is the last trading day used in the calculation of the abnormal returns.

4.4. Long-term recovery

The long-term recovery will be assessed by comparing the market right before the COVID-19 pandemic broke out and a year after the lockdown has been introduced. These dates have been previously mentioned in section 2. By comparing the levels of the total market indices and the average stock prices of individual industrial sectors, there can be determined whether the market has recovered, as predicted by Yan, Tu, Stuart and Zhang (2020). This way it will also be clear which industrial sectors have been struggling to return to their pre-pandemic levels and which sectors actually may have benefitted from the COVID-19 outbreak.

For this analysis the average stock prices within the sectors have been collected on the dates mentioned in section 2. This was done by using the closing stock prices on that particular date and averaging these across the different industrial sectors. The percentual change between the average stock prices before the minor restrictions and a year after the lockdown is calculated and tabulated in the results section.

4.5. Effect of the amount of cases on cumulative abnormal returns

Besides just analysing the cumulative abnormal returns per sector within each country, it is also important to understand the relationship between the amount of COVID-19 cases and the cumulative abnormal returns. This is done by pooling all the available data and performing two regressions for each of the separate events, such as the introduction of minor restrictions, major restrictions and lockdown. By performing these two regressions the general effect of the cases on cumulative returns, as well as the sector-specific effects can be calculated. The regressions are structured as follows:

General effect:

$$CAR_{i,c} = \alpha + \beta_1 * Cases_c + u_{i,c} \tag{5}$$

Sector-specific effect:

$$CAR_{i,c} = \alpha + \sum_{k=1}^{10}(\beta_k * SectorID * Cases_c) + u_{i,c} \tag{6}$$

Where $CAR_{i,c}$ is the cumulative abnormal returns of stock *i* within country *c*. The α denotes the constant of the regression and $Cases_c$ is equal to the amount of new COVID-19 cases in country *c*. The term $\sum_{k=1}^{10}(\beta_k * SectorID_k * Cases_c)$ portrays a set of 10 interaction variables which consists of a dummy variable $SectorID_k$ for each separate sector except for the Real Estate sector and the cases per country, $Cases_c$. At last, the $u_{i,c}$ stands for the error term of the regression.

5. Results

5.1. Minor Restrictions

Table 2 shows the cumulative abnormal returns of each sector within each country which are due to the minor restrictions being introduced. It can be seen in Table 2 that most sectors did not show significant abnormal returns. However, the financials sector saw a significant negative abnormal return in 3 different countries, with the United States seeing the largest negative return of 13.43%. Another significant change is noticeable in Italy, where the communication services experienced a negative cumulative return of 7.57% compared to the market.

Table 2: Cumulative abnormal returns – minor restrictions

Cumulative Abnormal Returns

Sector	AEX 06/03/2020	CAC40 25/02/2020	FTSE MIB 30/01/2020	FTSE100 02/02/2020	DAX30 12/02/2020	S&P500 02/03/2020
Energy	-0.0356	-0.0038	-0.0048	-0.0277	0.0321	-0.0758
	(-1.157)	(-0.077)	(-0.151)	(-0.725)	(0.962)	(-1.004)
Materials	-0.0291	-0.0058	-0.1842	0.0198	-0.0161	-
	(-0.623)	(-0.359)	(-0.567)	(0.640)	(-0.611)	-
Industrials	-0.0028	-0.0123	0.0171	0.0090	-0.0149	0.0402
	(-0.054)	(-0.280)	(0.316)	(0.249)	(-0.610)	(0.930)
Consumer Discretionary	0.0399	-0.0140	-0.0226	-	0.0053	0.0122
	(0.581)	(-0.338)	(-0.493)	-	(0.107)	(0.215)
Consumer Staples	0.0221	0.0238	0.0092	-0.008	-	0.0808
	(0.545)	(0.852)	(0.295)	(-0.202)	-	(1.428)
Health Care	-0.0088	-0.0034	-0.0021	-0.015	-0.0036	0.0735
	(-0.247)	(-0.120)	(-0.082)	(-0.461)	(-0.220)	(1.529)
Financials	-0.0904**	-0.0602*	-0.0096	0.0094	0.0229	-0.1343**
	(-2.375)	(-1.852)	(-0.318)	(0.429)	(0.906)	(-2.650)
Information Technology	0.0236	0.0002	-0.0049	-0.0342	-0.0027	0.0062
	(0.345)	(0.004)	(-0.104)	(-0.337)	(-0.103)	(0.150)
Communication Services	-0.0370	0.0101	-0.0757*	-0.0399	0.0397	0.0148
	(-0.833)	(0.241)	(-1.720)	(-0.940)	(1.397)	(0.208)
Utilities	-	0.0174	0.0189	0.0027	-	-
	-	(1.592)	(1.484)	(0.090)	-	-
Real Estate	-0.0720	-	-	0.0278	-0.0022	-
	(-1.210)	-	-	(0.791)	(-0.078)	-

This table shows the cumulative abnormal returns of each sector within each market during the event window after the minor restrictions were imposed. The t-test statistic is shown between brackets below the cumulative returns.

***, **, and * are significant at the 1%, 5%, and 10% confidence levels, respectively.

5.2. Major Restrictions

In table 3 the cumulative abnormal returns that are the results of the major restrictions are shown for each sector within each separate country. It is noticeable that the major restrictions do not cause a lot more significant abnormal returns. Table 3 shows significant positive returns within the utilities sector within France and Italy, with cumulative abnormal returns of 8.08% and 3.57%, respectively. The materials sector in Italy and the financials sector in France also show significant abnormal returns. Lastly, the real estate sector in the Netherlands shows a significant

negative abnormal return of 34.43%. It is hard to assess this result though, as the real estate sector within the AEX only consists of a single company, making the results very sensitive to the individual circumstances of this company.

