



Faculty of Economics and Business

**The Impact of COVID-19 Pandemic on Selected Sectoral Stock Returns
in Malaysia**

Lee Wei Jie

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The Impact of COVID-19 Pandemic on Selected Sectoral Stock Returns in Malaysia

Lee Wei Jie

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DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

LEE WEI JIE

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Signature

Name: LEE WEI JIE

Matric No.:20020351

Faculty of Economics and Business

Universiti Malaysia Sarawak

Date : 14/07/2025

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ABSTRACT

The COVID-19 pandemic that happen in year 2020 brought massive impact in worldwide including Malaysia. The global stock market was affected due to the COVID-19 pandemic. The purpose of this study is to determine the impact of the COVID-19 pandemic on sectoral stock return in Malaysia by using time series analysis. This study employed Ordinary Least Squares (OLS) estimation to determine the impact of the COVID-19 pandemic. The data collected are daily data. The Kuala Lumpur Composite Index (KLCI), financial sector (KLFI), healthcare sector (KLHC) and telecommunication sector (KLTC) are the dependent variable in this study. The independent variables are divided into two categories which are the COVID-19 variables and the control variables. The COVID-19 variables include the confirmed cases, death cases, recovery cases, lockdown policy, and vaccination while the control variables include the gold price, the oil price, the exchange rate, the volatility index and the NASDAQ composite index. The Granger causality test was developed to determine the short-run causality between those surveyed variables. The result showed that the COVID-19 variables significantly impacted the selected sectoral stock indices and major indices in Malaysia. Therefore, a suitable policy and lockdown measure is essential to minimize the negative impact of COVID-19 pandemic on Malaysian stock market.

Keywords: COVID-19 pandemic, sectoral stock return, lockdown, vaccination, Ordinary Least Squares (OLS) estimation

Kesan Pandemik COVID-19 terhadap Pulangan Saham Sektor Terpilih di Malaysia

ABSTRAK

Pandemik COVID-19 yang berlaku pada tahun 2020 telah membawa kesan yang besar di seluruh dunia termasuk Malaysia. Pasaran saham global turut terjejas akibat pandemik COVID-19. Tujuan kajian ini adalah untuk menentukan kesan pandemik COVID-19 terhadap pulangan saham sektor di Malaysia dengan menggunakan analisis siri masa. Kajian ini menggunakan anggaran Ordinary Least Squares (OLS) untuk menentukan kesan pandemik COVID-19. Data yang dikumpul adalah data harian. Indeks Komposit Kuala Lumpur (KLCI), sektor kewangan (KLFI), sektor penjagaan kesihatan (KLHC), dan sektor telekomunikasi (KLTC) adalah pembolehubah dimanipulasi dalam kajian ini. Pembolehubah bergerak balas dibahagikan kepada dua kategori iaitu pembolehubah COVID-19 dan pembolehubah kawalan. Pembolehubah COVID-19 termasuk kes yang disahkan, kes kematian, kes sembuh, dasar lockdown, dan vaksinasi, manakala pembolehubah kawalan termasuk harga emas, harga minyak, kadar pertukaran, indeks volatiliti, dan indeks komposit NASDAQ. Ujian Granger causality telah dibangunkan untuk menentukan hubungan sebab-akibat jangka pendek antara pembolehubah yang dikaji. Hasil kajian menunjukkan bahawa pembolehubah COVID-19 memberi kesan yang signifikan terhadap indeks saham sektor terpilih dan indeks utama di Malaysia. Oleh itu, dasar yang sesuai dan langkah lockdown adalah penting untuk mengurangkan kesan negatif pandemik COVID-19 terhadap pasaran saham Malaysia.

Kata kunci: *Pandemik COVID-19, pulangan saham sektor, lockdown, vaksinasi, anggaran Ordinary Least Squares (OLS)*

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Coronavirus disease 2019, also acknowledged as COVID-19, is classified by the World Health Organization (WHO) as a novel coronavirus that caused epidemic, namely Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (WHO, 2020a). In December 2019, in Wuhan, a city of China, discovered the first cases of coronavirus disease. On December 31, 2019, the WHO received the report regarding the outbreak of respiratory cases that happened in Wuhan, China. After a month, the WHO declared that the respiratory cases (COVID-19) epidemic in Wuhan is a global health emergency. On March 11, 2020, WHO declared that the coronavirus outbreak had become a global pandemic (WHO, 2020b).

Globalization not only increases the movement and exchange of human beings, goods and services, capital, technologies. It also increases the chance and speed of disease spread around the world, such as COVID-19. On January 23, 2020, a lockdown was imposed in Wuhan and cities nearby Wuhan to terminate the COVID-19 outbreak. However, the COVID-19 has spread globally. On January 25, 2020, Malaysia detected the first COVID-19 positive cases. According to WHO (2021), on December 3, 2021, there was a total of 263,563,622 positive cases, together with 5,232,562 fatal cases worldwide. As until 7 November 2021, 7,864,123,018 vaccination doses have been dispensed in total (WHO, 2021).

Other than the global pandemic, the COVID-19 outbreak also affects global economic activities. Most of the countries implement movement control or lockdown to prevent the rapid spread of coronavirus. However, this action significantly impacts economic activities, including service sectors, manufacturing, imports, and exports. The enactment of movement control or lockdown resulted in a decline of the supply and demand for goods and services. The outbreak of the coronavirus also influences the global stock markets. The uncertainty brought by the coronavirus outbreak affected the investors' decision which caused higher volatility in the financial market, including Malaysian stock market. This study attempts to identify the influence of the coronavirus outbreak on Malaysian sectoral stock returns.

1.2 Background of the Study

1.2.1 The COVID-19 Outbreak in Malaysia

COVID-19 epidemic is a global health emergency as well as a global pandemic. Malaysia is not exempted from this global pandemic. On January 25, 2020, Malaysia detected the first COVID-19 confirmed cases from the Chinese citizens who entered Malaysia through Singapore (Pung et al. 2020). Until January 30, 2020, eight COVID-19 positive cases were detected in total, and all reported cases were residents of China (Bernama 2020a). Malaysia detected the first local COVID-19 positive case on February 4, 2020. Figure 1.1 below shows the COVID-19 confirmed cases, death cases, and recovery cases starting from 25 January 2020 to 31 December 2021.

Figure 1.1 showed that the COVID-19 confirmed cases was increasing during the end of September 2020. The increasing of COVID-19 confirmed cases might be due to the state election that held in Sabah in September. Besides, the implementation of Recovery Movement Control Order (RMCO) further increases the spread of virus. During RMCO

period, more regulations are relaxed, and more activities are allowed which caused the virus spread more rapidly. The confirmed cases started to decline during the mid of February 2021, this is because of the reimposed of the Movement Control Order 2.0 (MCO 2.0) on January 2021 in the states or area that highly affected by COVID-19 including Selangor, Penang, Melaka, Johor, Sabah together with Federal Territories.

However, the MCO 2.0 stem the spread of virus for a few weeks only. The COVID-19 confirmed cases rise rapidly during early of April 2021 and reach it peak on 29 May 2021 which recorded 9,020 of COVID-19 confirmed cases. During this period, government reimplemented the Movement Control Order 3.0 (MCO 3.0) in most of the states to avoid the outbreak of coronavirus. After the implementation of MCO 3.0, the COVID-19 confirmed cases still remain at high level. Hence, Prime Minister introduced the Full Movement Control Order (FMCO) in whole Malaysia to avoid and terminate the COVID-19 outbreak on May 28, 2021.

On 15 June 2021, Prime Minister introduced the National Recovery Plan, this plan was divided into four phases formulated based on the data of three main threshold indicators. The three threshold indicators are the number of daily confirmed cases, the occupancy of intensive care unit (ICU) wards, and the rate of the population who are fully vaccinated (Povera & Radhi, 2021).

