**ERASMUS UNIVERSITY ROTTERDAM  
Erasmus School of Economics**

**Bachelor Thesis International Bachelor’s in Economics and Business Economics**

***The impact of vaccine approval announcements against SARS-CoV-2 on stock market returns in the United States***

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

**Preface**

**I would like to thank my supervisor Yashvir Gangaram-Panday for all his assistance in writing my bachelor’s thesis. I would also like to thank my friends and family for their advice and support. With them in mind, I was able to write a better thesis. Finally, I want to thank Erasmus School of Economics for allowing me to finish my bachelor’s degree here.**

**Abstract**

The S&P 500 index has grown by roughly 35.31% since the US encountered the first coronavirus case in its own borders, on January 21st, 2020 (Google, 2021). It is clear that the index fluctuations can be explained in part by the different unexpected announcements, and in part by insider information. This paper aims to identify whether there were significant cumulative abnormal returns (CARs) around 2 vaccine distribution approval announcements during the pandemic using an event study methodology. The abnormal returns of each company will be calculated then aggregated per industry to find industry-specific CARS. **WRITE THIS LAST – ez to write, check Karreman’s book**

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**1. Introduction**

The Covid-19 virus, also known as the novel coronavirus, or SARS-CoV-2, was previously recognized by the World Health Organisation (WHO) on December 31st, 2019 . However, the world got aroused by the news of this new virus which could be spread among people for the first time on January 20, 2020. As such, a plethora of studies appeared investigating the effect of mass news about the novel virus on January 20/21st on stock market returns. Such papers include the one written by Liu, Manzoor, Wang, Zhang and Manzoor (2020), who find that around January 20, Covid-19 had a significant negative effect on stock markets from all the affected countries (e.g. Hong Kong, Malaysia, Japan, Thailand). Al-Awadhi, Alsaifi, Al-Awadhi, Alhammadi (2020) also report a negative interaction of the disease with stock market returns in Shanghai and Hong Kong. He, Sun, Zhang, Li (2020), similarly, find that the transportation, mining, electric and heating, and environmental industries in China were heavily affected around January 23rd.

Despite all the literature on the effects of Covid-19 on stock market returns, little literature exists around the effect of the vaccine approval news on stock returns. Furthermore, most of the studies encountered examine the impact of Covid-19 in the Asian markets. As such, this paper aims to examine how the vaccine approval announcements for the novel coronavirus impacted the stock market returns. It is important to research this subject, because it tests whether investors were expecting a cure to Covid-19 less than a year after its outbreak.

This paper will use an event study approach to calculate the abnormal returns of individual companies within the S&P 500 index. First, the normal return will be calculated. Then, the normal return will be subtracted from the actual market return during the event window to calculate the abnormal return (AR). Finally, by adding up the individual ARs per event window and industry, the cumulative abnormal returns (CAR) will be computed. The data on stock prices will be collected from Compustat – CRSP and the data on company and industry fundamentals will be taken from the WRDS database. The events to be researched are selected from the American Journal of Managed Care (AJMC). The AJMC (2020) provides a timeline of all important covid-19 announcements. The events are as follows:

**December 11 —** **FDA Agrees to EUA for COVID-19 Vaccine from Pfizer, BioNTech**

**December 18 — FDA Signs Off on EUA for Moderna's COVID-19 Vaccine**

These two events were selected for analysis because …

The S&P 500 index has grown by 35.97% since the US encountered the first coronavirus case in its borders, on January 21st, 2020 (Google, 2021). The index fluctuations are explained in part by unexpected announcements, and in part by insider information. This paper aims to identify whether there were significant cumulative abnormal returns (CARs) around 2 vaccine distribution approval announcements during the pandemic using an event study methodology. The abnormal returns of each company will be calculated then aggregated per industry to find industry-specific CARS.

The companies in the S&P 500 are grouped in 11 sectors, namely Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Communication Services, Utilities, Real Estate (MSCI, 2021). Of these, the energy, real estate, financials, utilities, consumer staples, industrials, and healthcare sectors have underperformed in 2020 when compared to the average returns of these industries between 2010-2019. (Statista, 2021). Previous studies also suggest that specific sectors may be affected in different ways during a pandemic, such as hotels, pharmaceutical, and biotech sectors (Al-Awadhi, Alsaifi, Al-Awadhi, Alhammadi, 2020).