Table 3: Cumulative abnormal returns – major restrictions

Cumulative Abnormal Returns

Sector	AEX 12/03/2020	CAC40 02/03/2020	FTSE MIB 22/02/2020	FTSE100 20/03/2020	DAX30 16/03/2020	S&P500 15/03/2020
Energy	-0.1874 (-1.516)	0.0333 (0.646)	0.0183 (0.580)	0.1118 (0.718)	0.0168 (0.207)	-0.1398 (-0.872)
Materials	-0.0712 (-0.625)	0.0244 (1.473)	0.1139** (2.40)	0.0580 (0.453)	0.0544 (0.885)	- -
Industrials	0.0060 (0.108)	-0.0220 (-0.475)	-0.0103 (-0.244)	-0.0946 (-0.496)	-0.1103 (-0.888)	-0.0015 (-0.014)
Consumer Discretionary	0.1602 (1.344)	-0.0233 (-0.503)	-0.0173 (-0.292)	- -	-0.0895 (-0.852)	-0.0282 (-0.169)
Consumer Staples	0.0705 (0.909)	0.0429) (1.128)	-0.0426 (-0.911)	-0.0529 (-0.393)	- -	0.0467 (0.424)
Health Care	0.0292 (0.819)	0.0242 (0.552)	-0.0109 (-0.286)	0.0440 (0.378)	0.0076 (0.079)	-0.0312 (-0.313)
Financials	-0.1337 (-0.992)	-0.1051** (-2.695)	-0.0299 (-0.947)	-0.0375 (-0.314)	-0.0512 (-0.517)	0.0129 (0.130)
Information Technology	-0.0098 (-0.104)	-0.0160 (-0.438)	-0.0124 (-0.228)	0.0537 (0.392)	-0.0565 (-0.571)	0.0719 (0.633)
Communication Services	0.1522 (1.089)	-0.0254 (-0.549)	-0.0110 (-0.156)	0.0359 (0.316)	0.0567 (1.042)	0.0529 (0.413)
Utilities	- -	0.0808** (2.545)	0.0357** (2.197)	-0.1015 (-0.930)	- -	- -
Real Estate	-0.3443* (-1.825)	- -		0.0176 (0.126)	0.0485 (0.545)	- -

This table shows the cumulative abnormal returns of each sector within each market during the event window after the minor restrictions were imposed. The t-test statistic is shown between brackets below the cumulative returns. ***, **, and * are significant at the 1%, 5%, and 10% confidence levels, respectively.

5.3. Lockdown

Table 4 shows the cumulative abnormal returns around the date when the lockdown was imposed. It becomes clear that the period in which the lockdown was initiated did not cause for any significant abnormal returns. While some results have a t-statistic of around 1, not one of them is significant, not even at the 10% significance level.

15

Table 4: Cumulative abnormal returns – Lockdown

Cumulative Abnormal Returns

Sector	AEX 23/03/2020	CAC40 17/03/2020	FTSE MIB 09/03/2020	FTSE100 23/03/2020	DAX30 22/03/2020	S&P500 22/03/2020
Energy	0.1566	-0.0732	-0.0276	0.1664	-0.0646	0.0862
	(0.954)	(-0.716)	(-0.312)	(1.113)	(-0.607)	(0.609)
Materials	-0.0101	0.0529	-0.0460	0.0359	-0.0349	-
	(-0.070)	(0.685)	(-0.706)	(0.286)	(-0.668)	-
Industrials	-0.0592	-0.0697	-0.0420	-0.0282	0.0453	-0.0242
	(-0.533)	(-0.384)	(-0.559)	(-0.168)	(0.269)	(-0.253)
Consumer Discretionary	-0.1546	0.0353	0.0770	-	0.0724	0.0613
	(-0.971)	(0.395)	(0.623)	-	(0.610)	(0.518)
Consumer Staples	-0.1563	0.0934	0.0338	-0.0633	-	-0.0689
	(-1.236)	(0.730)	(0.437)	(-0.447)	-	(-0.717)
Health Care	0.0062	0.0849	0.1046	-0.0009	-0.0269	-0.0057
	(0.053)	(0.694)	(0.933)	(-0.007)	(0.232)	(-0.073)
Financials	0.0715	-0.0788	-0.0093	0.0132	0.0815	-0.0223
	(0.538)	(-0.549)	(-0.124)	(0.110)	(0.778)	(-0.292)
Information Technology	-0.236	-0.0379	-0.0020	0.0464	0.0221	0.0119
	(-0.170)	(-0.315)	(-0.034)	(0.327)	(0.206)	(0.133)
Communication Services	-0.0839	0.0238	-0.1589	0.0256	-0.0644	-0.0483
	(-0.585)	(0.202)	(-1.450)	(0.233)	(-0.745)	(-0.436)
Utilities	-	-0.0893	0.0121	-0.0197	-	-
	-	(-0.700)	(0.219)	(-0.127)	-	-
Real Estate	-0.0692	-	-	0.0215	0.0020	-
	(-0.261)	-	-	(0.155)	(0.028)	-

This table shows the cumulative abnormal returns of each sector within each market during the event window after the minor restrictions were imposed. The t-test statistic is shown between brackets below the cumulative returns. ***, **, and * are significant at the 1%, 5%, and 10% confidence levels, respectively.

5.4. Long-term recovery

Table 5, table 6, and table 7 show the average stock prices for each separate sector within each country on January 24th, 2020 compared to one year after the lockdown was imposed. In this section I will shortly discuss the two markets mentioned in each table. Afterwards I will make a short remark regarding all markets.