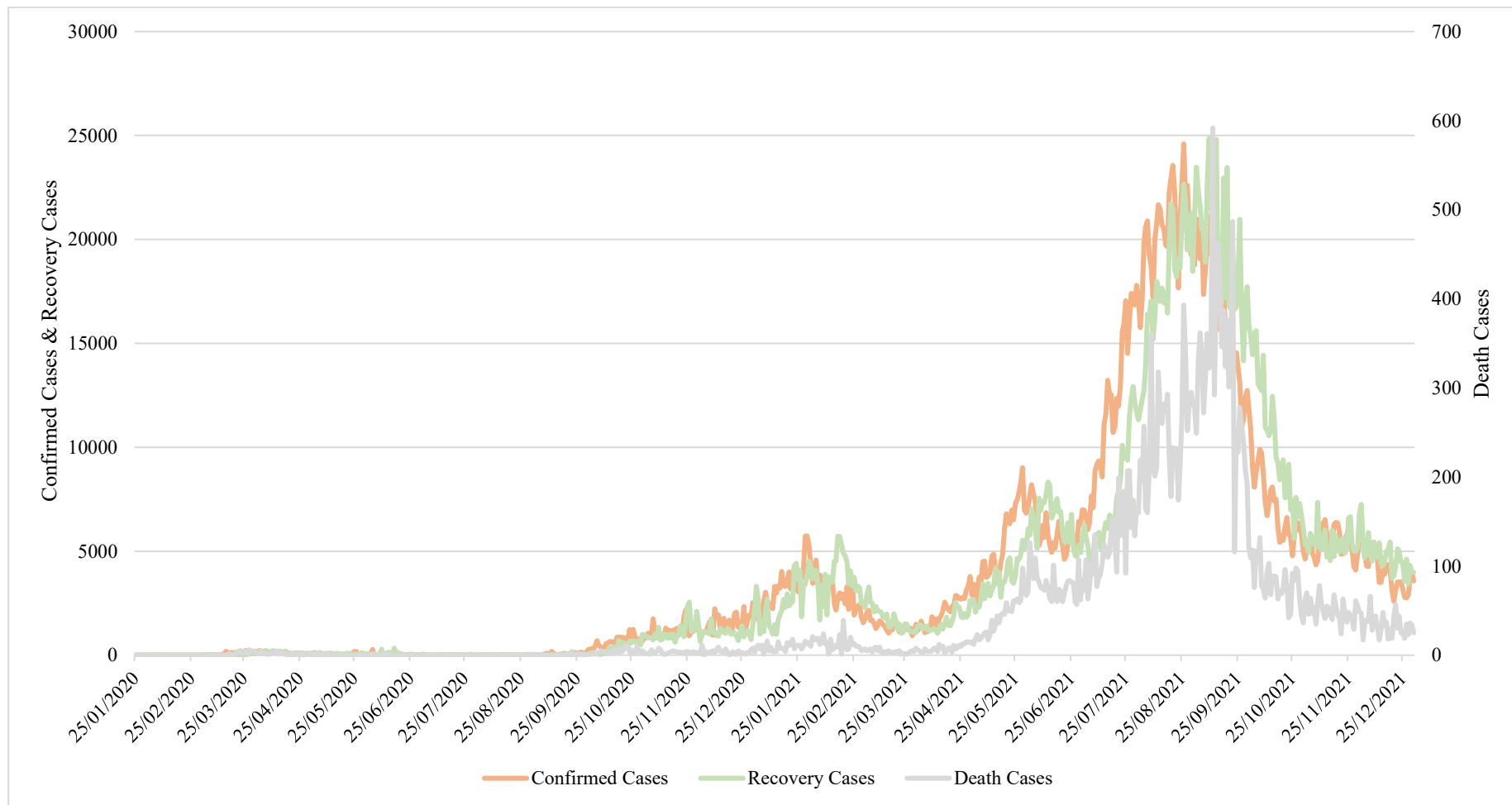


Figure 1.1: The COVID-19 Cases in Malaysia from January 2020 to December 2021
Source: Ministry of Health, Malaysia (2021)

On March 16, 2020, Malaysian Prime Minister at that time declared the MCO implementation started on March 18, 2020, until March 31, 2020. The enactment of MCO referred to the Prevention and Control of Infectious Diseases Act 1988 as well as the Police Act 1967 (Bunyan, 2020). All government premises together with private premises would be shut down with the exception of necessary services during MCO. Besides, all businesses also had to close, with the exception of businesses that sell daily basic needs such as supermarkets, grocery stores as well as convenience stores. Other than that, traveling abroad was banned for all Malaysia, and no tourists and foreigners were allowed to enter Malaysia. The implementation of the MCO was then further extended until 3 May 2020. The MCO is effective in stemming the COVID-19 outbreak in Malaysia. Figure 1.2 illustrates that the COVID-19 confirmed cases were reduced from more than 150 cases daily during the end of March 2020 and early April 2020 to less than 100 cases daily during the end of April 2020 and early May 2020.

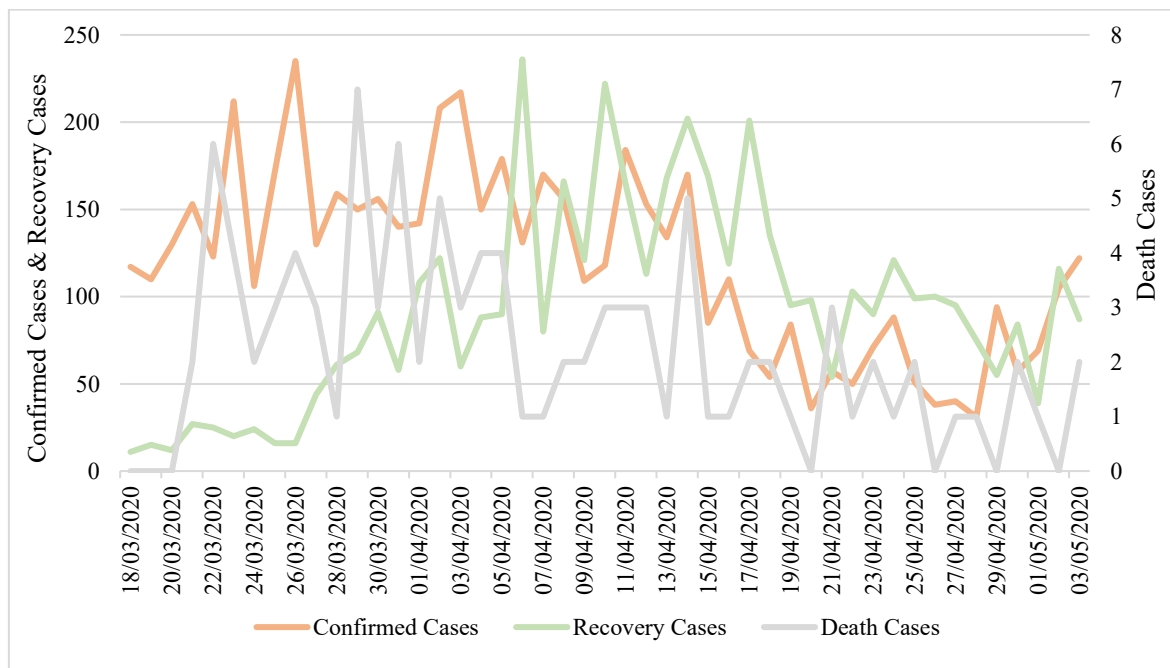


Figure 1.2: The COVID-19 Cases in Malaysia During MCO
Source: Ministry of Health, Malaysia (2021)

After nearly two months of the MCO, then Malaysia's Prime Minister declared that the MCO was replaced by the Conditional Movement Control Order (CMCO). Under the CMCO, numerous economic activities and social activities were approved to operate with the government's conditionals and standard operating procedure (SOP) (Bernama, 2020b). The implementation of the CMCO started from 4 May 2020 to 9 June 2020. Figure 1.3 below displays the coronavirus cases in Malaysia during the CMCO. The daily COVID-19 confirmed cases were mostly less than 100 cases per day during the CMCO period. However, the COVID-19 confirmed cases recorded 172 cases on 25 May 2020, 187 cases on 26 May 2020, and 277 cases on 4 June 2020. Although these three days had higher COVID-19 positive cases than others, primarily positive cases involved non-Malaysian, and they were detected at the Immigration detention centre (Bedi, 2020a & 2020b; Tang, 2020).

