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Covid-19: Stock market reaction to government interventions in the UK

Industrial analysis

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ABSTRACT:
During the Covid-19 pandemic, governments around the globe have carried out unforeseen actions to stabilize the economy and to prevent the virus from spreading. This thesis aims to examine the short-term impact of these government interventions on different stock market sectors in the UK. In addition, interest lies in whether the stock market reaction is more prevalent in the early stages of the pandemic than in the late stages. An Event study methodology is employed to test the semi-strong form of the Efficient Market Hypothesis, which states that all available information, including historic, is already incorporated in the market prices. The data consists of FTSE All-Share index, and ten industry indices that are selected accordingly to the ICB recommendations.

The results show that it is clear that the impact of these discussed government interventions is more prevalent in the early stages of the pandemic than what it is later, to similar announcements. Social distancing intervention announcements have a negative impact on all investigated industries except for Oil & Gas, Health care, Telecommunications and Financials industries. Government economic support packages do not have an immediate impact on the stock market, although significant and positive impact is observed in the post-event period. When the UK stock market is compared to the ACWI All-Country index, the impact of these government announcement is negative and significant for all investigated events. The results indicate that industries that are dependent on real economic activity, react negatively and significantly to government imposed social distancing measures. This negative reaction can be alleviated by government support packages, but the effect is not always present. As the epidemic progresses, the negative impacts of government interventions become less negative while the positive impacts become more positive.

KEYWORDS: Pandemic, Market reaction, EMH, Government intervention, Sector analysis

TIIVISTELMÄ :
Covid-19 pandemian aikana valtiot ovat määränneet ennennäkemättömän määrän eristämistoimenpiteitä viruksen leviämisen estämiseksi sekä valtiontukia talouselämän tukemiseksi. Tämä tutkimus pyrkii selvittämään, millainen vaikutus näillä vastatoimenpiteillä on Iso-Britannian osakemarkkinoihin ja miten eri sektorit näihin reagoivat. Tämän lisäksi tarkastellaan, onko markkinareaktio erilainen pandemian alkupuolella kuin mitä se on myöhemmin pandemian edetessä. Tässä tutkimuksessa käytetään Event study -metodologiaa ja testataan Tehokkaiden markkinoiden keskivahvoja ehtoja, joiden mukaan kaikki saatavilla oleva informaatio, sekä historiallinen informaatio on jo sisällytettynä markkinahintoihin. Aineisto koostuu FTSE All-share osakeindeksistä sekä sen kymmenestä eri sektori-indeksistä, jotka on valittu ICB-suositusten mukaisesti.

Tulokset osoittavat, että pandemian alussa markkinat reagoivat huomattavasti voimakkaammin valtion väliintuloihin kuin myöhemmässä vaiheessa. Viruksen leviämistä hidastavat toimenpiteet, kuten ulkonaliikkumiskiellot, vaikuttavat negatiivisesti kaikkiin toimialoihin, lukuun ottamatta öljyn & kaasun, terveydenhuollon, tietoliikenteen sekä rahoituksen toimialoja. Valtion taloustukiin osakemarkkinat eivät reagoi välittömästi, mutta merkitseviä ja positiivisia epänormaaleja tuottoja havaitaan tapahtuman jälkeisellä tarkkailujaksolla. Vastatoimenpiteiden vaikutus Iso-Britannian osakemarkkinaan suhteessa muun maailman osakemarkkinoihin on merkitsevästi negatiivinen kaikissa tutkituissa tapahtumissa. Tutkimustuloksista voi päätellä, että reaalitaloudesta riippuvaiset toimialat kuten yleishyödykkeet tai kuluttajien palvelut reagoivat voimakkaasti ja negatiivisesti tartuntojen ehkäisyyn määrättyihin toimenpiteisiin. Tätä negatiivista reaktiota voidaan yrittää lievittää valtion taloustukien muodossa. Pandemian edetessä valtion väliintulojen negatiiviset vaikutukset lievenevät ja positiiviset vaikutukset vahvistuvat.

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1 Introduction

As the tragic COVID-19 pandemic is ongoing at the time of writing this thesis, we are currently waiting for more vaccines to be available so that we can start our normal routines again. The economic impact of COVID-19 pandemic has been in interest of researchers ever since it became prevalent that the pandemic will cause disturbance to the real economic ecosystem and drive companies on the verge of bankruptcy. The virus started spreading rapidly in China and it was not noted significantly in the western media. Only when the death toll in Europe increased rapidly, COVID-19 gained media attention. Not too long after on March 11 WHO officially announced COVID-19 as a world-wide pandemic. Since the start of the pandemic the highest level of containment measures in history has been imposed by different governments and multinational organizations world-wide.

By March 23, 2020 the U.S. stock index S&P 500 lost 35% of its' value when compared to its recent maximum on February 19, 2020. In comparison, the magnitude of this decline is comparable to the financial crisis of October 2007, Black Monday in 1987 and the start of the Great Depression in 1929.

In this paper the main focus will lie on the short-term effects of government-imposed lock-down measures and economic support packages on different sectors in the UK. These two types of government response measures are the most common and have been implemented by almost all countries in the world. The aim of the paper is two-folded, to provide important information about market reactions to government interventions for decision-making governmental institutions, as well as provide investors with useful information on sectoral performance under crises. This thesis concentrates on developed economies, where the largest financial markets by market capitalization exist. The U.S. would be the optimal market to observe but that is not possible as there are 51 states of which each imposes social distancing measures such as lock-downs. Thus, this thesis will be observing the UK market, from where it is expected that it will be easy to draw universal results and market reactions that can be generalized as mechanisms of these announcements.

1.1 Purpose of the study

In this paper, the stock market impact of COVID-19 will be researched to expand the knowledge on policy implications as well as market reaction. Most of the literature regarding this topic has focused on the major decline in markets once the pandemic was announced by the WHO and the spread of the virus. This paper aims to emphasize the post-announcement movements of the stock market as well as the initial reaction and widen the scope and lengthen the research period.

The research questions are laid out as follows:

1) What impact do social distancing interventions implemented by the government have on different stock market sectors?
2) What impact do government economic support programs have on different stock market sectors?
3) What impact do these government interventions have on the UK stock returns in comparison to MSCI-all country index returns?
4) How do the previous research questions' impact change at a later stage of the Covid-19 pandemic in comparison to the initial reaction in the beginning of the pandemic?

The main contribution of this paper is to find out short-term effects of government intervention announcements on the UK stock market, and whether any differences in cross-sector performance are observable. There are multiple studies that concentrate on cross-country differences and overall global economics but not many that aim to catch the market reaction between different sectors.

In addition, this paper will examine the stock-market reaction of the policy interventions in two different stages of the pandemic. Both, social distancing measures and economic support package announcements, will be tested in the beginning of the crisis as well as in the later stages. The market is expected to have more pronounced reaction in the beginning of the crisis in comparison to later stages. This could be explained by market sentiment. For example, Aschraf (2020) found evidence that in the early stages of the pandemic the stock market reaction is stronger than later. The severity of the outbreak, the number of new daily infections, affects market reaction more significantly in the later stages than in the early stages of the pandemic.

1.2 Limitations

This paper examines the UK stock market reaction to government policy interventions during the COVID-19 pandemic, more specifically social distancing measures and government economic support programs. This paper seeks to conduct empirical analysis as simply as possible so that the results help in understanding the reaction of the stock market to government intervention announcements during times of crisis. However, there are some limitations that should be taken into account from reader's perspective.

First, this study focuses only on the UK stock market which works as a good proxy for developed markets so that the consequences of these policy measures can be drawn into other developed markets to understand the mechanisms around the issue. This means that the results of this study will not be applicable into making conclusions how emerging market returns behave under similar policy interventions.

Secondly, event-study methodology only accounts for the short-term reaction of stock-market. To conduct a robust study on the long-term effects would require other tools and shift the emphasis from singular announcements to rather larger dataset of government measures throughout the whole pandemic.

1.3 Structure of the thesis

The rest of the paper is organized as follows. Section 2 discusses the theoretical background of the thesis, covering Keynesian Economics, the Efficient Market Hypothesis and

Investor Sentiment. Section 3 covers previous evidence on the arrival of new information to the market. Section 4 focuses on data and section 5 on the methodology used in this thesis. Section 6 discusses the results of the empirical part, and finally section 7 concludes.