The two markets in table 5 are the AEX and the CAC40. As can be seen in table 5, both markets have recovered to their pre-pandemic levels, with the average stock price within the AEX even increasing by 30.43%. This increase is smaller in France, but is still noticeable at 9.13%. When

Table 5: Long-term recovery stock prices – AEX and CAC40

	Average Stock Price					
	AEX			CAC40		
Sector	24/01/2020	23/03/2021	Change	24/01/2020	17/03/2021	Change
Energy	€25.91	€16.88	-34.85% [a]	€31.55	€26.34	-16.51% [b]
Materials	€71.68	€87.37	21.89% [c]	€130.60	€135.50	3.75% [a]
Industrial	€56.76	€67.61	19.12% [d]	€87.11	€75.12	-13.76% [d]
Consumer Discretionary	€81.38	€79.62	-2.16% [a]	€368.71	€464.20	25.90% [d]
Consumer Staples	€61.47	€56.08	-8.77% [b]	€131.02	€140.69	7.38% [d]
Health Care	€44.70	€48.13	7.67% [a]	€114.06	€108.19	-5.15% [b]
Financials	€20.26	€22.80	12.54% [d]	€36.92	€36.19	-1.98% [d]
Information Technology	€259.61	€546.91	110.67% [d]	€92.76	€102.60	10.61% [d]
Communication Services	€2.74	€2.87	4.74% [a]	€26.41	€30.17	14.24% [c]
Utilities	-	-	-	€26.99	€22.61	-16.23% [a]
Real Estate	€132.00	€65.98	-50.02% [a]	-	-	-
Total	**€756.51**	**€994.25**	**30.43%**	**€1046.13**	**€1141.61**	**9.13%**

This table shows the stock prices on the 14th of January, 2020, a week before the first minor restrictions were imposed in Italy, and on the date a year after the lockdown was imposed. This was the 23rd of March, 2021 for the Netherlands and the 17th of March, 2021 for France (See section 2). In the third column the percentage change between the two average stock prices is shown. Lastly, next to the percentage change is also noted how many companies were used to calculate the averages, which is as follows:
a = 1 company used to determine average
b = 2 companies used to determine average
c = 3 companies used to determine average
d = 4 or more companies used to determine average

comparing the two, it becomes clear that the energy sector is lagging behind in both countries, down 34.85% and 16.51% in the Netherlands and France, respectively. However, for both indices the energy sector consists of less than 3 individual companies, making these results more sensitive to fluctuations of individual companies. The same is the case for the real estate sector in the AEX. While it seems that the sector lost approximately half its value, the average only consists of a single company. Another remarkable result is the 110.67% increase of the average stock price within the AEX information technology sector.

Table 6 consists of the average stock prices of the FTSE MIB and the FTSE100, the indices of Italy and the United Kingdom, respectively. The Italian index saw a recovery of 10.21%, while the United Kingdom saw an overall decline of 1.29% in the average stock prices. It is noticeable that the energy sector sees large declines, just as we have seen in the previous two markets. For both these markets, however, more than 4 individual companies were used to determine the

Table 6: Long-term recovery stock prices – FTSE MIB and FTSE100

Average Stock Price

Sector	FTSE MIB			FTSE100		
	24/01/2020	09/03/2021	Change	24/01/2020	23/03/2021	Change
Energy	€6.55	€5.51	-15.88% [d]	£1584.66	£1136.89	-28.26% [d]
Materials	€0.50	€0.40	-20.00% [a]	£1881.59	£2408.90	28.02% [d]
Industrial	€16.03	€14.51	-9.48% [d]	£3093.33	£4319.48	39.64% [d]
Consumer Discretionary	€37.65	€40.59	7.81% [d]	-	-	-
Consumer Staples	€13.10	€12.83	-2.06% [b]	£3331.93	£3332.44	0.02% [d]
Health Care	€60.72	€77.92	28.33% [c]	£3786.67	£3287.07	-13.19% [c]
Financials	€15.77	€14.97	-5.07% [d]	£1361.00	£1260.98	-7.35% [d]
Information Technology	€24.48	€28.65	17.03% [b]	£6358.00	£5161.50	-18.82% [b]
Communication Services	€10.24	€9.55	-6.74% [a]	£830.75	£748.34	-9.92% [d]
Utilities	€4.88	€4.39	-10.04% [a]	£219.10	£195.10	-10.95% [a]
Real Estate	-	-	-	£739.50	£1036.60	40.18% [b]
Total	**€189.92**	**€209.32**	**10.21%**	**£23186.53**	**£22887.30**	**-1.29%**

This table shows the stock prices on the 14th of January, 2020, a week before the first minor restrictions were imposed in Italy, and on the date a year after the lockdown was imposed. This was the 9th of March, 2021 for Italy and the 23rd of March, 2021 for the United Kingdom (See section 2). In the third column the percentage change between the two average stock prices is shown. Lastly, next to the percentage change is also noted how many companies were used to calculate the averages, which is as follows:
a = 1 company used to determine average
b = 2 companies used to determine average
c = 3 companies used to determine average
d = 4 or more companies used to determine average

average stock prices, providing more certainty for these results. The financial sector, as well as the utility, and communication services sectors, have all seen declines in both countries, with the utility sector losing the most value of roughly 10%. Contrasting results can be seen within the information technology sector, where Italy gained 17.03% and the United Kingdom lost 18.82%.

Lastly, another interesting result is the 40.18% increase within the real estate sector in the United Kingdom. It does suffer from the same problem that has been mentioned before, as only 2 companies were used to determine the average stock price.