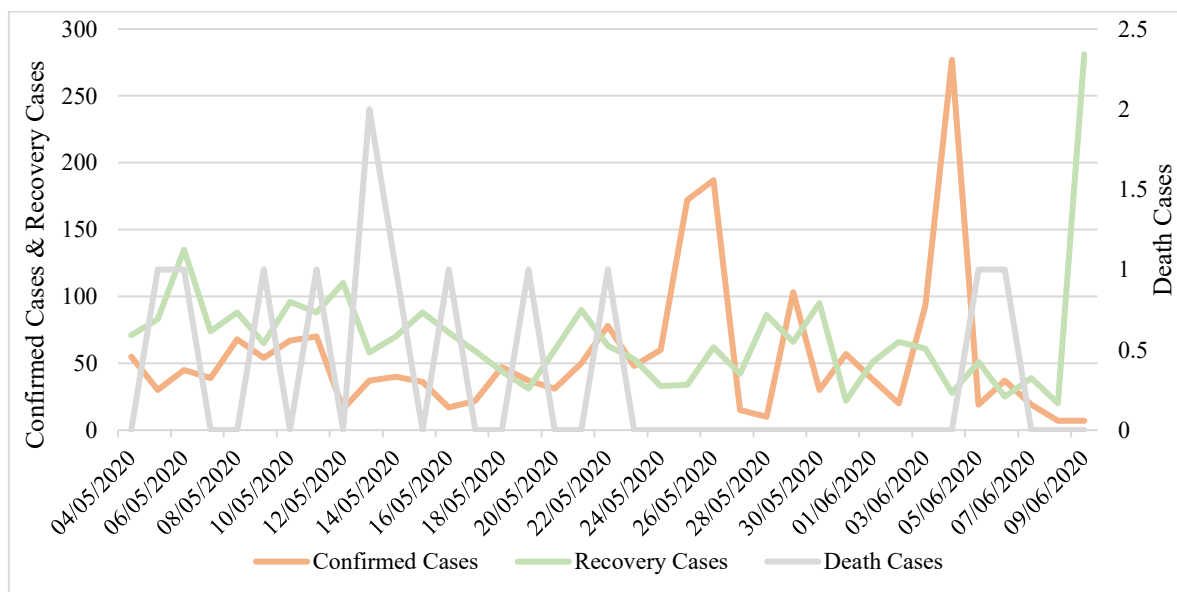


Figure 1.3: The COVID-19 Cases in Malaysia During CMCO
Source: Ministry of Health, Malaysia (2021)

After a month of the CMCO, Malaysia's Prime Minister declared that the CMCO ended on June 9 and took over with the Recovery Movement Control Order (RMCO), and it enforced started on June 10, 2020, to August 31, 2020. More regulations will be relaxed during the RMCO, and the public will be allowed to continue their daily activities while complying with the SOP (Povera & Chan, 2020). Since the coronavirus outbreak was under control, the Prime Minister declared the extension of RMCO to December 31, 2020 (Babulal et al., 2020). Figure 1.4 below shows the COVID-19 cases in Malaysia during the RMCO period. From Figure 1.4, the daily confirmed cases began to increase rapidly during the end of September, and the highest daily coronavirus confirmed cases were during the second phase of the RMCO. It was recorded on 31 December 2020, which was 2525 confirmed cases. On 18 November 2020, the Prime Minister admitted that the reason for the rapid spread of coronavirus was the election held in Sabah in September 2020 (The Straits Times, 2020).

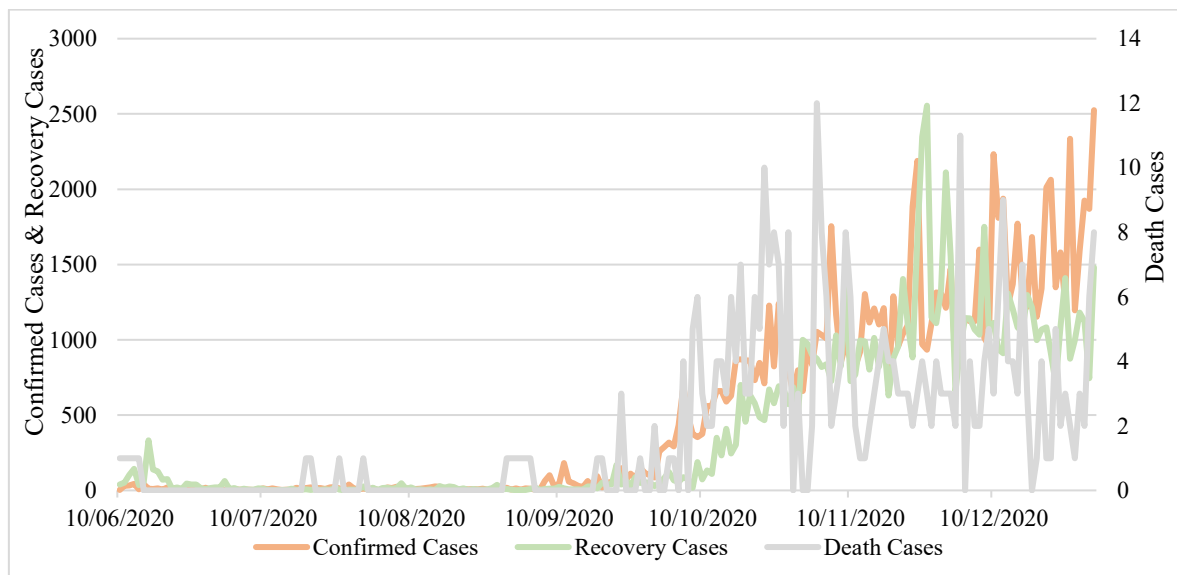


Figure 1.4: The COVID-19 Cases in Malaysia During RMCO
Source: Ministry of Health, Malaysia (2021)

On 11 January 2021, the Prime Minister Tan Sri Mahiaddin Md Yassin announced that the MCO would reimposed in Selangor, Penang, Melaka, Johor, Sabah together with Federal Territories from January 13, 2021, to January 26, 2021 (Povera & Harun, 2021). The reimposed of MCO, also known as MCO 2.0, is to avoid the further spread of the coronavirus. Figure 1.5 shows the COVID-19 cases during the MCO 2.0. On January 21, 2020, the Senior Minister (Security) Dato' Sri Ismail Sabri Yaakob declared the extension of MCO 2.0 to February 4, 2021. This decision was advised by the Ministry of Health, where the daily COVID-19 cases were still high in those areas (Bernama, 2021). On 2 February 2021, the Senior Minister of Security declared that the MCO 2.0 would be extended for all states and federal territories except for Sarawak (Yusof, 2021). On February 16, 2021, the Senior Minister of Security stated that there is an extension of MCO 2.0 from February 19, 2021, until March 4, 2021, in Kuala Lumpur, Selangor, Penang, and Johor. At the same time, other states and federal territories will return to the CMCO (Daim, 2021).

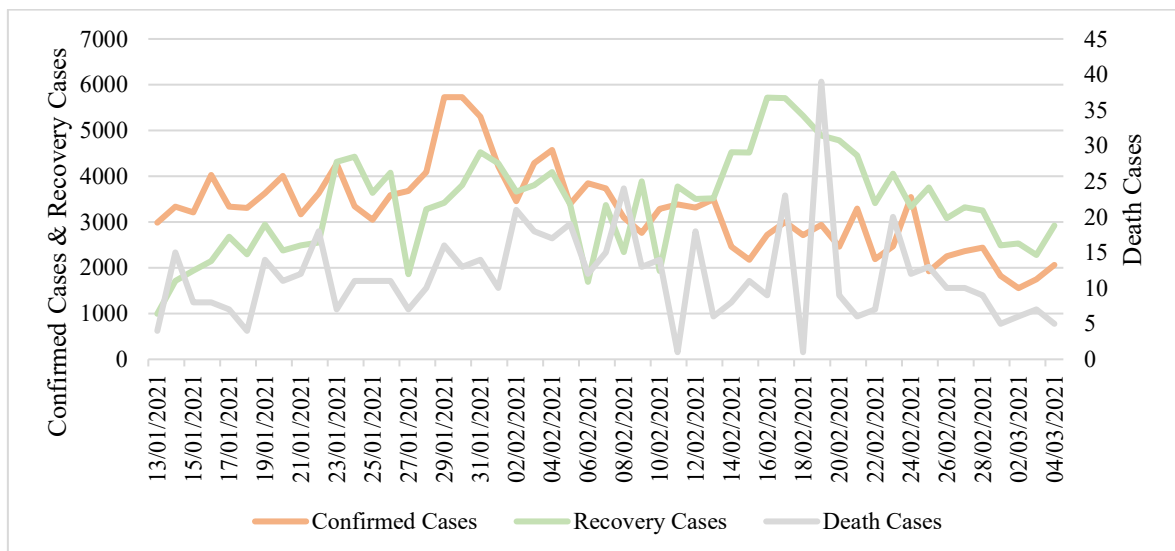


Figure 1.5: The COVID-19 Cases in Malaysia During MCO 2.0
Source: Ministry of Health, Malaysia (2021)

On 14 April 2021, the Senior Minister (Security) Dato' Sri Ismail Sabri Yaakob declared that MCO implemented in Kelantan from April 16, 2021, to April 29, 2021, was due to the increase of coronavirus cases (The Straits Times, 2021). The MCO in Kelantan was further extended until May 17, 2021 (Zack, 2021). On 5 May 2021, Dato' Sri Ismail Sabri Yaakob declared that some districts in Selangor, Johor, Terengganu, and Perak, as well as Kuala Lumpur, would be placed under MCO (Kanyakumari, 2021). The MCO that was implemented during this period is also known as MCO 3.0. On May 10, 2021, Malaysian Prime Minister declared that the implementation of third MCO on the whole of Malaysia from May 12, 2021, until June 7, 2021, to stem the outbreak of coronavirus (Zainul, 2021).