2 Theoretical framework

This chapter focuses on the theoretical concepts that are necessary to understand the thesis. The Keynesian Economic Theory, the Efficient Market Hypothesis, and Investor Sentiment are explained in this chapter.

2.1 Keynesian Economic Theory

It is important to understand why governments interfere with the markets. These could include adjusting interest rates, inflation expectations or providing cheap loan to companies and direct support to people who are in danger of losing their jobs or have already lost their job. While social distancing measures during the pandemic can understandably be based on public health related reasons and to guarantee the carrying capacity of the health care system, some economic support packages or monetary policy responses might have multiple reasons and could vary in many forms.

The Keynesian Economic Theory is a school of economics invented by John Maynard Keynes that states that government intervention is required to help economies fight against recessions (Keynes, Moggridge, & Johnson 1971). The idea originates from the economic cycles, which is the fluctuation of the economy between periods of expansion and contraction, that free-market economies experience and positions the government as a balancing institution to control the magnitude of these cycles. The theory was found during and after the great depression in order to explain why government interventions are needed to control the economy when a crisis occurred. During the crisis period of the Great Depression, inefficient performance of the private sector raised, Keynes explained that the public sector needed to make proper decisions regarding monetary and fiscal policy to ensure stable growth in the economy.

According to Keynesian Economic Theory there are three main metrics that governments should keep an eye on; interest rates, tax rates and social programs.

Interest rates are basically the cost of borrowing money (Keynes et al. 1971). The theory states that during a booming economic cycle central banks should increase interest rates in order to generate more income from borrowers. Controlling the magnitude of the boom is important as it is possible that investing too much on public and private sectors could lead to a reduction in the money supply, which again leads to a severe recession. During times of recession the theory argues that governments should lower interest rates in a bid to encourage borrowing, which leads to more investments in the private sector and to increased output, which in turn helps the economy out of the recession. Unlike in times of expansion, in recessions governments should aggressively fight the magnitude of the contraction cycle in order to guarantee the recovery of the economy in a reasonable time.

Income taxes are government's main source of income. This is used to finance public sector interventions such as infrastructure, health care etc. During booming economic cycles the theory states that governments should increase income tax rates in order to participate in growth of economic activity (Keynes et al. 1971). During times of busting economy, The Keynesian theory argues that governments should lower taxation on individuals and businesses in order to increase private spending during a time of recession and help the economy recover. The overall dynamic in taxation is to generate more cash reserves during times of booming economy in order to cushion the dip in economy during contractive periods by for example using those cash reserves for expansive policies.

Government spending on social programs during times of booming markets should be decreased. Social programs are government programs to provide some useful tools to individuals in order to stimulate the labor market. During recessions, the Keynesian Economic Theory suggests that governments should increase spending on social programs in order to stimulate the labor market with an influx of skilled labor. The dynamic here is that an increase in skilled labor causes wages to drop, enabling businesses to gain productive workforce without significant cost increases. Keynes et al. 1971)

New economic schools have emerged since Keynes' thoughts but Keynes is widely regarded as the father of modern macroeconomics and his diagnosis of recessions and depressions based the foundation for modern applications of these theories. (Jahan, Mahmud and Georgiou (2014)

2.2 Efficient Market Hypothesis

The Efficient Market Hypothesis was established in 1965 (Samuelson; Fama) and it is considered to be one of the strongest theorems in social sciences (Jensen 1978). First time in 1965 Paul Samuelson attached perfect information with random walk by showing that correctly predicted prices varied randomly. During the same year a U.S. economist Eugen Fama empirically studied the statistical properties of stock prices and described the markets for the first time as efficient. He also stated that in an efficient market, on the average, competition will cause the full effects of new information on intrinsic values to be reflected "instantaneously" in actual prices. It is notable that even though Samuelson and Fama had different aims at their studies they ended up in similar results.

In 1970 Malkiel and Fama published an article; "Efficient capital market: A Review of Theory and Empirical Work", which was a breakthrough for Efficient Market Hypothesis. In this article Fama presented his famous definition that market in which the prices fully reflect the available information are called efficient markets. More precisely, current stock prices fully reflect available information about the value of the firm, and there is no way to earn excess profits, more than the market overall, by using this information. The main force behind efficient markets is the fact that investors always seek for profits, so if there is a possibility of arbitrage it will be balanced with minimal delay. The EMH deals with one of the most fundamental issues and research topics in finance, why do prices change in security markets and how those changes take place.

Many investors seek to identify securities that are undervalued and are expected to increase in value in the future, and particularly those that will increase more than other securities or the market overall. Also, many investors, including investment managers of big institutional companies, believe that they are capable of selecting securities that will outperform the market in a variety of time series. They use different types of complicated forecasting and valuation techniques with unique input data to aid them in investment decisions, and any edge that an investor possesses can be translated into substantial profits. The previous also partly explains why the EMH has been such a hot research topic for so long, different methods are studied and tested. Also, the efficient market hypothesis in reality almost never holds because of information asymmetry.

2.2.1 The properties of efficient markets

Fama (1970) divides efficient markets into three forms according to their informative efficiency, meaning how efficiently the available information reflects the market prices. In weakly efficient markets all historical information is included in the market price, and changes in the market prices follow a random walk, which means that no technical analysis will help investors. The semi-strong form suggests that because all public information is part of a stock's current price, investors cannot utilize either technical or fundamental analysis to predict price movements, although it is possible to utilize non public information for profits. The strong form states that all information, both public and not public, is included in the current stock prices meaning that no type of information can be used to gain abnormal profits. The strong form though might be impossible to ever accomplish meaning that in practice there are no efficient markets.

Fama in his 1970 paper presents three conditions that are sufficient for efficient markets.

1. There are no transaction costs.
2. All information is available to every market participant with no costs, equally.
3. Every market participant agree on how the current information affects the current and future prices.

Fama adds that these conditions are not always true in practice, but either are they always inevitable to reach efficient markets.

Jensen (1978) presents a more generic and economically realistic definition of market efficiency. He states that the market is efficient in relation to a variable x if it is impossible to make profit by trading based on information about x. In other words, the marginal utility of expected returns does not exceed the marginal costs of collecting information.

2.3 Investor sentiment

Contrary to the EMH, this subchapter discusses an alternative theory that stems from the fact that markets do not always function with such rational behavior as was proposed by Fama. Behavioral analysis in Finance has suggested that Market sentiment, (a.k.a investor sentiment) could explain some market movements by studying investor behavior and irrationality and how it affects the market. Behavioral analysis was created in attempt to explain anomalies that cannot be explained by fundamentals. Baker and Würgler (2007) define Investor sentiment as "a belief about future cash flows and investment risks that is not justified by the facts at hand".

Fisher and Statman (2000; 2003) find that both American Association of Individual Investors' sentiment index and Wall Street strategists' sentiments are negatively correlated with the S&P 500 returns the following month. This indicates that investor sentiment works as a contrary indicator of future stock returns. Fisher and Statman (2003) examine also whether consumer confidence index works as a proxy for investor sentiment and predicts stock returns. The results show that increase in consumer confidence about the general economy comes together with increase in bullishness of individual investor about the stock market. And as mentioned earlier, high consumer confidence is followed by significant low returns in S&P500, NASDAQ and small stock returns.

Similar results are also found by Brown and Cliff (2005) who state that High investor sentiment level is followed by low returns at horizons of two and three years. Charoenrook (2005) observes the University of Michigan Consumer Sentiment index to investigate its explanatory qualities on market returns and finds that changes in consumer sentiment are positively related to contemporaneous excess market returns and negatively related to future excess returns at the one-month and the one-year horizons.

This evidence leads to conclusion that firstly, the positive contemporaneous sentiment-return relationship shows that stock prices tend to be overvalued in a bullish market. Secondly, the negative relationship between investor sentiment and subsequent stock returns indicate that the market is bound to decline to its fundamental value after gradual corrections occur over a longer horizon.