Table 7: Long-term recovery stock prices – DAX30 and S&P 500

Average Stock Price

Sector	DAX30			S&P 500		
	24/01/2020	22/03/2021	Change	24/01/2020	22/03/2021	Change
Energy	€21.19	€20.38	-3.82% [b]	$89.09	$79.23	-11.07% [b]
Materials	€91.72	€97.19	5.96% [d]	-	-	-
Industrial	€125.73	€112.20	-10.76% [d]	$146.90	$186.60	27.03% [b]
Consumer Discretionary	€129.50	€150.33	16.08% [d]	$503.97	$886.63	75.93% [d]
Consumer Staples	-	-	-	$150.12	$157.17	4.69% [d]
Health Care	€86.84	€81.74	-5.87% [d]	$149.31	$184.91	23.84% [d]
Financials	€162.77	€154.15	-5.30% [d]	$110.28	$111.99	1.55% [d]
Information Technology	€71.60	€69.37	-3.11% [b]	$173.22	$240.14	38.63% [d]
Communication Services	€14.80	€16.45	11.14% [a]	$331.53	$454.74	37.16% [d]
Utilities	-	-	-	-	-	-
Real Estate	€44.64	€47.87	7.24% [b]	-	-	-
Total	**€748.79**	**€749.68**	**0.12%**	**$1654.42**	**$2301.41**	**39.11%**

This table shows the stock prices on the 14th of January, 2020, a week before the first minor restrictions were imposed in Italy, and on the date a year after the lockdown was imposed. This was the 22nd of March, 2021 for Germany and the United States (See section 2). In the third column the percentage change between the two average stock prices is shown. Lastly, next to the percentage change is also noted how many companies were used to calculate the averages, which is as follows:
a = 1 company used to determine average
b = 2 companies used to determine average
c = 3 companies used to determine average
d = 4 or more companies used to determine average

The results for the DAX30 and the S&P 500 are shown in table 7. A clear difference in the total change in return between the two is clearly present, with the DAX30 just recovering to pre-pandemic levels with a 0.12% increase, while the S&P 500 increased by an incredible 39.11% during the same period. For these two countries the same can be concluded about the energy sector as for the other four, as they both see a decrease in average stock prices, comparable to the other four markets. It is also remarkable that the energy sector is the only sector within the S&P 500 that saw a decline in average stock prices, while all the others sectors experienced gains.

The consumer discretionary, as well as the communication services sectors produced an increase in average stock prices in both markets, with the average stock price within this first sector increasing by 75.93% in the United States. The sectors information technology and communication services also display significant increases in average stock price within the S&P 500, with both sectors showing an increase of almost 40%.

When taking all markets in consideration, it can be seen that, overall, the markets seem to have recovered to their pre-pandemic levels and even saw an increase since then. This is, however, not the case for the energy sector as it shows a negative change in average stock returns of more than 10% in 5 out of 6 markets. On the other hand, the consumer discretionary sector mainly sees a positive change in average stock prices, with only one negative change of 2.16% within the AEX. Another sector experiencing an overall increase in average stock prices is the information technology sector, with the 110.67% increase within the AEX as a highlight. All other sectors see a mixture of positive and negative changes in stock prices, with neither the positive or the negative changes being more prominent. Overall, these sectors did not experience any extraordinary changes in average stock prices.

5.5. Effect of the amount of cases on cumulative abnormal returns

In table 8 the effects of the amount of cases on the cumulative abnormal returns are shown. As can be seen, the impact of an increase in cases on the cumulative abnormal returns gets smaller as the restrictions get stricter. Where a difference of 10 cases could cause a change in cumulative abnormal returns of, for example, 2.8% in the energy sector, a difference of 10,000 cases is needed to cause a change in cumulative abnormal returns of 3.2% in this very same energy sector, only now during the introduction of the lockdown.

The results also show in which sectors the severity of the pandemic benefitted the stock returns during the period in which restrictions were introduced and in which sectors the severity of the pandemic worsened the stock returns. To give an example, lets again look at the energy sector during the introduction of the minor restrictions. The findings show that in a country where the amount of cases is 1 higher than the average, there will be a significant 0.28% negative cumulative abnormal return in comparison to the average cumulative abnormal return in the

20

energy sector. This interpretation is applicable to all result mentioned below, except for the last results which shows the general effect of the amount of cases. These results will be interpreted in a slightly different way. To illustrate this clearly, the result for the minor restrictions shows that in a country with 1 more case than average, the cumulative abnormal returns will see a positive difference of 0.06% compared to the average of all the countries. This implies that in countries

Table 8: Effect of amount of cases on cumulative abnormal returns

Cumulative Abnormal Returns

Sector	Minor Restrictions		Major Restrictions		Lockdown	
	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic
Energy	-0.0028***	-4.74	-0.000051***	-3.30	3.12×10^{-6}	1.27
Materials	-0.0021*	-1.65	0.000049***	2.66	-7.95×10^{-6}**	-2.04
Industrial	0.0006	1.21	-0.000049***	-3.62	-3.16×10^{-6}	-1.39
Consumer Discretionary	0.0005	1.21	-0.000037***	-3.87	9.26×10^{-6}***	5.93
Consumer Staples	0.0031***	7.96	0.0000262**	2.25	-6.05×10^{-6}***	-3.47
Health Care	0.0029***	9.98	-0.000013*	-1.74	-3.04×10^{-7}	-0.25
Financials	-0.0056***	-13.85	-0.000017	-1.59	2.12×10^{-9}	0.00
Information Technology	0.0003	1.39	0.000032***	5.06	1.03×10^{-6}	1.03
Communication Services	0.0005	1.41	0.000031***	3.26	-5.48×10^{-6}***	-3.74
Utilities	0.0011	0.53	0.000425	0.72	-0.000026	-1.37
Real Estate	-0.0069***	-2.61	0.000022	0.75	-8.56×10^{-7}	-0.14
General	0.0006***	3.81	0.000011**	2.44	7.69×10^{-7}	1.08

This table shows the effect of the amount of cases on the cumulative abnormal return by sector. The CAR stands for the cumulative abnormal returns and the results show how much the cumulative abnormal return of a sector would change in case the amount of cases increased by 1, as follows from equation (5) and (6) from section 4.5.
***, **, and * are significant at the 1%, 5%, and 10% confidence levels, respectively.

where the COVID-19 situation is more severe, the introduction of the restrictions is more accepted or anticipated and the stock prices show a more positive cumulative abnormal return.