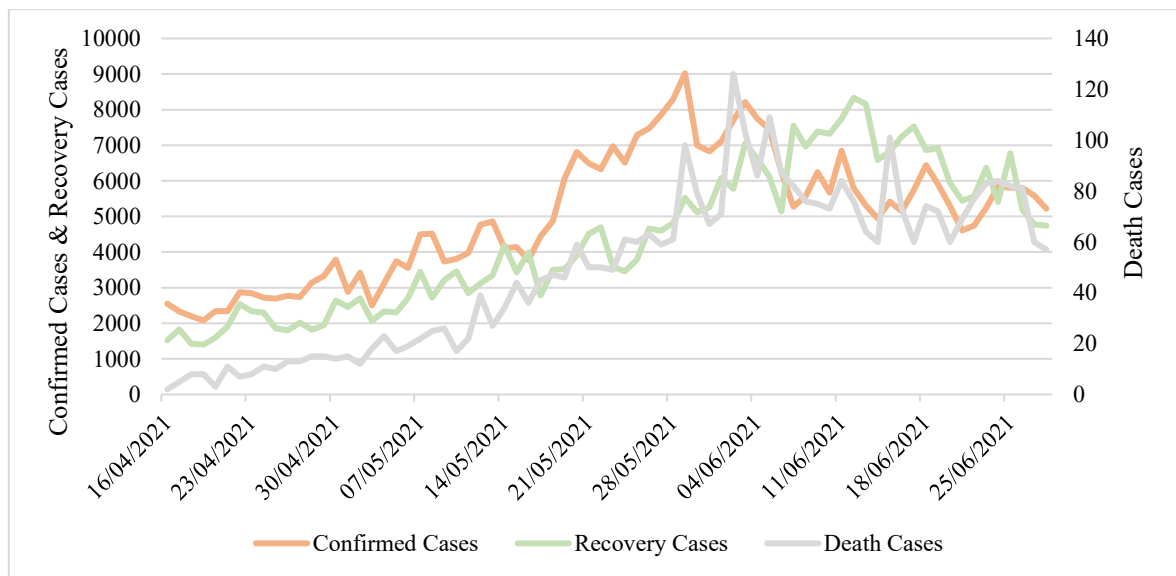


Figure 1.6: The COVID-19 Cases in Malaysia During MCO 3.0 and FMCO
Source: Ministry of Health, Malaysia (2021)

After a few weeks of MCO 3.0, the COVID-19 cases remain at a high level. Hence, the Prime Minister introduced the Full Movement Control Order (FMCO) to avoid and terminate the COVID-19 outbreak on May 28, 2021. The FMCO started from June 1, 2021, until June 14, 2021, only needed economic and social services will be approved to operate

as determined by the National Security Council during this lockdown (Babulal, 2021). After two weeks of FMCO, the average daily COVID-19 cases were still over 5000 cases per day. Therefore, the Senior Minister of Security declared that the FMCO would extend by another two weeks according to the recommendation from the Ministry of Health, Malaysia (Teoh, 2021).

On June 15, 2021, the Prime Minister declared the National Recovery Plan and outlined its details. The prime minister stated that the plan was divided into four phases formulated based on the data of three main threshold indicators. Those three threshold indicators are the number of daily cases, the occupancy of intensive care unit (ICU) wards, and the rate of the population who are fully vaccinated (Povera & Radhi, 2021). Figure 1.7 illustrates the highlights of the National Recovery Plan, while Figure 1.8 displays the coronavirus cases during the period of the National Recovery Plan.

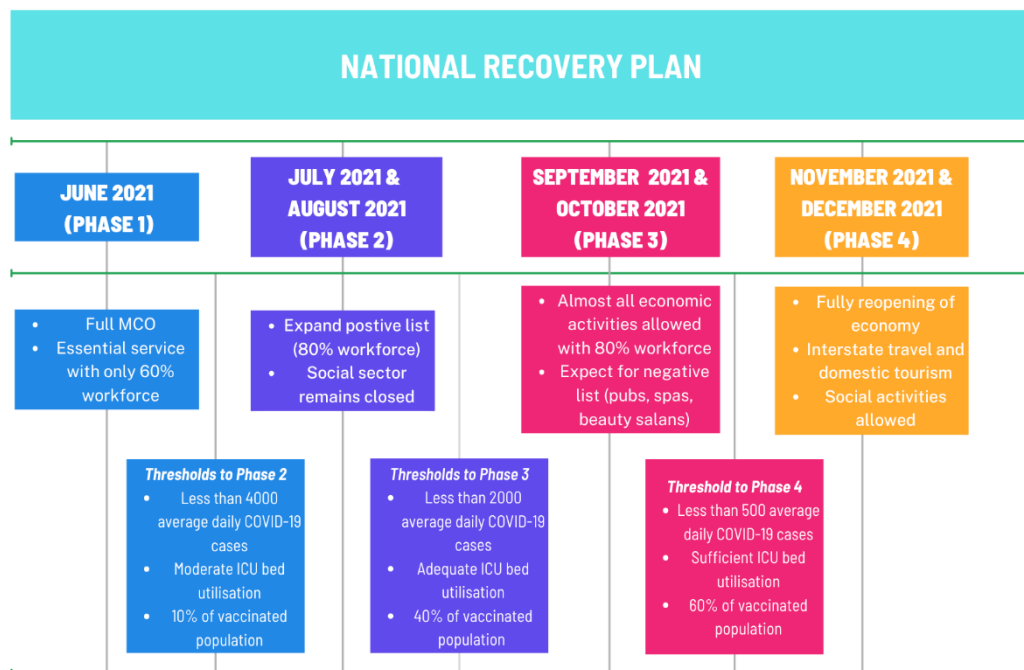


Figure 1.7: The Highlights of the National Recovery Plan
Source: The Edge Market (2021)

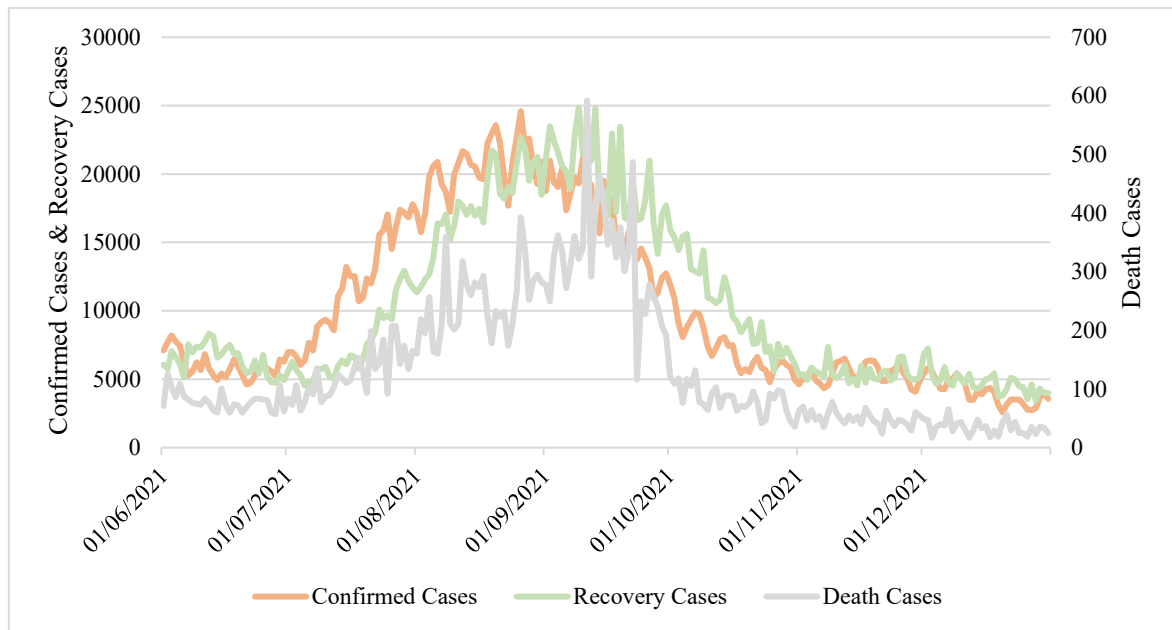


Figure 1.8: The COVID-19 Cases in Malaysia During the National Recovery Plan
Source: Ministry of Health, Malaysia (2021)

To terminate the transmission of the coronavirus and minimize the symptoms as well as decrease the chance of death due to coronavirus, the COVID-19 vaccine is crucial. According to the Copenhagen (2021), the coronavirus vaccine avoids severe illness and death, especially among adults aged 60 and older in 33 European regions. Malaysia started the COVID-19 vaccination on 24 February 2021, and the first person who received the vaccination was Malaysia's Prime Minister (Anand, 2021). Until 30 November 2021, 96.9% of the adult population and 86.1% of the adolescents aged between 12 and 17 have completed their COVID-19 vaccination (The Star, 2021). Figure 1.9 illustrates the fully vaccinated people in Malaysia until 30 November 2021.