Overall, the previously mentioned literature gives us a cross-section of existing literature on investor sentiment from which we can agree that it has to be considered as a component in the formation of stock prices. Market sentiment is positively correlated with contemporaneous stock returns and negatively correlated with subsequent stock returns. Some stocks are more prone to be affected by sentiment, depending on the company's characteristics in terms of market cap, price multiples, ownership etc, although this might not be the emphasis on in this paper as we are focusing on a pandemic. Recent literature also shows that investor sentiment influences stock volatility and the market risk.(Lee et al. 2002).

3 Literature review

This chapter focuses on existing literature on the topic.

3.1 Macro-economic announcements and government intervention

Stock-market reaction to macro-economic news announcements has been studied by for example Nikkinen et al.(2006), Cai et al. (2009), Sorokina et al. (2013) and Seda et al.(2018). Nikkinen et al. suggest that the most important macroeconomic news announcements are the consumer price index, employment cost index, employment situation and the NAPM reports in regards to global stock market reaction, and this is confirmed in earlier studies by Bollerslev et al. (2000) and Graham et al.(2003). The results of Nikkinen et al. also show that the developed economies as well as the Asian region are all integrated with the world's major stock markets and the impact of US macroeconomic news also shows on stock markets in Asia and Europe. Hanousek et al. (2009) support the view on the spill-over effects of the US macroeconomic news and similarly to Nikkinen et al. confirm that the markets are integrated both in terms of stock returns and volatility.

Hardouvelis (1987) in his paper tests stock market reaction to 15 representative macroeconomic announcements and state that stock prices primarily respond to monetary variables, such as money supply, inflation and discount rates. Hu & Li (1998) from the International Monetary Fund study the market reaction to different types of monetary news and divide them into three subcategories similarly to Hardouvelis: money supply surprises, Inflation surprises and discount rate changes.

According to their paper, Hu & Li (1998) state that unanticipated increases in the money supply lead to immediate increases in interest rates and thus decreases in security prices. If interest rates and stock prices react to money supply announcements because of inflationary expectations, they also react to shocks contained in the inflation rate announcements. This dynamic should result in a negative effect, in case a positive surprise in announced inflation rate is observed, indicating for decision-making agents to raise the level of expected inflation. Moreover, unanticipated higher inflation can lead to expectations towards more restrictive monetary policies, which in turn results in reduced cash flows and lower stock prices. They continue that discount rate changes often reveal new information about policy objectives in the short run. An increase in discount rate can reveal a short-run objective of returning to the implied long-run money growth target more quickly. When short-run money growth is reduced and the long-run objectives remain unchanged, the change in discount rate will raise market interest rates and stock prices should fall as a result. These previously mentioned dynamics of monetary announcements have been documented for example by Cornell (1979, 1983) and Ulrich and Wachtel (1981,1984).

Contrary to monetary policy announcements, real economic activity surprises might increase agents' expectations of future growth and cause an increase in share prices. Alternatively, greater than expected real economic activity might cause agents to worry about more restrictive monetary policy in the future, which likely leads to depressed stock prices. The exact impact of real economic activity surprises cannot be determined because there is a lack of evidence in the literature (Hu & Li 1998).

Government interventions' impact on stock market has been studied on the Chinese stock market by i.e. Chen, Sun, Tang & Wu (2011), but drawing conclusions from a market that is anything but a free market and nothing similar to the western economies is not optimal. Pastor & Veronesi (2012) study how changes in government policy affect stock prices in the US and argue that in general, stock prices should fall at the announcement of a policy change, unless the policy change is preceded by a sufficiently deep downturn after which they should rise instead. Moreover, the average announcement return should be more negative if either impact uncertainty or political uncertainty is large, in other words the more there is uncertainty present the more negative announcement returns. Finally, they argue that policy changes should make stock returns more volatile, and more highly correlated across firms.

3.2 Stock market reaction to epidemic diseases

Baker et al. (2020) examine historical jumps in the stock market and according to their research no other disease has produced such huge swings in the U.S. stock market since 1900. They lay out an example of the VIX volatility index, which reached its' historic all-time high in March 2020, leaving behind the outbreak of the global financial crisis in 2008 as well as all the previous pandemic diseases like Ebola and SARS.

Chen, Jang and Kim (2007) applied the event study method on seven publicly traded hotel companies in attempt to research the impact of the SARS outbreak on hospitality stocks in Taiwan. Industry-wise they found that the Tourism industry suffered the most. They continue, that manufacturing, retail trade and banking industries were less influenced. The results show significant negative cumulative mean abnormal returns on the hospitality industry. Similar results were captured by Chen, C. D.; Chen, C. C; Tang and Huang (2009). Negative returns were observed in tourism, wholesale and retail sectors, while biotechnology sector was booming and experiencing positive abnormal returns. Lee, Tsong and Lee (2014) on their part found evidence of several policy implications from the SARS outbreak. They argue that there is evidence of exogenous shocks such as various crises do not have any permanent effects on the stock markets, but these effects are rather transitory, and short-term. They also state that only little evidence is found to support stationarity, suggesting that stock prices are characterized by an efficient market, which leads to the fact that predicting stock prices from past prices is close to impossible.

Ma, Rogers and Zhou (2020) examine the impact of SARS in 2003, H1N1 in 2009, MERS in 2012, Ebola in 2014 and Zika in 2016 on real economic indicators and asset prices. Their results show that real GDP falls persistently, and more so in countries that employ less aggressive first year response in government spending. Stock market reactions in turn suggest for short-run overreaction of the negative impact. The authors state that these historical effects are impossible to translate into forecasting the economic and financial effects of COVID-19, given the higher number of cases and deaths, and the scale of aggressive lock-downs imposed by governments around the globe.

As mentioned, the outbreak of COVID-19 pandemic was unexpected and unprecedented and governments around the globe started pushing emergency policy actions in order to fight both the spread of the virus and the economic impacts. Aschraf (2020) studies the stock market reaction to government policy measures in the context of the pandemic. He suggests that while social distancing saves lives, strict government actions reduce economic activity and hurt businesses and increase unemployment rate. He continues to estimate both a direct and an indirect effect on stock market returns. While the direct effect lies on the reduced economic activity in general, there can be a positive indirect effect when these actions reduce the intensity of the pandemic outbreak through which it decreases the negative market effect that is associated with the growth of COVID-19 cases.

Like Aschraf, also Efetherious & Patsoulis (2020) measure the impact of government policy actions on stock market indices in 45 different countries. They find that when social distancing measures (i.e. lock-downs) are increased in intensity it is followed by decreased stock returns in the observed country. They also find evidence of an indirect spillover effect, meaning that increase in the intensity of containment in country A resulted in decreased stock returns in interrelated country B. Contrarily, Narayan, Phan & Liu (2021) find evidence that country lock-downs, stimulus packages and travel bans all had positive effect on the G7 countries' excess stock returns. Thorbecke (2020) finds similar results as Narayan et al. stating that their results showed that between Feb 19 and Mar 23 news of the pandemic contributed to a 43% drop in the aggregate U.S. stock market, while later on expansionary policies by the Federal Reserve contributed to a 37% increase in the stock prices between 23 Mar and 10 July 2020.

Phan & Narayan (2020) confirm results that whether the stock market reaction to government stimulus package announcement was highly dependent whether the underlying government had a clear vision on how to exercise travel bans and lock-downs together with stimulus packages.

Huo & Qiu (2020) conduct an event-study on stock market reaction to Wuhan's lockdown in China and measure the impact on the industry level. They find that out of all significant results, except for Electronics, Computer and Pharmaceutical & Biotechnical industries, the regression coefficients were negative. Similar results were presented also by Thorbecke (2020) in the U.S market, as they mention that electronic entertainment, diversified retailer, nondurable household goods, biotechnology, computer hardware and software industries were overperforming in comparison to underperformance by airlines, aerospace, real estate, tourism, oil, brewers and funerals.

Government actions regarding healthcare are estimated to have positive effect on stock market returns. Aschraf (2020) gives an example of an aggressive government program about benefits of staying at home, sanitizing public places and washing your hands properly, which leads to the outcome of better hygiene in general meaning less infections and cases, causing the indirect effect of fighting the pandemic which results in weaker effect of negative stock returns. Also, testing and tracing infections helps identifying the spread of the disease. These kind of better healthcare policies are expected to boost investors' confidence and trust in the government which leads to positive market effect.