Hence, the following research question is put forward:

**What is the effect of Covid-19 vaccine approval announcements on the returns of stocks within the S&P 500?**

Several papers have been written on how news affect stock prices. Since the outbreak of Covid-19, Liu et al. (2020) have investigated the effect of the outbreak on stock prices on the days of the first known cases, i.e. January 20. Similarly, He et al. (2020) look at the impact of the outbreak on stock prices across different sectors, around january 23. Finally, Mazur, Dang and Vega (2021) analyse the march 2020 stock market crash by looking at companies within the S&P 1500. However, there are few credible papers which study how stocks reacted to the vaccine approval announcements related to Covid-19. In this sense, the research question is scientifically relevant, because it adds to existing literature. On another note, according to Statista (2021), 55% of the United States adults had shares in the stock market in 2019 and 2020. Therefore, the research question is socially relevant, because it helps the individual investor understand how different news have different impacts on stock prices.

Leaving the Introduction aside, the paper follows the following format. Relevant literature is reviewed and discussed in Section 2. This literature includes papers on abnormal returns during pandemics and other black swan events. Furthermore, Section 2 also builds upon the research question, and discusses the most important outcomes of research done on topics similar to the subject of this paper. Section 3 constructs the theoretical foundation of this research. It includes sub-questions, the hypotheses, and the models which will be used. Section 4 discusses the different data sources that were used, as well as how the data was prepared and cleaned to be later used for analysis. Section 5 presents the different techniques and ……… WHAT GOES INTO METHODOLOGY??. Other statistics?? Section 6 discusses the results of the technical analysis and uses various tables to strengthen the findings. Finally, Section 7 includes a discussion of the work done as well as its limitations and concludes the paper.

2. Literature review

2.1. The impact of the outbreak of global disease outbreaks on market returns

As of today, 22nd of September 2021, Statista (2021) registers 43,242,302 coronavirus cases in the United States of America and a death toll of 675,051 people. Amidst worldwide panic, between the 12th of February 2020 and 18th of March 2020, the stock market plunged roughly 27.39% (Statista, 2021). The US stock market was not the only one affected by Covid-19 developments in 2020. Rahman, Amin, Al Mamun (2021) use an event study methodology and analyse four announcements related to Covid-19. In particular, they identify two negative events, namely: January 30, 2020, when WHO declares Covid-19 as a public health emergency, and 11th of March 2020, when WHO declares Covid-19 a pandemic. Further, Rahman et al. (2021) find significantly negative CARs given event windows of [-5,5] and [-7,7] days for the negative events. On the other hand, they identify two positive events, a 66.4 billion Australian dollar (AUD) stimulus package on the 22nd of March 2020, and the AUD130 billion JobKeeper package. Third, interestingly, in Panel C, we find a negative and statistically significant average CAR for the first positive event

This result may arise as the AUD66.4 billion stimulus package fails to reduce the uncertainty associated with the pandemic and build investors’ confidence.

Fourth, while the EMH argues that the CAR should no longer change significantly after an event date due to rapid incorporation of information into stock prices, we observe that the magnitude of the average CAR is typically higher in the longer event windows compared to that in [−3,3] event window.

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economically meaningful. Since the average market capitalization of the sample firms is AUD8,011 million, the average cost associated with the second event over the window [−5,5] is about AUD352 million (0.0439 x AUD8,011 million).

2.2. The effect of Covid-19-related government announcements on market returns

2.3. Identifying the most vulnerable industries during a pandemic

He, Sun and Zhang (2020) start their paper stating that 2020 will be recorded in history because of an extraordinary turn of events. They study the impact of covid-19 on stock prices through an event-study methodology. The event day of the Covid-19 outbreak is January 23rd, 2020. Their regression shows that the Shanghai and Shenzhen A-shares showed no significant cumulative abnormal returns on the day of the outbreak. However, starting with the 15th day after the outbreak, both stock exchanges’ shares significantly dropped. They find that the CARs were negative for the Shanghai stock exchange (SE) and positive for the Shenzhen SE. This discrepancy is explained by differences in industry characteristics of the companies listed on each exchange. In particular, the Shanghai SE listed companies are mostly based in the transportation, mining, electricity and heating and environment industries whereas the Shenzhen SE includes companies which are highly technological.

He et al. (2020) further break the impact of covid-19 on each industry with different event windows. 30 days after the event day, the sectors which showed the largest negative CARs are agriculture (CAR ~ -1.12%), electric&heating (CAR~ -0.59%), transportation (CAR ~ -0.33%), environment (CAR~-0.73%) and information technology (CAR~ -0.65%). These are significant at the 1% confidence level. Lastly, He et al. (2020) investigate how covid-19 impacted companies with different equity properties, and argue they have different capabilities to deal with external shocks. They find that the non-technological companies showed significant negative CARs on all event windows chosen. In contrast, most technological companies showed significant positive CARs on all event windows.