A clear pattern is noticeable for 2 sectors, namely the energy and the consumer staples sector. As can be seen, the energy sector sees significant negative relations during the minor-, as well as the major restrictions, whilst the consumer staples sector sees a significant positive relation during both these periods. For the consumer staples, however, the relationship during the lockdown period is significantly negative, while the energy sector sees no significant

relationship during this period. For the other sectors, no clear pattern becomes noticeable. It is still interesting to note that the results from the lockdown period are often the opposite sign compared to the results seen during the major restrictions.

6. Discussion

6.1. Cumulative abnormal returns

It was noticeable that in table 2, 3, and 4, not a lot of significant cumulative abnormal returns were found. One thing the results show clearly are the significant negative cumulative abnormal returns of the financials sector during the minor restrictions. These results are probably because most of the analysed stocks of the financial sector fall within the banking industry group. This industry group persistently underperformed relative to other financial and non-financial stocks during the pandemic, according to Acharya, Engle III and Steffen (2021). This was due to the balance-liquidity risk of the banks and the impact of this on stock returns has also been documented during other global financial crises, such as in 2008. To fully understand the results, it could be recommended to perform the same methodology, but now distinguish the separate industry groups within the financial sector, such as banks, diversified financials, and insurance. You could go even more in-depth and also include the industries and sub-industries, to further distinguish where the negative cumulative returns within the financial sector come from.

A second finding are the significant positive cumulative abnormal returns of the utility sector during the major restrictions. This could be the case due to the fact that utility companies did not lose a huge amount of revenue due to the pandemic. Of course, the commercial energy, water and gas consumption sharply decreased, but the domestic use of utilities increased as everyone was now at home more often. In case that the domestic rate was higher than the commercial rate, which is true in most countries, the utility suppliers actually increased their revenue from domestic utility use (Sarkar, 2021). This causes the utility sector to remain somewhat profitable, which results in the sector outperforming the overall market during the introduction of the major restrictions due to the COVID-19 pandemic.

As mentioned at the start, not a lot of significant results were found during the analysis. Therefore, another suggestion would be to increase the amount of firms taken into the analysis

for each separate country. This will increase the significance of the results and the analysis will yield more significant results. The greatest number of firms taken into consideration is now 50, but could be increased to 100 or even 150. For example, the Netherlands also features the AMX and the AScX, which could be used for this analysis as well. For Germany the HDAX could be used, as it consists of all the companies in the DAX, MDAX and TecDAX, making a total of 110 companies.

6.2. Long-term recovery

As discussed in the final part of section 5.4, the results of the long-term recovery show some patterns within the sectors. One of these findings was that the energy sector has not recovered to pre-pandemic levels and even saw a negative change in average stock prices of more than 10% in 5 out of 6 markets. While the oil market has recovered from the huge drop in late April, 2020, it does not seem like the market is going to recover in such a fashion as after the 2008 recession (OECD, 2020). This is partly due to the decreasing cost of renewable energy, an increasing commitment to minimize carbon emissions, and decreasing investor interest in the oil and gas sector, guiding the fossil fuel industry into a structural decline (Lahn & Bradley, 2020). Mark Lewis (2020), Global Head of Sustainability Research at BNP Paribas, also suggests that the fossil fuels market will not recover to levels seen pre-pandemic, mainly because the world is transitioning towards environmental friendlier forms of energy. This could explain why these companies have not recovered the losses on their stock prices and will maybe not do so at all.

On the other hand, an increase in average stock prices was noticeable within the consumer discretionary sector in all markets, except for the AEX. The consumer discretionary sector took a huge hit during the initial lockdown, as retailers, restaurants, and other shops had to close their doors. Now that everything is slowly opening up again and people have been inside for extended periods of time, they are now ready to treat themselves, as more than 50% of US consumers expect to spend extra on discretionary goods (McKinsey, 2021). During the pandemic, the discretionary spending on home furnishings and homebuilding have seen a massive increase, as people now have time to do these kind of renovations, as most other activities they would usually do are now not possible. This expectation of growth within the discretionary spending and people's urge to treat themselves could explain the increase of the average stock prices. Another

explanation could be that due to the physical stores being closed temporarily, people tend to gravitate towards the bigger online retailers, like Amazon. Because these big online retail companies are used in the analysis, while the smaller, physical retailers have not been taken into account during the analysis, the results could show a biased picture. To further explore this, it could be helpful to increase the amount of companies used to determine the average stock price within the sector, as this would also include the smaller physical retailers, instead of just the large online retailers.

Lastly, the information technology sector saw a significant increase in the average stock prices across the markets. This increase in average stock prices can easily be linked to the ongoing pandemic. Due to offices being closed down and people not being able to come to work, remote working became crucial to keeping the economy going. With technological companies offering plenty of products for remote connectivity, like VPNs and cloud computing, this was easily facilitated (AON, n.d.). Due to this, the technological companies achieved increased revenues and more growth, which is reflected in their average stock prices.

6.3. Effect of the amount of cases

Within the results in table 8, a clear pattern is again recognizable for the energy and the consumer staples sector. The energy sector saw a significant negative effect of the cases on the cumulative abnormal returns during the minor- and major restrictions. The consumer staples, on the other hand, saw a significant positive effect during the same period. The results should be interpreted as has been described in section 5.5, but they can also implicitly describe the extent to which people expect the restrictions to last or end any time soon. When the cases in a certain country are high, indicating a more severe situation, people are more likely to expect more restrictions to follow soon when compared to countries where the amount of cases is much lower. This would mean that when there are more cases within a country, and people therefore are anticipating additional restrictions soon, they would see the energy sector as a riskier sector and the consumer staples sector as a more promising sector.