Government economic support programs are likely positive reactors for stock market returns (Aschraf 2020). When correctly directed, these support programs can partly counter adverse the impact of the social distancing practices on employment and business activity. If the investors trust in governments' ability to steer these subsidies in the right direction it might increase expected stock market returns.

Aschraf goes on to state that support programs might increase people's willingness to comply with the social distancing measures being taken, which leads to decreased infection rate and indirectly affects stock returns positively.

3.3 Stock market reaction to the spread of the virus

Al-Awadhi (2020) et al. study the impact of COVID-19 pandemic on stock market returns in the Chinese financial markets and use the observation period from Jan 2020 to March 2020. Their research suggest that stock market returns are significantly negatively correlated with both the daily growth in total confirmed cases and the daily growth in total cases of death caused by COVID-19. They also perform a sector analysis, and as expected, the stock returns of information technology and medicine manufacturing companies performed significantly better than the market. The worst-performing sectors were unsurprisingly beverages, air transportation, water transportation, and highway transportation, which performed significantly worse than the market in general during the covid-19 pandemic.

Mazur et al. (2020) study the S&P500 firms' reaction to the drastic increase in cases in the US in March 2020 and find further similar evidence as suggested earlier in this chapter. They also find that natural gas companies are among the winner stocks in returns during the stock market crash of March 2020. They believe this reaction is caused by the sharp decline of oil price in March 2020. It caused companies to reduce both the production of crude oil and natural gas which had a positive effect on future cash flow expectations of natural gas producers. Similarly, some companies in the food and chemicals industry experience 20% positive jumps on 1 day. The worst performers were naturally crude oil stocks, of which some sunk more than 60% for one day. Hospitality, real estate, and entertainment sectors suffer similar declines during that day. Among the best performing industries are expectedly healthcare and medical devices.

Aschraf (2020) studies stock market reaction to the growth of cases and to growth of deaths from 64 countries during time period from March 11 to April 17. Similarly, to Al-Awadhi (2020) they find that stock market returns are negatively correlated to the growth in total number of cases, meaning that stock markets decline whenever the daily growth is upward sloping, at the later stage of the pandemic stock market response to infected cases varies over time depending on the severity of the outbreak. They also find that the stock market's response to the daily growth of deaths is weak, so as a more viable parameter should be used the number of new infections rather than the number of deaths according to Aschraf. He also states that the reaction of stock market is stronger in the early days of COVID-19 in comparison to later stages, when the stock prices have already been absorbed with much of negative information. Overall Aschraf reports that the stock markets quickly respond to the COVID-19 outbreak but later on the response varies over time depending on the severity of the outbreak. Ramelli and Wagner (2020) find similar results with the fama-french model. They state that stocks that were associated with China performed weaker in comparison to the market. Onali (2020) in turn employs a GARCH model and the results suggest that during the first three months of the outbreak in the US the number of cases and deaths did not have an explanatory effect on US stock returns.

3.4 Investor sentiment during the pandemic

Lyócsa et al. (2020) attempt show that the stock market reacted to fear, by using coronavirus related words in the Google Search Volume Index (GSVI). They find that during the period from December 2, 2019 to April 30, 2020 the market declined in negative correlation while the uncertainty increased. They also find that when the uncertainty, google searches, increase the price variation in stock market lags one day behind, and increases the following day. When abnormal search activity increases 2 SDs above the average, the market's realized variance effect almost doubles. Lyócsa et al. continue that the fear is global, and the spill-over effects are significant across the studied 10 largest financial markets, meaning the economies are highly inter-connected. They also apply the same model to a post-fear period, with a time span from 1 April 2020 to 31 July 2020, and as expected the model reaches fewer extreme values during that period. This effect is probably explained due to increased knowledge among public and successful government policy measures such as lock-downs. Liu et al. (2020) also find a significant connection that the markets were affected by sentiments and short-term overreaction was observed, depending on the pessimism or optimism that prevails the market.

Liu et al. (2020) continue that from investor's POV the COVID-19 outbreak has a significant negative effect on stock market returns across all affected countries, financial markets in Asia react more quickly, and the confirmed cases of COVID-19 have statistically significant adverse reactions on major stock market indices. They also find that the fear sentiment is proved to be a significant mediator and transmission channel for the outbreak's effect on stock markets. The effects on real economic activities can be most severely seen as a global supply shock as the lock-downs and moving restrictions were rolled out, which especially affected the labor-intensive and manufacturing sectors. Their findings can teach something to policymakers as well; they state that a coalition of government officials, investment bank regulators, and the central bank would be required to tackle this issue with proper government intervention. This coalition would make it possible to coordinate actions to carry economies over the crisis periods and help banks and businesses survive through turbulence cause by the virus outbreak. The main goal would be to manage the crisis with a rational and transparent approach by making sure that the citizens are being informed of what the government and the healthcare system are doing, in order to avoid triggering unnecessary uncertainty in the market.

Ali et al. (2020) find the usual general result that negative returns and higher volatility can be observed in all security classes except for the US treasury bonds, suggesting the reason to be the investor sentiment and perceived uncertainty during the COVID-19 outbreak. Apart from debt securities, gold turned out to be relatively stable and crude oil was the most volatile asset, which cannot wholly be attributed to the pandemic as there was regional disputes among oil producing nations. While observing equity markets, European markets showed most sensitivity towards the pandemic which could be explained by the fast growth rate of cases in the early stages in Italy and Spain.

Ali et al. (2020) show that the global markets uncertainty increased as the epidemic shifted to pandemic stage from 11 March onwards and market declines amplified evidently from higher negative returns, Europe registering the highest negative returns geographically. The authors think that this could be attributed either to the negative market sentiment caused by high media coverage, or to the fact that European countries announced strict lock-downs simultaneously with the beginning of the pandemic stage. The Chinese market on its side, at the beginning of the pandemic stage, showed a lower decline in retains and remained stable. This could be attributed to the governments control on the coronavirus, which to investors might have seemed under control. The volatility levels of debt-based securities increased from the epidemic period. Commodities-wise Bitcoin showed weak performance as it registered the largest average negative return of -3.66%, and also Gold that was relatively stable in the epidemic phase also registered negative returns, but still was the most stable asset measured by volatility and showed why it is called a safe-haven asset.

Haldar & Sethi (2020) seek to find out whether demographic characteristics, socio-economic factors and public policy parameters work as determinants of new COVID-19 cases. They employ a multivariate regression model to cover the 10 countries that have the highest number of confirmed cases per million people. They state that the findings show that the role of demographic characteristics of the population as well as government stringency and testing policies cannot be neglected as important factors in reducing the incidence of the coronavirus. Consistent with related studies the authors find proof that dynamic government lock-down policies with periodic lock-downs are effective in preventing new cases, and that way reducing the severity of the crisis. They suggest that the most effective way to react for countries with high number of new cases would be to employ periodic lock-downs and increase COVID-19 testing. As a biproduct they state that countries should react by adding more capacity to hospitals if the carrying capacity of the healthcare system is not sufficient for the current situation.

Sharif, Aloui and Yarovaya (2020) analyze the connectedness of recent spread of COVID-19, oil price volatility shock, the stock market, geopolitical risk and economic policy uncertainty in the US within a time-frequency framework. Their investigations support the fact that the COVID-19 pandemic and the regulatory response are sources of geopolitical risk and the pandemic has a significant impact on the US economic uncertainty as well as on the geopolitical risk. The study shows that the long-term effect on geopolitical risk and economic uncertainty is expected to be highly negative. During the observation period, the oil slump had the strongest impact on the US stock markets even in comparison to COVID-19, and that the oil prices were the leading factor throughout the time span. On the other hand, the results show that the COVID-19 pandemic affected the oil prices for example through imposed travel restrictions.