In another paper, Xiong, Wu, Hou and Zhang (2020) investigate the investors’ responses to the covid-19 pandemic using the event study method. They find that institutional investors have a significantly negative impact on market reaction of the companies. They also show that firms in the industries that are more affected by the emergence of the virus show significantly lower CARs. They take over which industries are vulnerable to a pandemic from previous research by Kong and Su (2019) and Shen et al. (2020). They also use an event study methodology and various regressions to explain their findings. Cheng, Jang and Kim (2020) examine the effect of the SARS outbreak on Taiwanese hotel stock movements. Hotel stocks had significant declines in earnings and stock prices, as the industry faced higher than average risk during the SARS-outbreak period.

- most important outcomes and trends

- relationships between articles (add articles whose results agree with each other, but also articles whose results disagree with each other)

- literature review is an academic report in which the current state of knowledge on a specific topic is summarized, analysed and described, using a selection of the most relevant academic literature. Google scholar/web of science

- provides an overview on a given topic (foundation)

- identify issues in the literature to build upon

- identify inconsistencies and contradictions in the literature

- it shows that the author’s knowledge is up to date

4 steps:

1. Defining your research question
2. Finding literature
3. Reading and selecting the literature
4. Starting to write your literature review

3. Theoretical framework

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4. Data

5. Methodology

6. Results

7. Conclusion

Write conclusion here (summarise etc)

7.1. Discussion

7.2 Limitations

Add recommendations for future research here.

Limitations:

1. Few studies being done specifically on how vaccine approval announcements affected market returns.
2. Problems with event dates being close together –
3. And “Are the results of the analysis of the chosen event dates consistent with each other?”. Poate o mentionez in partea de limitatii

The companies in the S&P 500 are grouped in 11 sectors, namely Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Communication Services, Utilities, Real Estate (MSCI, 2021). Of these, the energy, real estate, financials, utilities, consumer staples, industrials and healthcare sectors have underperformed in 2020 when compared to the average returns of these industries between 2010-2019. (Statista Research Department, 2021). Previous studies also suggest that specific sectors may be affected in different ways in the event of a pandemic, such as hotels, pharmaceutical and biotech sectors (Al-Awadhi, Alsaifi, Al-Awadhi, Alhammadi, 2020).

**Introduction**

More than 1 year after its outbreak, the coronavirus pandemic continues to wreak havoc on the world’s economy. It is imperative that we understand the consequences of this pandemic on the economy in order to better respond to future outbreaks of diseases. Its long-term impact cannot be analysed at the current time, but there is plenty of literature around the short-term effects of covid-19 on different areas of the economy. Although investigating the impact of covid-19 on the health of the overall economy is an important topic, I will leave that for other researchers to investigate. Hence, the purpose of this investigative research is to determine the short-term impact of different announcements on stock market returns.

The S&P 500 index has grown by roughly 35.31% since the US encountered the first coronavirus case in its own borders, on January 21st, 2020 (Google, 2021). It is clear that the index fluctuations can be explained in part by the different unexpected announcements, and in part by insider information. This paper aims to identify whether there were significant cumulative abnormal returns (CARs) around 2 vaccine distribution approval announcements during the pandemic using an event study methodology. The abnormal returns of each company will be calculated then aggregated per industry to find industry-specific CARS.

The companies in the S&P 500 are grouped in 11 sectors, namely Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Communication Services, Utilities, Real Estate (MSCI, 2021). Of these, the energy, real estate, financials, utilities, consumer staples, industrials and healthcare sectors have underperformed in 2020 when compared to the average returns of these industries between 2010-2019. (Statista Research Department, 2021). Previous studies also suggest that specific sectors may be affected in different ways in the event of a pandemic, such as hotels, pharmaceutical and biotech sectors (Al-Awadhi, Alsaifi, Al-Awadhi, Alhammadi, 2020).

Hence, the following research question is put forward:

*What is the effect of covid-19 vaccine approval announcements on equity market returns per industry within the S&P 500?*

It is important to tackle this question to test the efficiency of the market as well as identifyindustries which are less conducive to virus transmission.. The answer to this question is therefore important for investors, as well as for the general workforce. What is more, the above question can be broken down into multiple sub-questions, as per the literature review below. One such question is: “Does the ownership structure matter? i.e. do different levels of insider vs institutional ownership lead to larger abnormal returns? Another sub-question is “Which company fundamentals have an effect on the (abnormal return) in a company or industry?”. And “Are the results of the analysis of the chosen event dates consistent with each other?”.