The significant negative relationship between the cumulative abnormal returns of the energy sector and the cases per country during the minor- and major restrictions could be

explained with the help of two things. Firstly, as mentioned in the previous section, the large fossil fuel energy companies were already losing their investor support due to the rise of environmental awareness (Lahn & Bradley, 2020). The forecast of incoming additional restrictions could have just pushed investors over the line and made them sell their positions within the fossil fuel industry. Secondly, the prognosis of gradually increasing restrictions could also warrant the extra negative cumulative returns associated with the energy sector, as people would anticipate on the fact that in the upcoming months, and perhaps years, the restrictions would still be in place, severely reducing the domestic, as well as the industrial usage of oil and gas. This could cause the decline in stock prices as stock prices also reflect the expectations of the investors and are priced in almost immediately, as shown by Elton, Gruber and Gultekin (1981).

The fact that expectations are priced in almost immediately can also be used to explain the positive relationship between the amount of cases and the cumulative abnormal returns of the consumer staples sector. As people expect the restrictions to become stricter sooner, they would expect the consumer staples sector to perform better in the upcoming period with stricter restrictions, as people now are at home more and therefore need more basic supplies. People would not be able to spend money on any consumer discretionary items, as most shops closed down, and will therefore shift a portion of their spending to the consumer staples sector.

The general effect in table 8 also shows a positive relation between cumulative abnormal returns and the severity of the COVID-19 pandemic within each country. This can also be explained from the viewpoint of people expecting restrictions to be introduced or not. If the severity of the pandemic is higher within a certain country, the investors in that country will anticipate more on incoming restrictions and therefore react in a less extreme fashion when these restrictions are actually introduced. It could also be due to people already selling their securities before the introduction of the restrictions, causing the negative abnormal returns to be spread out more in the period before the introduction instead of being centred around the period of introduction.

7. Conclusion

In this paper, an event study was used to assess the impact of the COVID-19 pandemic on the stock prices within different sectors across 6 countries. The results of this study shows that the pandemic generated significant negative cumulative abnormal returns within the financials sector during the introduction of the minor restrictions, as well as significant positive cumulative abnormal returns within the utility sector during the period around which the major restrictions were inaugurated. It also became clear that the start of the lockdown did not cause any significant cumulative abnormal returns.

The study also reveals that 5 out of 6 markets have recovered to their pre-pandemic levels, with the AEX and the S&P 500 even experiencing an increase in their average stock prices of more than 30%. It also shows that the consumer discretionary and the information technology sectors were the big winners during the pandemic, while the energy sector actually still has not recovered to their initial values, due to the rise of clean energy and the decreasing investor interest.

In addition to this, it became clear that there is a negative relationship between the amount of cases within a country and the cumulative abnormal returns of the energy sector, while the consumer staples showed a positive relationship. These results could be explained by interpreting the amount of cases as a factor which determines the extent to which the investors within a certain country expect additional measures to be introduced anytime soon. This would mean that investors expected the energy sector to underperform as the restrictions went on for a longer period of time and the consumer staples sector to outperform the general market. The general effects of the amount of cases on the stock prices also shows a positive relation, which is the result of people reacting in a less severe manner when they were already expecting additional restrictions, instead of panic-selling due to the sudden introduction of measures.

All things considered, this paper gives a general idea of the effects of the COVID-19 outbreak on stock prices within 6 countries, but there still remains a lot more additional research that can be done within this field. Some ideas for additional studies include the analysis being expanded into more different countries and adding more companies per country to improve the results gathered by the analysis.

Appendix – List of companies per market used for the analysis

AEX		DAX30	
Company	**Sector**	**Company**	**Sector**
ASML Holding NV	*Information Technology*	Covestro AG	*Materials*
BE Semiconductor Industries NV	*Information Technology*	Adidas AG	*Consumer Discretionary*
ASR Nederland NV	*Financials*	Allianz SE	*Financials*
Signify NV	*Information Technology*	BASF SE	*Materials*
IMCD NV	*Industrials*	Bayer AG	*Materials*
Randstad NV	*Industrials*	Beiersdorf AG	*Health Care*
Aegon	*Financials*	Bayerische Motoren Werke AG	*Consumer Discretionary*
Unibail-Rodamco-Westfield	*Real Estate*	Continental AG	*Consumer Discretionary*
Koninklijke KPN NV	*Communications Services*	Daimler AG	*Consumer Discretionary*
ASM International NV	*Information Technology*	Delivery Hero SE	*Consumer Discretionary*
Just Eat Takeaway	*Consumer Discretionary*	Deutsche Boerse AG	*Financials*
NN Group NV	*Financials*	Deutsche Bank AG	*Financials*
ArcelorMittal SA	*Materials*	Deutsche Wohnen SE	*Real Estate*
Akzo Nobel NV	*Materials*	Deutsche Post AG	*Industrials*
Wolters Kluwer NV	*Industrials*	Deutsche Telekom AG	*Communication Services*
Heineken	*Consumer Staples*	E.ON SE	*Energy*
Koninklijke Ahold Delhaize NV	*Consumer Staples*	Fresenius Medical Care AG & CO KGaA	*Health Care*
Koninklijke DSM NV	*Materials*	Fresenius SE & Co KGaA	*Health Care*
Prosus NV	*Consumer Discretionary*	HeidelbergCement AG	*Industrials*
ING Groep NV	*Financials*	Henkel AG & Co KGaA	*Materials*
RELX PLC	*Industrials*	Infineon Technologies	*Information Technology*
Koninklijke Phillips NV	*Health Care*	Linde PLC	*Materials*
Adyen NV	*Information Technology*	Merck KGaA	*Health Care*
Royal Dutch Shell PLC	*Energy*	MTU Aero Engines AG	*Industrials*
		Muenchener Rueckversicherings-Gesellschaft AG in Muenchen	*Financials*
		RWE AG	*Energy*
		SAP SE	*Information Technology*
		Siemens AG	*Industrials*
		Vonovia SE	*Real Estate*
		Volkswagen AG	*Consumer Discretionary*