4 Data

The data sample in this study has been collected from Datastream (FTSE) and Yahoo Finance (MSCI ACWI). The data consists of MSCI All Country World Index, to proxy as a leading Index to FTSE All-Share Index. FTSE All-Share Index is the leading index for examined Industry Indexes. The Industry Breakdown has been categorized in accordance with the Industry Classification Benchmark and suggested by FTSE Russel on their fact sheet. The 10 Industries examined consist of Oil & Gas, Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Telecommunications, Utilities, Financials and Technology. Market capitalization shown below in Picture 1.

ICB Industry Breakdown

		FTSE All-Share		
ICB Code	ICB Industry	No. of Cons	Net MCap (GBPm)	Wgt %
0001	Oil & Gas	13	175,075	8.01
1000	Basic Materials	23	222,697	10.19
2000	Industrials	97	277,366	12.69
3000	Consumer Goods	41	340,887	15.59
4000	Health Care	15	181,948	8.32
5000	Consumer Services	79	273,543	12.51
6000	Telecommunications	6	46,522	2.13
7000	Utilities	8	61,714	2.82
8000	Financials	308	582,833	26.66
9000	Technology	16	23,339	1.07
Totals		606	2,185,925	100.00

Picture 1. ICB Industry break-down (FTSE Russell 2021)

4.1 Event clarification

This thesis examines three events that are picked from a policy tracker provided by the Health Foundation UK in cooperation with the UK Government (2020). All the events have been defined as "major" policies according to the tracker. Estimation window for each event last 90 trading days and are customized to be as close to the event but avoiding overlapping with huge single day swings. Examined event window for each event is

[-5,+5], except for event number three it is [-5,+3] as there is a pause of 4 trading days due to Christmas.

The first Event date is 23 Mar 2020, that is, the first lock-down ordered by the government in the UK simultaneously with a £300bn economic support package that was announced on the same day. The estimation period for event 1 starts from 17 Oct 2019 and ends 19 Feb 2020, so that overlapping with the stock market crash after 19 Feb is avoided.

The second event date is 24 Sep 2020 when the HM Treasury under the UK government published their Winter Economy Plan to help businesses survive the crisis. The estimation period for Event 2 starts on the 28 Apr 2020 and ends on 31 Aug 2020.

The third event date is 21 Dec 2020, a Tier 4 'Stay at home order' announced on the 19 December, effective 20 December. For event 3 the event window will be from t-5 to t+3 as the 25th and the 28th of December were non trading days, leaving a gap of 4 days in total (including the weekend inbetween), that is why the event window is shortened.

5 Methodology

The methodology in this paper follows closely to Event Study methodology suggested by Fama et al. (1969) and some customization made by Pandey and Kumari (2021). Event Study is used to investigate the impact that arrival of new information of a particular event has on stock markets. It tests for semi-strong form market efficiency, which states that all publicly relevant information is already incorporated in the value of a certain stock, as defined earlier in chapter 3.

The short-term market reaction can be easily measured by event study methodology, which suggests that the stock market reaction to a particular information flow could be observed by the change of stock price. (Ball and Brown 1968; Mackinlay 1997; Malkiel 2003) This leads to the fact that by calculating the abnormal return and the cumulative abnormal return using stock price during the event window is a easy way to measure the response of the stock market to the event. According to Fama, Fisher, Jensen and Roll (1969) the more efficient the stock market is, the faster the market responds to the event and bounces back rapidly.

5.1 Estimation procedure

First, an estimation window is defined. The estimation window is supposed to estimate the underlying stock index's returns under "normal" circumstances. This study applies the most common estimation model called the market model. It essentially is a OLS regression of the examined market index returns and the returns of the leading benchmark index. The market model for stock index i is expressed as:

$$ER_{it} = \alpha_i + \beta_i R_{Mt}, \quad (1)$$

Where,

ER_{it} is the investigated stock index's normal return on day t

α_i is the intercept estimated from the estimation window

β_i is the slope coefficient estimated from the estimation window

R_{Mt} is the benchmark stock index return on day t

5.2 Abnormal returns

Now that the estimation procedure is defined, the impact that an event has on a particular stock index's return is measured. For a day t in the event window, a stock index's abnormal return can be defined as follows, difference between its actual return and its predicted return:

$$AR_{it} = R_{it} - ER_{it} \qquad (2)$$

Where,

AR_{it} is the Abnormal Return of the investigated stock index

R_{it} is the actual stock return on event window day t

ER_{it} is the normal return of the index i on day t ($\alpha_i + \beta_i R_{Mt}$)

To calculate the actual daily returns of the sample indexes as well as the benchmark indexes, the log returns have been used as suggested by Pandey and Kumari (2021). The actual return R_{it} is calculated using the log function of MS-excel as described below:

$$R_{it} = LN\left(\frac{P_{it}}{P_{it-1}}\right) \times 100 \qquad (3)$$

Where,

LN is the logarithm of natural number

P_{it} is the price of index i on day t

P_{it-1} is the price of index i on day before day t

5.3 Cumulative abnormal returns

The cumulative abnormal return measures the total abnormal returns during the event window. CAR_t is the sum of all the abnormal returns during the observed time period and calculated as:

$$CAR_t = \sum_{j=1}^{t} AR_{T_1+j} \tag{4}$$

Contrary to Pandey and Kumari (2021) this study uses a shorter event window from -5 trading days to +5 trading days. According to EMH all the information from a particular event will be merged in the stock prices with no delay, and the 11-day event window will allow observation for some pre-event and post-event effects on the market. Also, the short event window is a way to avoid for overlapping significant events in the stock market.

5.4 Significance testing

First, we test for significance for Abnormal returns on each day during the event window. The test statistic used in this paper is student's t-test. The test statistic for single index at each point of time t is calculated as below:

$$t_{AR_{i,t}} = \frac{AR_{i,t}}{S_{AR_i}} \tag{5}$$

Where S_{AR_i} is the standard deviation of the abnormal returns in the estimation window obtained from the regression analysis.

Second, we test for significance of the abnormal returns with t-test as follows:

$$t_{CAR} = \frac{CAR_i}{S_{CAR}} \tag{6}$$

Where S_{CAR} is the standard deviation of cumulative abnormal returns during the event window.

5.5 Testable hypotheses

The hypotheses setup for testing our research questions with cumulative abnormal returns will be setup as followed: if $H_0: CAR = 0$ holds there is no significant impact on the examined stock indices. If $H_0: CAR \neq 0$ there is an observed impact on the stock indices being examined. Whether the observed impact is positive or negative, it is shown in the CAR absolute value.

6 Empirical results

6.1 Normality testing

A total of 2970 daily returns in 3 different events for 11 indices are examined in this paper. Each estimation window consists of 90 estimation day returns. The normality of the data has been checked via NormalityTest function provided by NumXL add-in on excel. The normality test results are shown below in table x. Test results for Jarque-Bera, Shapiro-Wilk and Chi-square test are reported for all the indices, for the 3 events. The tests are performed with following hypotheses:

H0: The sample is normally distributed

H1: The sample is not normally distributed.

Table 1. Normality test results for Event 1 estimation period.

Event 1	**Jarque-Bera**	**Shapiro-Wilk**	**Chi-sq**
FTSE ALL-SHARE	**<0,0001**	**<0,0001**	**<0,0001**
OIL&GAS	0,300	0,094	0,204
BASIC MATS	0,241	0,156	0,115
INDUSTRIALS	0,994	0,557	0,855
CONSUMER GOODS	**0,002**	**0,007**	**0,024**
HEALTH CARE	0,139	0,135	0,117
CONSUMER SVS	**<0,0001**	**0,001**	**<0,0001**
TELECOM	**0,011**	**0,003**	**0,011**
UTILITIES	**<0,0001**	**<0,0001**	**<0,0001**
FINANCIALS	**0,024**	**0,017**	**0,006**
TECHNOLOGY	**<0,0001**	**0,001**	**0,002**

During event 1 the test results for FTSE All-Share, Consumer goods, Consumer services, Telecommunications, Utilities, Financials and Technology indices are all significant and the computed p-value is less than the alpha of 0,05. Therefore, we accept the alternative hypothesis H1 and state that the sample is not normally distributed. With the rest of the indices we can accept the null hypothesis and state that the samples are normally distributed.

Table 2. Normality test results for Event 2 estimation period.