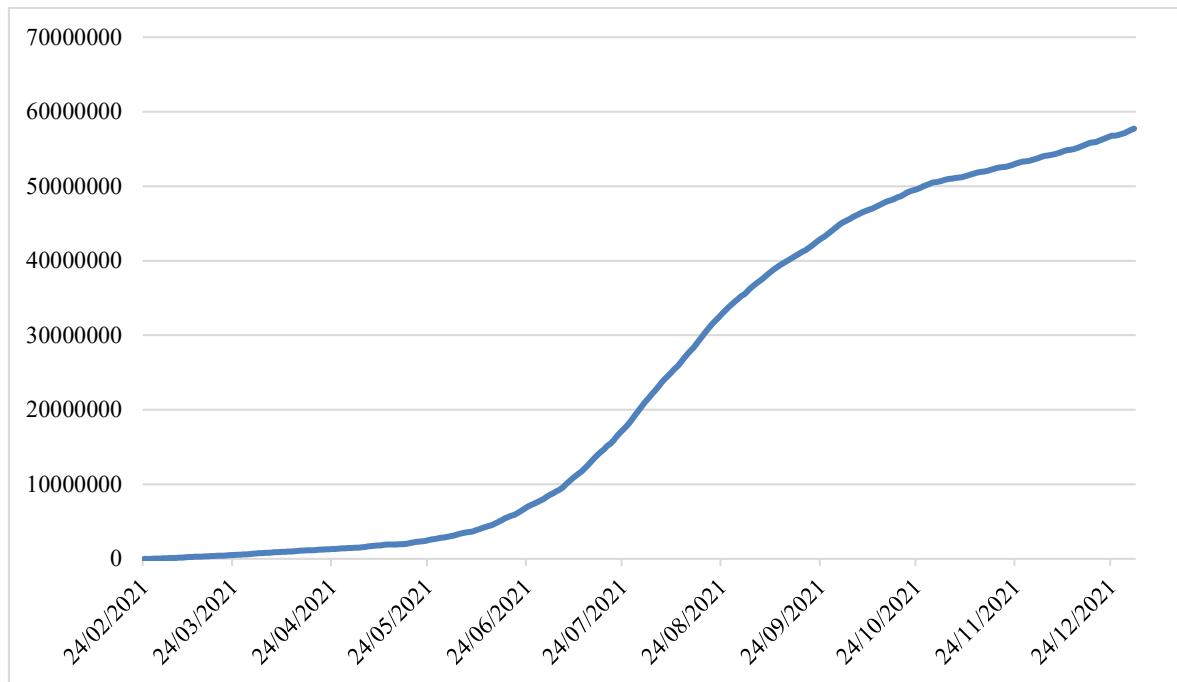


Figure 1.9: The Fully Vaccination People in Malaysia until December 2021
Source: Ministry of Health, Malaysia (2021)

1.2.2 The Stock Market in Malaysia

The first stock exchange that provide public trading in Malaya was formed in year 1960 which known as Malayan Stock Exchange. In year 1961, Malaysia was formed after the joining of Sabah, Sarawak, and Singapore. The Malayan Stock Exchange was then replaced by the Stock Exchange of Malaysia in year 1964. In year 1965, the separation of Singapore from Malaysia, caused the Stock Exchange of Malaysia became the Stock Exchange of Malaysia and Singapore. This scenario happened until year 1973 where the interchangeability among Singapore and Malaysia was terminated. Therefore, Kuala Lumpur Stock Exchange and Stock Exchange of Singapore were formed. In year 2004, the Kuala Lumpur Stock Exchange was renamed as Bursa Malaysia and currently be used until now (Bursa Malaysia, 2007).

Kuala Lumpur Composite Index (KLCI) is the primary index that indicates Malaysian stock performance in Malaysia, and it was first announced on year 1986. Bursa Malaysia incorporated with FTSE to introduce a suitable index, to further improve the KLCI in year 2006. In year 2009, KLCI was replaced by the FTSE Bursa Malaysia KLCI which also known as FBM KLCI (FTSE Asia Research, 2009). According to Bursa Malaysia (2009), the formation of FBM KLCI involve the largest 30 listed companies on the Main Board in accordance with the market capitalization. Those listed companies must fulfil the Ground Rules that stated by FTSE Bursa Malaysia. The main requirements of the Ground Rules are float and liquidity.

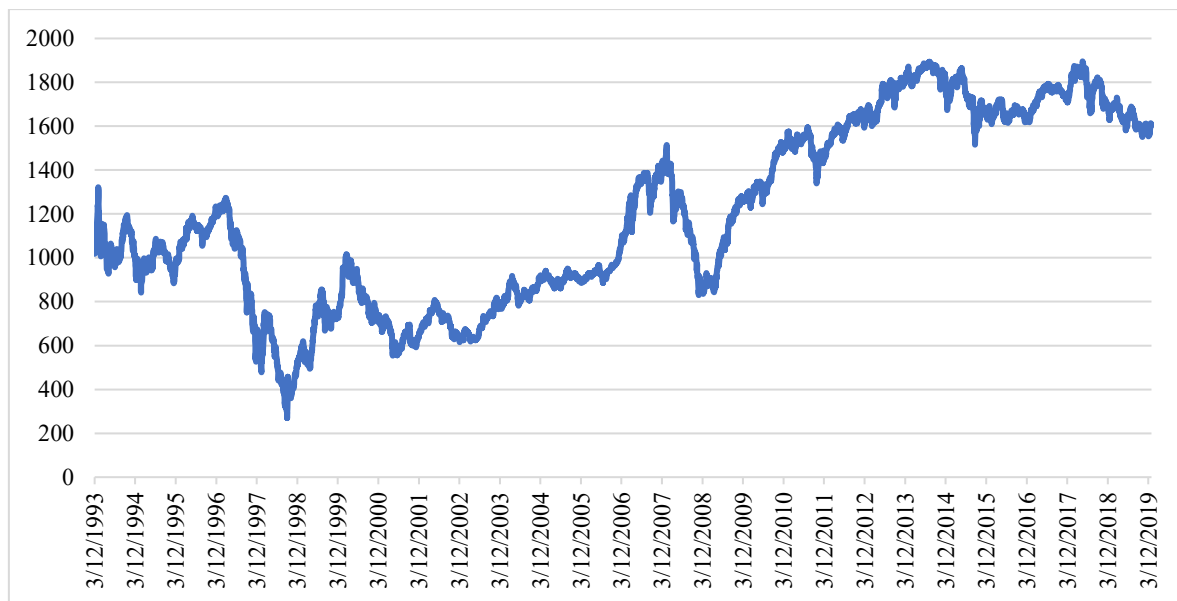


Figure 1.10: FTSE Bursa Malaysia KLCI from December 1993 to December 2019
Source: Yahoo Finance (2021)

From Figure 1.10, KLCI experienced three significant decline which happened in year 1998, year 2008 and year 2014. In year 1998, the dramatically decrease of KLCI was caused by the Asian financial crisis that happen around year 1997 and 1998. During the Asian financial crisis, the net portfolio investment was decrease RM 22 billion which caused a

deficit of RM 12.9 billion in year 1997. This brought a massive impact to Malaysian stock market while the companies that highly leveraged in foreign-denominated debt began to default which caused a banking crisis in Malaysia (Lee, 2020). This scenario further worsened the stock market performance in Malaysia. In year 2008, a multinational financial crisis had happened. The collapse of financial institutions and investment banks in US caused Malaysia experienced the impact on financial and trade (Bursa Malaysia, 2014). This situation significantly affected the Malaysian stock market since Malaysia is a trade dependent country (Lee, 2020). In year 2014, the oil price fell more than 50% since peak in mid-June (Bursa Malaysia, 2014). The oil price shock significantly impacts the Malaysian stock market since Malaysia is oil exporting country.