FTSE MIB		CAC40	
Company	**Sector**	**Company**	**Sector**
A2A SpA	*Energy*	Accor	*Industrials*
Amplifon SpA	*Health Care*	Credit Agricole SA	*Financials*
Atlantia SpA	*Industrials*	Air Liquide SA	*Materials*
Azimut Holding SpA	*Financials*	Airbus SE	*Industrials*
Banco BPM SpA	*Financials*	Atos SE	*Information Technology*
Banca Generali SpA	*Financials*	Danone SA	*Consumer Staples*
Bper Banca SpA	*Financials*	BNP Paribas SA	*Financials*
Brembo SpA	*Consumer Discretionary*	Carrefour SA	*Consumer Staples*
Buzzi Unicem SpA	*Industrials*	Capgemini SE	*Information Technology*
Davide Campari Milano NV	*Consumer Staples*	Axa SA	*Life Insurance*
CNH Industrial NV	*Industrials*	Vinci SA	*Industrials*
DiaSorin SpA	*Health Care*	Dassault Systemes SA	*Information Technology*
Enel SpA	*Energy*	EssilorLuxottica SA	*Health Care*
Eni SpA	*Energy*	Bouygues SA	*Industrials*
Exor NV	*Financials*	Engie SA	*Energy*
Ferrari NV	*Consumer Discretionary*	TotalEnergies SE	*Energy*
FinecoBank Banca Fineco SpA	*Financials*	Societe Generale SA	*Financials*
Assicurazioni Generali SpA	*Financials*	Thales SA	*Industrials*
Intesa Sanpaolo SpA	*Financials*	Kering SA	*Consumer Discretionary*
Italgas SpA	*Energy*	Legrand SA	*Information Technology*
Juventus FC SpA	*Consumer Discretionary*	Lvhm Moet Hennessy Vuitton SE	*Consumer Discretionary*
Leonardo SpA	*Industrials*	Michelin (CGDE)-B	*Consumer Discretionary*
Mediobanca Banca Di Credito Fnnzr SpA	*Financials*	L'Oreal SA	*Consumer Staples*
Moncler SpA	*Consumer Discretionary*	Orange SA	*Communication Services*
Pirelli & C. SpA	*Consumer Discretionary*	Publicis Groupe SA	*Communication Services*
Poste Italiane SpA	*Financials*	Pernod Ricard SA	*Consumer Staples*
Prysmian SpA	*Information Technology*	Hermes International SCA	*Consumer Discretionary*
Recordati Industria Chimica e Farma SpA	*Health Care*	Renault SA	*Consumer Discretionary*
Saipem SpA	*Energy*	Safran SA	*Industrials*
Salvatore Ferragamo SpA	*Consumer Staples*	Sanofi SA	*Health Care*
Snam SpA	*Utility*	Compagnie de Saint-Gobain SA	*Industrials*
Stellantis NV	*Consumer Discretionary*	ST Microelectronics NV	*Information Technology*
ST Microelectronics NV	*Information Technology*	Schneider Electric SE	*Information Technology*
Tenaris SA	*Materials*	Sodexo SA	*Information Technology*
Terna – Rete Ellettrica Nazionale SpA	*Energy*	Veolia Environment SA	*Utilities*
Telecom Italia SpA	*Communication Services*	Vivendi SE	*Communication Services*
UniCredit SpA	*Financials*	Worldline SA	*Financials*
Unipol Gruppo SpA	*Financials*		
UnipolSai Assicurazioni SpA	*Financials*		

FTSE100		S&P 500	
Company	**Sector**	**Company**	**Sector**
Anglo American PLC	*Materials*	Apple Inc.	*Information Technology*
Associated British Foods PLC	*Consumer Staples*	AbbVie Inc.	*Health Care*
Ashtead Group PLC	*Industrials*	Abbott Laboratories	*Health Care*
Antofagasta PLC	*Materials*	Accenture PLC Class A	*Information Technology*
Aviva PLC	*Financials*	Adobe Inc.	*Information Technology*
AVEVA Group PLC	*Information Technology*	Amazon.com Inc.	*Consumer Discretionary*
AstraZeneca PLC	*Health Care*	Broadcom Inc.	*Information Technology*
BAE Systems PLC	*Industrials*	Bank of America Corp	*Financials*
Barclays PLC	*Financials*	Berkshire Hathaway Inc. Class B	*Financials*
British American Tobacco PLC	*Consumer Staples*	Comcast Corporation Class A	*Communications Services*
BHP Group PLC	*Materials*	Costco Wholesale Corporation	*Consumer Staples*
BP PLC	*Energy*	Salesforce.com Inc.	*Information Technology*
BT Group PLC	*Communication Services*	Cisco Systems Inc.	*Information Technolgy*
Compass Group PLC	*Industrials*	Chevron Corporation	*Energy*
CRH PLC	*Industrials*	Danaher Corporation	*Health Care*
Diageo PLC	*Consumer Staples*	Walt Disney Company	*Communication Services*
Enter Air SA	*Industrials*	Facebook Inc. Class A	*Communication Services*
Experian PLC	*Industrials*	Alphabet Inc. Class A	*Communication Services*
Ferguson PLC	*Industrials*	Home Depot Inc.	*Consumer Discretionary*
Flutter Entertainment PLC	*Industrials*	Honeywell International Inc.	*Industrials*
Glencore PLC	*Materials*	Intel Corporation	*Information Technology*
GlaxoSmithKline PLC	*Health Care*	Johnson & Johnson	*Health Care*
HSBC Holdings PLC	*Financials*	JPMorgan Chase & Co.	*Financials*
International Consolidated Airlines Group	*Industrials*	Coca-Cola Company	*Consumer Staples*
3i Group PLC	*Financials*	Eli Lilly and Company	*Health Care*
Imperial Brands PLC	*Consumer Staples*	Mastercard Incorporated Class A	*Information Technology*
Just Eat Takeaway NV	*Information Technology*	McDonald's Corporation	*Consumer Discretionary*
Legal & General Group PLC	*Financials*	Medtronic PLC	*Health Care*
Lloyds Banking Group PLC	*Financials*	Merck & Co. Inc.	*Health Care*
London Stock Exchange Group PLC	*Financials*	Microsoft Corporation	*Information Technology*
National Grid PLC	*Utilities*	Netflix Inc.	*Communication Services*
Natwest Group PLC	*Financials*	NIKE Inc. Class B	*Consumer Discretionary*
Next PLC	*Consumer Staples*	NVIDIA Corporation	*Information Technology*
Ocado Group PLC	*Consumer Staples*	Oracle Corporation	*Information Technology*
Prudential PLC	*Financials*	PepsiCo Inc.	*Consumer Staples*
Persimmon PLC	*Consumer Staples*	Pfizer Inc.	*Health Care*
Royal Dutch Shell PLC A shares	*Energy*	Procter & Gamble Company	*Consumer Staples*
Royal Dutch Shell PLC B shares	*Energy*	PayPal Holdings Inc.	*Information Technology*
RELX PLC	*Communication Services*	Qualcomm Inc.	*Information Technology*
Rio Tinto PLC	*Materials*	AT&T Inc.	*Communication Services*
Reckitt Benckiser Group PLC	*Consumer Staples*	Thermo Fisher Scientific Inc.	*Health Care*
Segro PLC	*Real Estate*	Tesla Inc.	*Consumer Discretionary*
Scottisch Mortgage Investment Trust	*Real Estate*	Texas Instruments Incorporated	*Information Technology*