Event 2	**Jarque-Bera**	**Shapiro-Wilk**	**Chi-sq**
FTSE ALL-SHARE	0,601	0,390	0,363
OIL&GAS	0,334	0,119	0,114
BASIC MATS	**0,018**	**0,019**	**0,008**
INDUSTRIALS	0,642	0,304	0,296
CONSUMER GOODS	0,900	0,853	0,981
HEALTH CARE	0,480	0,183	0,446
CONSUMER SVS	0,846	0,541	0,535
TELECOM	**<0,0001**	**0,002**	**0,001**
UTILITIES	0,217	0,113	0,221
FINANCIALS	0,783	0,254	0,443
TECHNOLOGY	**0,013**	**0,017**	**0,044**

In the second event, the computed p-value for Basic Materials, Telecommunications and Technology indices is less than the alpha value of 0,05 meaning that the results are significant and null hypothesis is rejected. The samples under these indices are not normally distributed. All the other indices compute the p-value of more than the alpha of 0,05 in all three tests meaning that the null hypothesis is accepted and they are normally distributed.

Table 3. Normality test results for Event 3 estimation period.

Event 3	**Jarque-Bera**	**Shapiro-Wilk**	**Chi-sq**
FTSE ALL-SHARE	**0,002**	**0,003**	**0,003**
OIL&GAS	**<0,0001**	**<0,0001**	**<0,0001**
BASIC MATS	0,493	0,317	0,276
INDUSTRIALS	0,385	0,143	0,195
CONSUMER GOODS	0,146	0,068	0,174
HEALTH CARE	**<0,0001**	**0,005**	**0,012**
CONSUMER SVS	**<0,0001**	**<0,0001**	**<0,0001**
TELECOM	**0,007**	**0,004**	**0,034**
UTILITIES	0,313	0,292	0,265
FINANCIALS	**<0,0001**	**<0,0001**	**<0,0001**
TECHNOLOGY	0,560	0,188	0,368

In the third event all the three different tests report similar results. For FTSE All-share, Oil & Gas, Health Care, Consumer services, Telecommunications and financials indices produce p-values that are significant and less than the alpha value of 0,05 meaning that the null hypothesis is rejected and the sample is not normally distributed. We accept the null hypothesis for the rest of the indices and state that the samples are normally distributed.

All of the test statistics, Jarque-Bera, Shapiro-Wilk and the Chi-sq test indicate similar results. 48% of all the 33 tests were accepted and the samples were normally distributed, while 52% of the tests were rejected and the samples were not normally distributed.

In line with Pandey and Kumari (2021), this paper will partly ignore non-normality based on a study by Dyckman et al. (1984) where they compared Event study methodologies and found that whether the sample is normally distributed or not did not affect the interferences drawn by the t-test. Therefore, we move on with the main results.

6.2 Single day abnormal returns and descriptive statistics

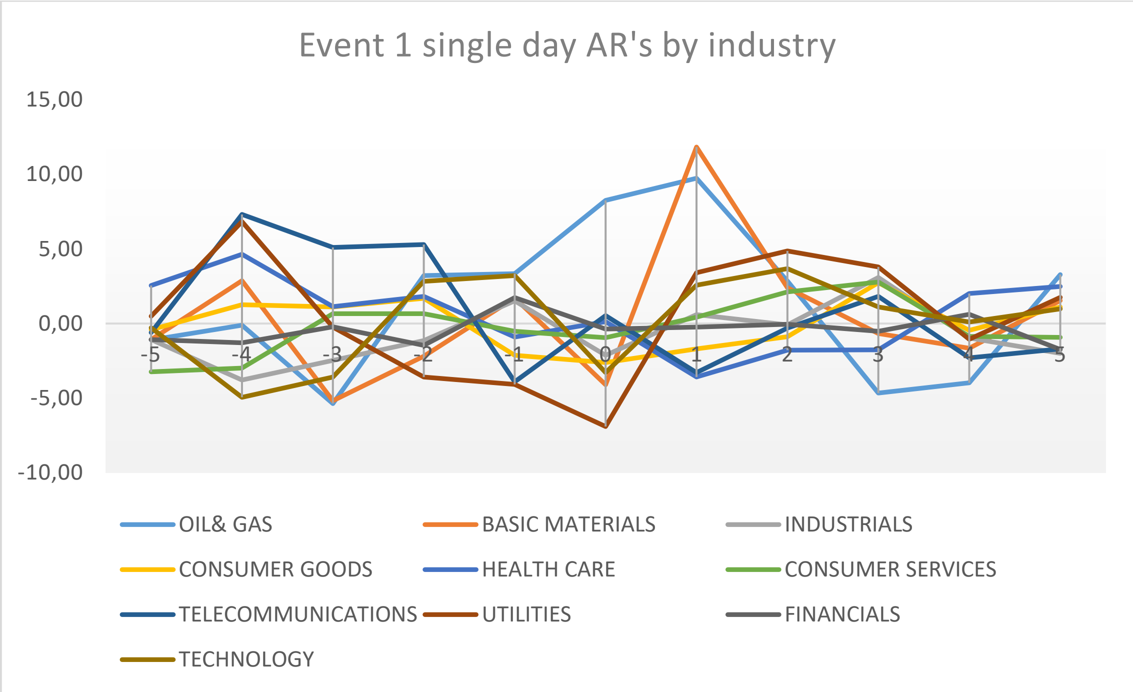

Figure 1. Single day abnormal returns for each index during event 1 Event window.

Trends of single day AR's for the first event can be seen in Figure 1 above. Notable here is that the event day has been marked at t_0, and most industries abnormal returns are close to zero. Going into one day after the event day t_{+1} there is a notable jump for multiple industries. Upward trend is observed in Oil & Gas, Basic materials, Utilities and Technology industries. A notable downwards trend can be observed in only health care and telecommunications industries. The maximum single day Abnormal return is observed in Basic materials with a positive abnormal return of 11,83% and the minimum single day abnormal return is observed in Utilities on the event date with a negative AR of 6,90%

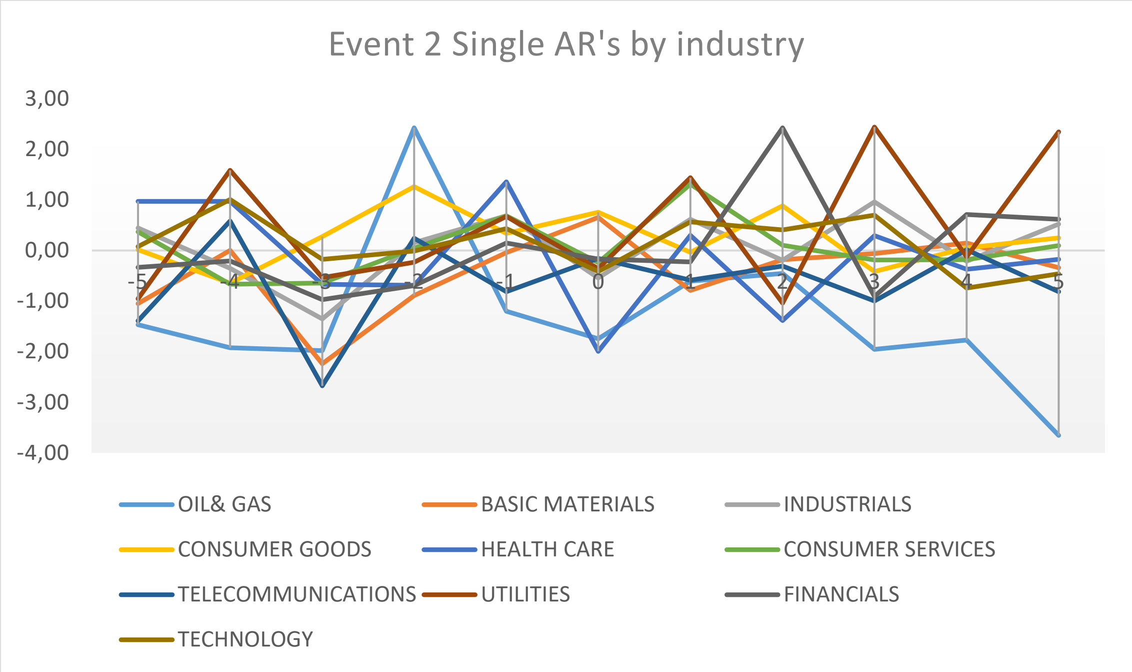

Figure 2. Single day ARs for each index during event 2 Event window.