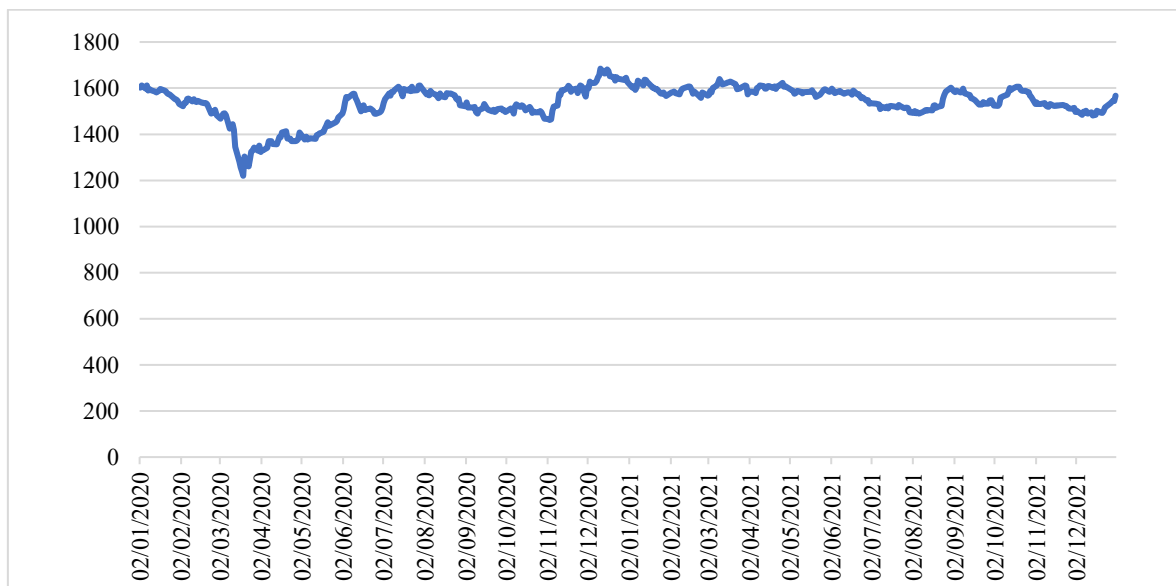


Figure 1.11: FTSE Bursa Malaysia KLCI from January 2020 to December 2021
Source: Yahoo Finance (2021)

From Figure 1.11, the FBM KLCI sunk to its lowest point on 19 March 2020, and it was the lowest level in 11 years. The fear of economic destruction due to the COVID-19 pandemic caused the huge losses in the Southeast Asian stock markets (Murugiah, 2020a).

On June 26, 2020, the rumours of windfall tax implementation on rubber glove counters caused the FBM KLCI fell below 1500 points. However, glove counters were one of the several industries that still benefited during the coronavirus pandemic (Lim, 2020a). On October 30, 2020, the FBM KLCI fell to 1466.89. The decline of Asian shares in October 2020 might be influenced by the US presidential elections and the fear of the global economic downturn (Murugiah, 2020b). The FBM KLCI kept decreasing during November 2021. This scenario might cause by the one-off windfall tax on companies announced by the Malaysian Finance Minister when presenting the government's budget for 2022 (Lee, 2021). Besides, the discovery of the COVID-19 variant "Omicron" in November further affected the stock performance of FBM KLCI (Sani, 2021).

Table 1.1: Information of Malaysian Sectoral Stock Indices

Sectors	Number of Constituents	Market Capitalization (RM billion)
Construction	52	29.41
Consumer Products and Services	165	262.09
Energy	25	36.48
Finance	31	374.85
Healthcare	14	125.33
Industrial Products and Services	216	243.16
Plantation	41	120.95
Property	95	57.57
REIT	18	38.44
Technology	42	109.70
Telecommunication and Media	15	146.02
Transportation and Logistics	29	67.37
Utilities	12	114.01

Source: Bursa Malaysia Sectorial Index Series (December 2021)

This study is performed to determine the influence of the coronavirus outbreak on sectoral stock returns in Malaysia. According to the Bursa Malaysia sector classification of applicants or listed issuers (2018), there is a total of 13 sectors in Malaysia's stock market. Those sectors are construction, consumer products and services, energy, finance, healthcare, industrial products and services, plantation, property, real estate investment trust (REIT), technology, telecommunication and media, transportation and logistics, as well as utilities. Table 1.1 above exhibits the number of constituents together with the market capitalization for each sector.

1.3 Problem Statement

The economics structure of Malaysia is highly dependent on few key industries such as manufacturing, finance, oil and gas, and healthcare. The FBM KLCI is relatively concentrated with the sectoral indices where the sectoral indices act as significant role in tracking investor sentiment and economic performance. Malaysia's smaller market size and the highly reliance on specific industries caused it more sensitive to external shocks like the COVID-19 pandemic (Keh & Tan, 2021). During the pandemic, the government responses like Movement Control Order, targeted stimulus packages and a phased vaccination rollout which differed with other countries make Malaysia a unique case for study in impact of COVID-19 on selected sectoral indices. Among the various industries, the healthcare, telecommunication, and financial industries have faced more challenges and opportunities during the pandemic. The healthcare industry experienced the surge in demand for medical services and supplies. The telecommunication industry faced the increasing demand for connectivity as remote working and online communications. Meanwhile, the market instability affected the financial industry which increased the credit risk and the uncertainty of the investors.

The COVID-19 variables such as confirmed cases, recovery cases, death cases, vaccination and lockdown measures are the key indicators in understanding the investor behaviour during the pandemic. The rising of confirmed cases and death cases might increase the uncertainty and risk aversion which leading to the increase of stock volatility while the increasing of recovery cases and vaccinations might increase the confidence of investors which able to stabilize the stock price. The study done by Xie et al. (2022) found that lockdown measures were necessary to terminate the spread of virus, but it will affected the business operation which further affecting the stock performance. There are several financial theories are useful to determine the respond of stock returns due to the COVID-19. The Capital Asset Pricing Model (CAPM) suggest that stock returns are affected by systematic risk which the Arbitrage Pricing Theory (APT) further expand on CAPM by considering several risk factors including macroeconomic factors. Other than that, the Efficient Market Hypothesis (EMH) suggest that the stock returns will affected by all available information meaning that the stock markets will quickly respond to new information like pandemic updates. The Black Swan Theory highlight the rare and unpredictable event that happen outside normal expectations and brings huge impact such as COVID-19 pandemic.

From previous studies, most of the studies determine the impacted of COVID-19 on global market or main indices like FBM KLCI. There are limited studies focus on the impact of the COVID-19 pandemic on the sectoral indices in Malaysia. Therefore, this study target to determine the impact of COVID-19 pandemic on stock returns of Malaysia's healthcare, telecommunication and financial sectors. This study employs the regression analysis and refers on the financial theories such as CAPM, APT, EMH and Black Swan theory. This

study able to help investor more understand the sectoral effects during pandemic, and it can be a reference when implementing policy responses during future crises.

1.4 The Objective of the Study

1.4.1 General Objective

The study's general objective is to determine the impact of the COVID-19 pandemic on selected sectoral stock returns in Malaysia.

1.4.2 Specific Objectives

- i. To determine the correlation among the COVID-19 variables and selected sectoral stock returns in Malaysia.
- ii. To investigate the short-run causal relationship among the daily confirmed cases, death cases together with recovery cases of COVID-19 and selected sectoral stock returns in Malaysia.
- iii. To identify the response of selected sectoral stock returns as a result of the COVID-19 lockdown in Malaysia.
- iv. To explore the response of selected sectoral stock returns to the COVID-19 vaccination in Malaysia.

1.5 Research Question

- i. Is there any correlation among the COVID-19 variables and selected sectoral stock returns in Malaysia?
- ii. Is there any short-run causal relationship among the daily confirmed cases, death cases together with recovery cases of COVID-19, and selected sectoral stock returns in Malaysia?