**Literature review and hypothesis**

He, Sun and Zhang (2020) start their paper stating that 2020 will be recorded in history because of an extraordinary turn of events. They study the impact of covid-19 on stock prices through an event-study methodology. The event day of the Covid-19 outbreak is January 23rd, 2020. Their regression shows that the Shanghai and Shenzhen A-shares showed no significant cumulative abnormal returns on the day of the outbreak. However, starting with the 15th day after the outbreak, both stock exchanges’ shares significantly dropped. They find that the CARs were negative for the Shanghai stock exchange (SE) and positive for the Shenzhen SE. This discrepancy is explained by differences in industry characteristics of the companies listed on each exchange. In particular, the Shanghai SE listed companies are mostly based in the transportation, mining, electricity and heating and environment industries whereas the Shenzhen SE includes companies which are highly technological. Hence, the following sub-question:

*What is the effect of company fundamentals and their corresponding sector on stock price reaction around the time of the vaccine approval announcements?*

He, Sun and Zhang (2020) further break the impact of covid-19 on each industry with different event windows. 30 days after the event day, the sectors which showed the largest negative CARs are agriculture (CAR ~ -1.12%), electric&heating (CAR~ -0.59%), transportation (CAR ~ -0.33%), environment (CAR~-0.73%) and information technology (CAR~ -0.65%). These are significant at the 1% confidence level. Lastly, He, Zun and Zhang (2020) investigate how covid-19 impacted companies with different equity properties, and argue they have different capabilities to deal with external shocks. They find that the non-technological companies showed significant negative CARs on all event windows chosen. In contrast, most technological companies showed significant positive CARs on all event windows.

*H1: Companies exhibited cumulative abnormal returns around the vaccine approval announcements.*

In another paper, Xiong, Wu, Hou and Zhang (2020) investigate the investors’ responses to the covid-19 pandemic using the event study method. They find that institutional investors have a significantly negative impact on market reaction of the companies. They also show that firms in the industries that are more affected by the emergence of the virus show significantly lower CARs. They take over which industries are vulnerable to a pandemic from previous research by Kong and Su (2019) and Shen et al. (2020). They also use an event study methodology and various regressions to explain their findings. Cheng, Jang and Kim (2020) examine the effect of the SARS outbreak on Taiwanese hotel stock movements. Hotel stocks had significant declines in earnings and stock prices, as the industry faced higher than average risk during the SARS-outbreak period.

From a theory standpoint, this research paper will determine to what extent the efficient market hypothesis holds, namely whether the vaccine approval announcements had an impact on stock prices. From an empirical perspective, this paper will determine whether there were abnormal returns in the S&P 500 around the vaccine approval announcements, controlling for industry type and company fundamentals. This is in contrast with most other papers, which investigate abnormal returns in the beginning of the pandemic, and which largely do not control for company fundamentals.

Wu, Hou, Zhang (2020) look at how other fundamentals and characteristics of a company and industry may have affected the returns using an event study methodology. The amount of cash held did not have a significant effect on the CARs they calculated. According to them, the industry, size, return on assets, the amount of leverage and fixed assets had a significant impact on stock returns. Chan, Hamao and Lakonishok (1991) look at the effect of the earnings yield, size, book to market ratio and cash yield on stock returns in the Japanese stock market. Of these, the book-to-market variable is the most positively impactful when predicting returns. The cash flow yield also had a significant positive impact on expected returns (Chan, Hamao and Lakonishok, 1991).

As the latter study is more technical and tests for many statistical assumptions, the market to book ratio and the cash flow yield effects on the abnormal returns of companies will be calculated. Hence, the following two hypotheses are formulated:

*H2: The book to market ratio of a company in a vulnerable industry\* had a positive effect on the abnormal return of that company.*

*H3: The cash flow yield of a company in a vulnerable industry had a positive effect on the abnormal return of that company.*

\*Vulnerable industry here implies transportation, food and beverage retail, hotel and tourism, postal warehouse, real estate, video entertainment and construction as per Xiong, Wu, Hou and Zhang (2020).

**Methodology and data**

This paper will use an event study approach to calculate the abnormal returns of individual companies within the S&P 500 index. First, the normal return will be calculated. Then, the normal return will be subtracted from the actual market return during the event window to calculate the abnormal return (AR). Finally, by adding up the individual ARs per event window and industry, I will get cumulative abnormal returns (CAR). The data on stock prices will be collected from Compustat – CRSP and the data on company and industry fundamentals will be taken from the WRDS database. The events to be researched are selected from the American Journal of Managed Care (AJMC). The AJMC (2020) provides a timeline of all important covid-19 announcements. The events are as follows:

**December 11 —** **FDA Agrees to EUA for COVID-19 Vaccine from Pfizer, BioNTech**

**December 18 — FDA Signs Off on EUA for Moderna's COVID-19 Vaccine**

**Planning**

The thesis will go in more depth with the relevance of the topic, the literature review, data selection and trimming and methodology. The data will be analysed using STATA. Furthermore, the results will be presented and conclusions as well as limitations will be drawn. In particular, the theoretical framework will be carefully explained and backed by scientific papers. The event study definition will be the one used by MacKinlay (1997).

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