Figure 2 shows single day abnormal return trends for event 2. To keep in mind here, the scale of event 2 graph is smaller than in event 1 due to less variation in the abnormal returns, indicating that the market did not react as powerfully to this event in comparison to the first event. At event date t_0 most of the industries do not experience notable abnormal returns, except for Oil & Gas and health care which stand close to 2% negative abnormal returns. Going into post-event window all industries are fluctuating calmly between -1% and 1% abnormal returns except for utilities and financials which reach positive abnormal returns of 2,44% on t_{+3} and 2,43% on t_{+2}, respectively. In addition, a significant negative abnormal return is observed in the Oil & Gas industry on t_{+5}, which most likely is not related to the investigated event here.

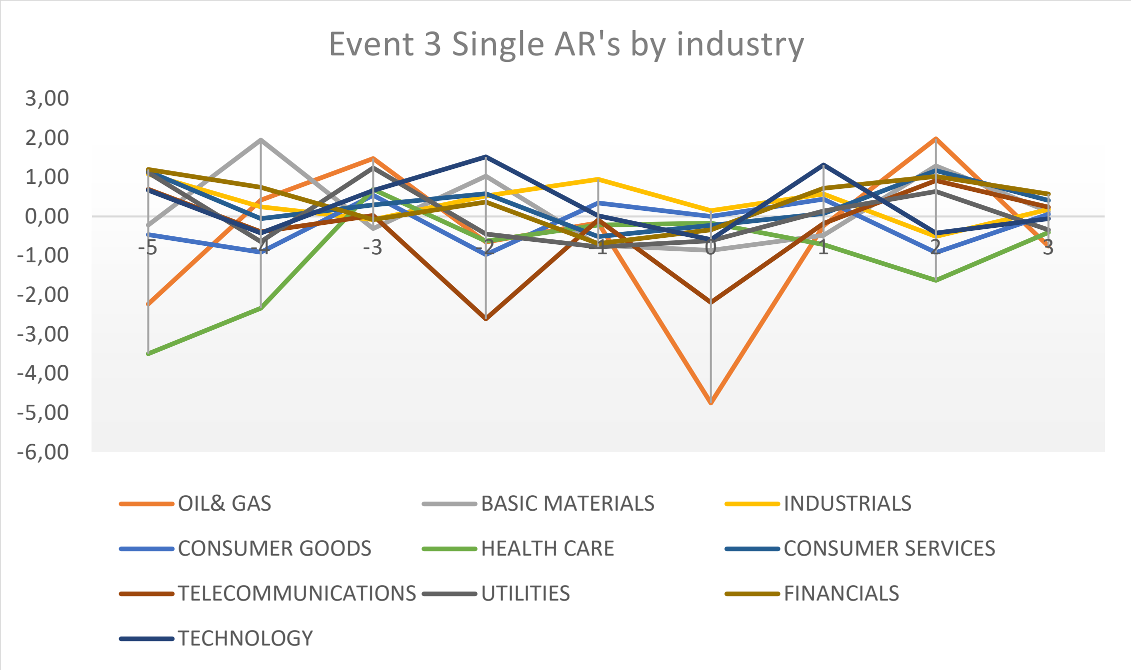

Figure 3. Single day abnormal returns for each index during event 3 Event window.

Figure 3 shows the single AR curve by industry during the event window. Notable here is that the event window lasts from t_{-5} until t_{+3}. This is because of winter holidays and non-trading days after the event. The pre-event window lasts 5 days in order to compare it to the earlier events. During the event date t_0 almost all ten industries are close to zero abnormal return, only Oil & Gas and Telecommunications experience strong negative abnormal returns. Overall the stock reaction to event 3 “Tier 4 stay at home order” is very mild and does indicate significant impact based solely on the graph.

6.3 Main results

Table 4 below presents main results of the study with cumulative abnormal returns and the underlying t-value and significance for three different periods during the event window. At the first glance it is easy to spot that Event 1 results offer more statistically significant results than Event 2 and 3.

During the pre-event window [-5,0] in Event 1 positive and statistically significant results at the 1% level were observed in health care and telecommunications industries with positive abnormal returns of 9,35% and 13,74% respectively. Positive and statistically significant results at the 10% level were reported in FTSE All-Share index and Oil & Gas industry. Negative and statistically significant results in the pre-event window were reported in Industrials, Consumer services and Financials at the 1% confidence level, technology at the 5% confidence level, and in Utilities and Basic materials at the 10% level.

In the On-event window [0,0] only Oil & Gas industry was observed to produce positive and statistically significant values, at the 1% level. Negative and statistically significant results at the 1% level were recorded in FTSE All-Share index (leading index ACWI) and in Basic materials, Industrials, Consumer goods, Consumer services, Utilities and Technology industry indices. Telecommunications, Health care and Financials industry indices' abnormal returns were statistically insignificant. Highest negative abnormal returns were recorded in Utilities, Basic materials and Technology indices, with abnormal returns of -6,90%, -4,10% and -3,29% respectively.

In the post-event window [0,+5] only 4 industry indices recorded significant results. Oil & Gas and Basic materials industries recorded positive abnormal returns of 15,49% and 9,35% at the 1% and 5% significance level. Technology recorded positive abnormal returns of 5,15% at the 10% level. Financials on its part recorded significant negative abnormal returns of -2,28% at the 5% significance level.

Table 4. Main results including cumulative abnormal returns and underlying t-stats.

Industry	Window	Event 1 (Mar 23, 2020)		Event 2 (Sep 24, 2020)		Event 3 (Dec 19, 2020)	
		CAR (AR)	t-stat	CAR (AR)	t-stat	CAR (AR)	t-stat
Pre-event							
FTAS	[-5,0]	5,42	1,895*	-3,40	-2,989***	-2,60	-3,279***
OIL & GAS	[-5,0]	8,25	1,732*	-5,89	-4,130***	-5,89	-3,426***
BASIC MATERIALS	[-5,0]	-7,95	-1,822*	-3,56	-4,802***	0,85	1,008
INDUSTRIALS	[-5,0]	-9,09	-4,890***	-0,96	-1,491	2,86	6,504***
CONSUMER GOODS	[-5,0]	-1,07	-0,652	2,01	3,777***	-1,46	-2,752***
HEALTH CARE	[-5,0]	9,35	4,050***	-0,04	-0,045	-6,16	-5,382***
CONSUMER SERVICES	[-5,0]	-6,37	-3,584***	-0,44	-0,807	1,23	2,456**
TELECOMMUNICATIONS	[-5,0]	13,74	3,852***	-4,21	-4,948***	-4,56	-4,367***
UTILITIES	[-5,0]	-7,49	-1,872*	0,18	0,148	-0,12	-0,186
FINANCIALS	[-5,0]	-2,67	-2,797***	-2,23	-2,427**	1,20	2,154**
TECHNOLOGY	[-5,0]	-6,08	-2,143**	0,92	1,763*	1,86	2,752***
On-event							
FTAS	[0,0]	-2,30	-4,416***	-1,53	-1,622	-1,63	-1,758*
OIL & GAS	[0,0]	8,26	8,962***	-1,75	-2,468**	-4,75	-6,081***
BASIC MATERIALS	[0,0]	-4,10	-8,738***	0,65	0,807	-0,86	-0,999
INDUSTRIALS	[0,0]	-2,13	-6,52***	-0,54	-1,235	0,15	0,307
CONSUMER GOODS	[0,0]	-2,61	-5,601***	0,76	0,995	0,00	0,003
HEALTH CARE	[0,0]	0,12	0,142	-1,99	-1,633	-0,17	-0,187
CONSUMER SERVICES	[0,0]	-0,95	-2,952***	-0,24	-0,385	-0,22	-0,412
TELECOMMUNICATIONS	[0,0]	0,53	0,499	-0,15	-0,158	-2,19	-2,821***
UTILITIES	[0,0]	-6,90	-11,504***	-0,36	-0,317	-0,62	-0,667
FINANCIALS	[0,0]	-0,37	-1,029	-0,17	-0,332	-0,34	-0,683
TECHNOLOGY	[0,0]	-3,29	-5,939***	-0,42	-0,401	-0,59	-0,573
Post-event							
FTAS	[0,5], [0,3]	-4,35	-1,522	-3,29	-2,886***	0,66	0,835
OIL & GAS	[0,5], [0,3]	15,49	3,254***	-10,20	-7,149***	-3,88	-2,257**
BASIC MATERIALS	[0,5], [0,3]	9,35	2,143**	-0,57	-0,764	0,01	0,017
INDUSTRIALS	[0,5], [0,3]	-1,51	-0,810	1,15	1,785*	0,46	1,040
CONSUMER GOODS	[0,5], [0,3]	-1,80	-1,096	1,49	2,806**	-0,51	-0,953
HEALTH CARE	[0,5], [0,3]	-2,51	-1,088	-3,32	-3,367***	-3,13	-2,739***
CONSUMER SERVICES	[0,5], [0,3]	2,58	1,454	0,90	1,644	1,62	3,244***
TELECOMMUNICATIONS	[0,5], [0,3]	-5,24	-1,468	-2,84	-3,337***	-1,28	-1,226
UTILITIES	[0,5], [0,3]	5,85	1,465	4,70	3,844***	-0,33	-0,493
FINANCIALS	[0,5], [0,3]	-2,28	-2,386**	2,45	2,672***	2,06	3,684***
TECHNOLOGY	[0,5], [0,3]	5,15	1,815*	0,05	0,094	0,09	0,130