- iii. What is the response of selected sectoral stock returns during the COVID-19 lockdown in Malaysia?
- iv. What is the response of selected sectoral stock returns to the COVID-19 vaccination in Malaysia?

1.6 Significance of the Study

This study aims to determine the impact of COVID-19 on stock return of Malaysia's healthcare, telecommunication and financial sectors. The limited previous study on impact of COVID-19 pandemic on sectoral stock return provided an opportunity to conduct this study. This study able to contribute practical value to investors by identifying the impact of COVID-19 variables on the sectoral stock performance. These findings able to help investors to conduct a better risk assessment and portfolio management during the pandemic period. Besides, the result of this study able to identify sectors that most sensitive to health and policy shock which support policymakers to design a more targeted economic stimulus packages and policy during future public health crisis or financial downturns.

From the theoretical perspective, this study examines the applicability of the major financial theories during a black swan event such as COVID-19 pandemic. The Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT) act as foundational models for identifying the response of stock returns to the market and macroeconomic risk. Meanwhile, the Efficient Market Hypothesis determine the response of stock returns to the pandemic related information. The Black Swan Theory provided the framework for understanding the effects of unpredictable and severe impact's event. This study employed the Ordinary Least Squares (OLS) regression to determine the relationship between COVID-19 variables and sectoral stock returns and the Granger causality tests to identify whether these the COVID-

19 variables can predict stock movements. These two methods help to determine the statistical impact and the predictive insights which able to provide policymakers more understanding the response of stock market during the pandemic.

1.7 Organization of the Study

This study is organized and presented in five chapters. Chapter one is the introduction of the study and the background of the study. Chapter Two presents the study's theoretical reviews, empirical reviews, and research gaps. Chapter Three is methodology. This chapter introduces the empirical model, empirical testing procedures, and data descriptions. The result is illustrated and interpreted in Chapter Four. Lastly, Chapter Five concludes this study and provides some recommendations, directions for future study, and limitations of this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter summarises the literature review from past studies related to this study. This chapter is organized into theoretical reviews, empirical reviews, research gaps, and concluding remarks. Theoretical reviews discuss the theories involved in this study, empirical reviews show the empirical findings and outcomes from past studies, and research gaps present the ascendency of this study.

2.2 Theoretical Reviews

This section presents the theories or hypotheses reviewed from the previous studies. The theoretical reviews discuss in this section are the Efficient Market Hypothesis (EMH) and the Capital Asset Pricing Model (CAPM), the Arbitrage Pricing Theory (APT), and the Black Swan Theory. The EMH indicates that all available information including positive and negative information will affect the stock prices. The CAPM is a single factor model built to determine the asset's expected return by following a set of underlying assumptions. The APT is a general principle for pricing of asset where a financial asset's expected return able to develop into a linear function with various factors or indices. The Black Swan Theory is an analogy that describes an unpredictable event that happens beyond the normal expectation and causes significant impacts.

2.2.1 Efficient Market Hypothesis (EMH)

The Efficient Market Hypothesis (EMH) is a hypothesis that indicates that the price of stock should fully response to all available information (Malkiel & Fama, 1970; Malkiel, 2003). In 1967, H.Roberts divided market efficiency into the strong and the weak forms. The semi-strong form of market efficiency was then added by Fama in year 1970 to strengthen the EMH. The weak form of EMH is consistent with the random walk theory, where the price of stock change independently. In the weak form of EMH, the price of stock able to forecast by analysing the movement of historical stock price. The semi-strong form of EMH indicates that the price of stock will respond immediately to the market and public information such as political issues and economic issues. In the semi-strong form of EMH, it is impossible to gain benefits from the abnormal returns by conducting fundamental analysis. In the strong form of EMH, the stock price will respond to all available information and all information are accessible by the public (Naseer & Tariq, 2016).

The information stated in EMH can be divided into two types which are fundamental informational and non-fundamental information (Bollerslev & Hodrick, 1992). Fundamental information can directly affect the stock prices, such as yields or macroeconomics factors. However, non-fundamental information is the information without a direct relationship but can still influence the stock price, such as news. In EMH, stocks will always trade at their market value where investors cannot buy undervalued stocks and sell stocks at high prices (Downey & Scott, 2021). During the COVID-19 pandemic, any information or rumours that published brought impact to the stock performance in Malaysia. Hence, there is an opportunity to determine the validity of EMH in Malaysia during the COVID-19 pandemic.

Borges (2010) conducted research on the efficient market hypothesis in European financial markets. This study performed joint variance ratio tests to stock market index of the United Kingdom, France, Germany, Spain, Greece, together with Portugal from January 1993 until December 2007. The EMH was invalid in Portugal, Greece, France together with United Kingdom since the hypothesis was rejected because of first order positive serial correlation and mean reversion. However, the EMH was valid in Germany and Spain since the hypothesis cannot be rejected.

Hamid et al. (2010) performed a market efficiency study on stock returns in selected Asia-Pacific countries. This study conducted serial correlation, Ljung-Box Q-statistic Test, Runs Test, unit root test, and the variance ratio to determine whether the selected stock returns follow the principle of weak-form market efficiency at the individual level or not. The study's period was from January 2004 to December 2009. The result showed that those selected stock returns were not in weak-form efficient market, and those selected stock returns did not perform Random Walk Model. Therefore, they concluded that investors might obtain some arbitrage benefit due to the inefficiency of the selected markets.

Nwidobie (2014) conducted a study on the random walk hypothesis, also known as weak-form efficiency on Nigerian stock market. The duration of this study was started on January 2000 to December 2012. This study analysed the all-price index (API) by performing the ADF test to determine the movement of the stock market. The result of the ADF test showed that the movement of the stock exchange did not illustrate the random walk pattern. Hence, this study unable to support the random walk hypothesis on the Nigerian stock market. The findings also indicated that the capital market was inefficient in Nigeria.

Ali et al. (2018) performed a comparative analysis of to determine the efficiency of Islamic and conventional stock markets from January 2003 to December 2016. This study used multifractal de-trended fluctuation analysis (MF-DFA) to determine the stock market efficiency. Their analysis found that the efficiency of almost all Islamic stock markets were better than the conventional counterparts except for Russia, Jordan, and Pakistan. Although the Islamic stock markets was new, but they were efficiency because effective administration and following the laws of shari'ah compliant.

Mubarok and Fadhi (2020) studied the efficient market hypothesis and forecasted the industrial sector on the Indonesia stock market from the year 1996 to the year 2020. This study performed variance ratios, data stationarity, Autoregressive Integrated Moving Average (ARIMA), and Autoregressive Conditional Heteroskedasticity (ARCH). This study indicated that the industrial sector on the Indonesia Stock Exchange was inefficient in its weak form. Hence, the market proved to be inefficient in its weak form, and the EMH was invalid for this study.

2.2.2 Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) was built to determine the interaction among systematic risk and expected asset returns (Kenton & Mansa, 2021). The CAPM is a single factor model, and a set of underlying assumptions conducts it. However, those assumptions are not suitable in the actual situation. Nguyen et al. (2017) sorted out a few assumptions of the CAPM framework. Firstly, the financial markets are ideal and competitive. Secondly, all investors are rational and decide to invest over the same timescale. Thirdly, transaction costs and distortionary taxes such as personal income taxes do not exist. Besides, the investors able to loan a limitless figure at the risk-free level. Other than that, all

investors prefer the overall portfolio reward and displeasure to the overall portfolio risk. Last but not least, all investors have homogenous expectations from the markets.

However, those assumptions are far from the truth. There is a lack of a perfect competition market in the real world which may cause additional risk to the investors. Besides, personal income taxes and transaction costs exist in the actual situation. Other than that, individual investors unable to lend unlimited amounts at the same rate as the government or other institutions.

The formula for CAPM is shown below.

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \quad (2.1)$$

where,

$E(R_i)$ = expected return of investment,

R_f = risk-free rate,

β_i = beta of investment,

$(E(R_m) - R_f)$ = market risk premium.

There are several previous studies studied on the validity of the CAPM. Banz (1981) studied the interaction among the returns and market value of common stocks. He figured out that the smaller corporations had higher risk-adjusted than more giant corporations, which was against the CAPM. Choudhary and Choudhary (2010) inspected the CAPM on the Indian stock returns. This study found that the higher risk did not bring a higher level of returns. Hence, this result provided evidence that against the CAPM.