Smith & Nephew PLC	*Health Care*	UnitedHealth Group Incorporated	*Health Care*
SSE PLC	*Energy*	United Parcel Service Inc. Class B	*Industrials*
Standard Chartered PLC	*Financials*	Visa Inc. Class A	*Information Technology*
Tesco PLC	*Consumer Staples*	Verizon Communications Inc.	*Communication Services*
Unilever PLC	*Consumer Staples*	Wells Fargo & Company	*Financials*
Vodafone Group PLC	*Communication Services*	Walmart Inc.	*Consumer Staples*
WPP PLC	*Communication Services*	Exxon Mobil Corporation	*Energy*

References

Acharya, V., Engle III, R. & Steffen, S. (2021). Why Did Bank Stocks Crash During COVID-19? *NBER Working Paper 28559*

Armitage, S. (1995). Event Study Methods and Evidence on Their Performance. *Journal of Economic Surveys, 9*(1), p25 – 52

BNP Paribas (2020), *Big Oil: Staring down the barrel of an uncertain future*. https://docfinder.bnpparibas-am.com/api/files/22AC4C06-8B50-4D3B-BC34-EF7A99DF9680.

Burch. T., Emery, D. & Fuerst, M. (2016). Who Moves Markets in a Sudden Marketwide Crisis? Evidence from 9/11. *Journal of Financial and Quantative Analysis, 51*(2), p463 – 487

Charm, T., Gillis, H., Grimmelt, A., Hua, G., Robinson, K., & Sanchez Caballero, R. (2021). *Survey: US consumer sentiment during the coronavirus crisis*. McKinsey & Company. https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/survey-us-consumer-sentiment-during-the-coronavirus-crisis

COVID-19 & the Technology Sector : | Aon. (n.d.). AON. https://www.aon.com/unitedkingdom/insights/covid-19-and-the-technology-sector.jsp

Elton, J., Gruber, M. & Gultekin, M. (1981). Expectations and Share Prices. *Management Science, 27*(9), p975 – 987.

Engebretsen, R. & Anderson, C. (2020). *The impact of coronavirus (COVID-19) and the global oil price shock on the fiscal position of oil-exporting developing countries.* OECD. https://www.oecd.org/coronavirus/policy-responses/the-impact-of-coronavirus-covid-19-and-the-global-oil-price-shock-on-the-fiscal-position-of-oil-exporting-developing-countries-8bafbd95/

Goodell, J. (2020). COVID-19 and finance: Agendas for future research. *Finance Research Letters, 35,* 101512

He, P., Sun, Y. & Zhang, Y. (2020) COVID-19's Impact on Stock Prices Across Different Sectors – An Event Study Based on the Chinese Stock Market. *Emerging Markets Finance and Trade, 56*(10), p2198 – 2212

Lahn, G. & Bradley, S. (2020). *How COVID-19 is changing the opportunities for oil and gas-led growth*. OECD Development Matters. https://oecd-development-matters.org/2020/07/10/how-covid-19-is-changing-the-opportunities-for-oil-and-gas-led-growth/

Luo, Y., Chen, Y. & Lin, J. (2020) Emotions and Inventor Productivity: Evidence from Terrorist Attacks. *Working Paper.*

Ori, L. & Galili, I. (2006) Terror and trade of individual investors, *The Journal of SocioEconomics, 35*(6), p980 – 991

Ortmann, R., Pelster, M. & Wengerek, S. (2020). COVID-19 and Investor Behavior. *Finance Research Letters, 37,* 101717.

Peterson, P. (1989). Event Studies: A Review of Issues and Methodology. *Quarterly Journal of Business and Economics, 28*(3), p36 – 66

Sarkar, M. (2021). *The impact of COVID-19 on electric utilities.* Capgemini Worldwide. https://www.capgemini.com/2021/02/the-impact-of-covid-19-on-electric-utilities/

Wang, A., Young, M. (2020). Terrorist attacks and investor risk preference: Evidence from mutual fund flows. *Journal of Financial Economics, 137*(2), p491 – 514

Yan, B., Stuart, L., Tu, A. & Zhang, T. (2020). Analysis of the Effect of COVID-19 on the Stock Market and Investing Strategies. *Working Paper*