*t-stat is significant at the 0,1 level (2-tailed)
**t-stat is significant at the 0,05 level (2-tailed)
***t-stat is significant at the 0,01 level (2-tailed)

Moving into Event 2 Pre-event window [-5,0] where the model produced statistically significant results for 7 out of 11 investigated indices. Positive and significant results at the 1% level are observed in the consumer goods industry with positive abnormal return of 2,01%. Positive and significant result at the 10% level is observed in the technology industry with an abnormal return of 0,92%. Instead, negative abnormal returns with 1% significance were recorded in 4 indices, FTSE All-share with -3,40%, Oil & Gas with -5,89%, Basic materials with -3,56% and Telecommunications with -4,21%. Financials recorded a significant negative abnormal return of -2,23% at the 5% level.

In the On-event period [0,0] for Event 2 only 1 significant result is observed, which was Oil and Gas industry with an abnormal return of -1,75% at the 5% level. T-values recorded in the FTSE All-share index and Health care approach close to the critical value for 10% significance but not quite. FTSE All-share and Health care indices recorded negative abnormal returns of -1,53% and -1,99%.

In the post-event window [0,+5] 8 out of 11 indices record significant abnormal returns. Positive and significant abnormal returns at 1% level are observed in Utilities and Financials industry indices with abnormal returns of 4,70% and 2,45%, respectively. Positive significant abnormal returns at the 5% and 10% levels of confidence are observed in Consumer goods and Industrials industry indices, with abnormal returns of 1,49% and 1,15%. Negative and statistically significant results at the 1% level were recorded in FTSE All-share index and Oil & Gas, Health care and Telecommunications industry indices with negative abnormal returns of -3.29%, -10,20%, -3,32% and -2,84%, respectively.

In the pre-event window [-5,0] in Event 3, 9 out of 11 observations produced were significant. Positive and significant abnormal returns were observed in Industrials, Consumer services, Financials and Technology industry indices. Industrials and Technology produced positive abnormal returns of 2,86% and 1,86% at the 1% level of confidence, while Consumer services and Financials indices produced abnormal returns of 1,23% and 1,20% at the 5% level. Negative abnormal returns in the pre-event window were all significant at 1% level of confidence. FTSE All-share produced -2,60%, Oil & gas -5,89%, Consumer goods -1,46%, Health care -6,16% and Telecommunications -4,56% negative abnormal returns.

On-event window [0,0] results in Event 3 produced only 3 significant results, all of which were negative. FTSE All-share index produced abnormal return of -1,63% at the 10% level, Oil & Gas industry produced a negative abnormal return of -4,75% at the 1% level and Telecommunications produced an abnormal return of -2,19% at the 1% level of confidence. Other result are insignificant in the examined window.

Post-event window of Event 3 only consisted from [0,+3]. Significant results were only 4 out of 11 examined indices. Positive and significant results at the 1% level were observed in Consumer services and Financials industry indices with abnormal returns of 1,62% and 2,06%, respectively. Negative abnormal returns at the 1% level were observed in Health care with -3,13% and at the 5% level in Oil & Gas with -3,88%, respectively.

7 Conclusions

The present paper employs an Event study model to investigate whether government-imposed social distancing interventions and economic support packages had a short term impact on different sectors on the stock market in the UK, and whether this impact was any different in the early stages and late stages of the COVID-19 pandemic. In addition, the FTSE All-share index is compared to the MSCI All-country index to examine the impact on the UK market in comparison to the rest of the world. The empirical part included three events, of which all were defined as major policies by the UK governing institutions. Social distancing interventions were examined in event 1 and 3, economic support program interventions in events 1 and 2.

The research shows that the impact on the stock market is more pronounced in the early stages of the pandemic with more significant abnormal returns being present. This was an expected result, that has been earlier established by Aschraf (2020). This is seen in the number of significant results that were observed in different events. Event 1 produced significant abnormal returns for 22 out of 33 examined periods and indices, while Events 2 and 3 only produced significant results for only 16 examined periods and indices each.

Social-distancing interventions by the government impacted negatively and significantly on all of the sector indices except for Oil & Gas, Health care, Telecommunications and Financials industries, displayed by Event 1 (March lock-down + £300 bn economic support program announced) results. Event 3, that was a Tier 4 lock-down order in Dec 2020, produced significant results in the pre-event period for multiple industries, but no on-event or post-event impact were found in any industries of interest, which was a surprise. Given that there was a £300 bn economic support package during the Event 1 window, it is clear that the impact of social distancing interventions at the early stages of the pandemic was more dominant than the counter-effect of the economic support package. In addition, the only reversal that was experienced during the post-event window after a lock-down announcement was for Basic materials industry after the first lock-down announcement.

The more prominent impact in the early stages for social-distancing measures could possibly be explained by overreaction of the investors when the information is new to the market. Later on, the lock-down announcement might be perceived as a positive indicator for a less severe outbreak in the future.

The results of this study indicate that the impact of economic support packages on different stock market sectors are positive, although less positive than the negative effects of lock-down policy announcements as witnessed in Event 1. While some reversal effect during post-event period in Event 1 is observed, Event 2 on-event period only shows one significant result for Oil & Gas industry. The post-event period in Event 2 shows that Industrials, Consumer goods and Utilities industries experience positive abnormal returns as expected. This indicates that government interventions can be used to achieve a positive reaction (or a less negative one) on stock markets among the industries that are most affected by the crisis. Negative stock reaction was observed in Health care and Technologies industries which could be explained by better-than-average performance throughout the pandemic. In general, it is possible that investors increase their positions in assets of the underperforming industries after a support package, thus decrease their positions in Tech and Health care that have been overperforming.

The impact of these government interventions on the FTSE All-share index that proxies the UK stock market in comparison to the ACWI All-country index that proxies the stock for rest of the world, are negative and significant for both social-distancing and economic support programs. The fact that the abnormal returns are negative and significant in the post-event period for Event 2 (support package September 2020) indicate that the contents of the announcement of the support package were not as positive as expected.

To my best knowledge, this is the first study to examine cross-sector stock market reaction to government intervention policies in the UK. The results of this study may be important for governmental decision-makers, financial managers, financial counselors and to us as investors. While the empirical model might lack complexity, the beauty in it lies in the simplicity. The results are unequivocal when the model is used correctly. As stated earlier, this Event study methodology tests for the semi-strong form of the Efficient Market Hypothesis. The results of this study show that this semi-strong form does not hold and inefficiencies are present in the market, as there are multiple significant abnormal surprises in the stock market both in the pre-event and post-event windows of the investigated indices.

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