However, the study was done by Rahman et al. (2006) in Bangladesh showed that the stock market return, beta, book to market value, and market capitalization had a significant relationship with the stock returns where the CAPM was valid in this study. In the year 2015, Bajpai and Sharma (2015) also conducted a study of CAPM in India. They tested the CAPM by applying the rolling regression technique. Their result showed that the CAPM was statistically significant in financial market of India, Besides, the model built were more advance than the traditional model. Although CAPM has some limitations from those studies above, CAPM still is the preferred tool in corporate finance. The limitations of the CAPM should be identified before applying it.

2.2.3 Arbitrage Pricing Theory

Arbitrage Pricing Theory (APT) is a multi-factor asset pricing model developed by employing the linear interaction among the expected return of assets and various macroeconomic factors that determine the systematic risk to predict the asset's expected return (Hayes & Scott, 2020). The APT was built by Stephen Ross in the year 1976, a substitute for the CAPM where the requirements of the APT are more flexible than the CAPM. The APT allows researchers to expand the CAPM by including more macroeconomic variables to the model, and the APT model does not fix the number or identity of the variables used to determine the expected assets' returns (Nguyen et al., 2017).

The study was done by Messis, Iatridis, and Blanas in the year 2006 figured out that the APT performs more advance than the CAPM and the Market Model. The Market Model is a linear regression model using return on market index as independent variable and return on a security as the dependent variable. This study conducted three models to examine the performance of 33 securities trading on the Athens stock market (ASE) from June 2000 to

June 2005. This study also found that other risk factors were able to influence the stock market's return, which is the exchange rate and inflation rate.

The CAPM and APT have the identical formula, but CAPM only has a single factor and single beta. The factor that is used in CAPM is the difference among the market risk premium and the risk-free rate. Conversely, the APT formula has more than one factor, which requires the asset's beta concerning each separate factor. Although the APT is more advance compared to the CAPM, but the APT is more complicated and more difficult. This is because the APT allows the investors to customize the model that identify the expected return for assets. However, the APT is complicated to be employed since it takes plenty of time to figure out all the related variables that will affect the assets' price.

The formula for APT is shown below,

Arbitrage Pricing Theory (APT)

$$E(R_i) = \beta_0 + \beta_1 b_{i1} + \beta_2 b_{i2} + \cdots + \beta_k b_{ik} \quad (2.2)$$

where, $E(R_i)$ = expected return of investment,

β_0 = the expected return on investment with zero systematic risk,

β_1 = the risk premium related to the common j th factor,

b_{ij} = the pricing interaction among the risk premium and investment.

There are plenty of studies studied on applying the APT in the financial market. Azeez and Yonezawa (2006) examine the APT in the Japanese stock exchange during the bubble periods. This research examined the pre-and post-bubble period to compare the impact of

the macroeconomic factors. The result illustrated that the empirical content of the APT cannot be rejected in the pre-and post-bubble periods in the Japanese stock exchange. Other than that, Gabriel, Semion, and Akpoede (2016) perform a study on the validity of the APT in the Nigerian capital market by using exchange rate, inflation rate together with interest rate as the macroeconomic factors. Their findings showed that those macroeconomic factors were not statistically significant with the returns on security. Hence, they concluded that the APT might not be applicable in the Nigerian capital market.

Elshqirat (2019) determined the validity of APT on stock market in Jordan. The selected macroeconomic factors were the GDP, industrial producers' price index (IPPI), unemployment rate and exports. The model excluded the GDP since multicollinearity was detected between GDP and exports. The findings indicated that there was a significant negative relationship among IPPI and returns of stock, but the results were against the hypothesized positive relationship. Export and unemployment rate illustrated an insignificant positive relationship. Hence, those results indicated that the APT unable to describe the fluctuation of the Jordanian stock returns.

Elhusseiny, Michieka, and Bae (2019) investigated the APT on the United States stock market. There were five different sectors selected: banking, chemicals, insurance, telecommunication together with utility. The macroeconomic variables that were selected to define the fluctuation were industrial production, inflation, term structure, foreign exchange rate, oil price, and market excess return. Their findings showed that the banking, chemical, and telecommunication sectors displayed more variations in their responses of stock to the risk factors. In their study, the relationship among the insurance and telecommunication sectors with the risk factors was insignificant. Therefore, the APT was invalid.

In this study, the Arbitrage Pricing Theory (APT) is one of the suitable theoretical frameworks to identify the impact of the COVID-19 pandemic on selected sectoral stock returns in Malaysia due to the multi factor nature of APT. During the COVID-19 pandemic, stock market in Malaysia was affected by various of macroeconomic variables and COVID-19 related variables. In APT, those variables can be interpreted as risk factors that influence the stock market performance and affect the investors' decision making.

2.2.4 Black Swan Theory

The Black Swan theory, also known as the Black Swan event, was introduced by Nassim Nicholas Taleb in the year 2007. The Black Swan theory is an analogy to describe an unpredictable event that happens out of normal expectation, which causes vast impacts. The Black Swan event is very uncommon and impossible to forecast. Besides, the event that happened has a disastrous effect. Furthermore, after the event occurs, the argument regarding the event's occurrence is able to predict will be further discussed by the people.

There are a few events categorised as Black Swan events. Khan (2019) published an article on the history of the Black Swan events. Those events include Asian Financial Crisis in the year 1997, the Dot Com bust in 2000, the 9/11 Terrorist Attack in 2001, the subprime mortgages crisis in 2008, the European Sovereign Debt Crisis in 2009, the Fukushima Nuclear disaster in 2011, the crude oil crisis in 2014, the Black Monday China in 2015, and the BREXIT in 2016. Although some of the events only happened in a single country, the events affect the global financial market. For example, the BREXIT in the year 2016 caused the decline of the Pound and Euro. The Pound value declined to a its lowest level which was the lowest level in 31 years on currency markets in a single day just after the Brexit vote (Allen, Treanor & Goodley, 2016). On the same day, Dow Jones industrial average dropped

over 600 points due to the raises of the risk of the global recession caused by the BREXIT (Mui, 2016). In Asian, Japan's Nikkei index also experienced a massive decline since the Fukushima disaster in the year 2011 (Wearden & Fletcher, 2016).

The COVID-19 pandemic that happened in the year 2020 also can be classified as Black Swan events. According to Halliburton (2020), the coronavirus pandemic is an unpredictable event, and it will causes in a catastrophic economic downturn on a world basis in the year 2020. The study conducted by Antipova (2020) stated that the coronavirus outbreak could be acknowledge as the Black Swan event according to considered signs from recent references, including economic activity, social cohesion, and political stability. However, some studies found that the coronavirus epidemic cannot be considered a Black Swan event. Kiky (2020) performed a study on Indonesia Composite Index during the COVID-19 pandemic. Kiky (2020) discovered that the coronavirus outbreak in Indonesia could not recognized as a Black Swan event since the Indonesia Composite Index moved gradually decreased since February 2020. Yarovaya et al. (2021) analysed the herding in cryptocurrency markets during the coronavirus pandemic. They stated several theoretical reasons for observing the "black swan" effect on cryptocurrency herding, but their result showed that the coronavirus pandemic did not amplify herding in cryptocurrency markets. In the case of Malaysia, the Malaysia's stock performance during the COVID-19 pandemic can be recognised as the Black Swan event since the FBM KLCI sunk to its lowest point on 19 March 2020, and it was the lowest level in 11 years.

2.3 Empirical Reviews

The outbreak of COVID-19 already caused significant economic disruption like the disruption of the global supply chain, declines of the final demand for imported goods and services, and rises of the risk aversion in the finance market (OECD, 2020). Before the coronavirus epidemic in year 2019, the outbreak of severe acute respiratory syndrome (SARS) in the year 2002 also affected the economics and stock markets in those affected countries, especially China, Hong Kong, and Taiwan. Hence, previous studies on the effect of the SARS outbreak on the stock performance can be referred to when conducting the study on the stock performance due to the outbreak of coronavirus. Therefore, this section will discuss the influence of COVID-19 outbreak on the stock performance together with the impact of SARS on the stock market. Besides, this section will also discuss the reviews of empirical studies of stock markets.

2.3.1 The Empirical Studies on Stock Market

Bundoo (2009) examined the impact of macroeconomic factors on Mauritius stock exchange from January 2002 to December 2006. The macroeconomic factors used in this study were the equity premium, CPI, oil price, exchange rate, tourist arrivals, electricity consumption, the Lombard rate together with money supply. The findings of this study illustrated that the CPI, price of oil, exchange rate, as well as consumption of electricity were statistically significant which able to explain the variation of the stock exchange of Mauritius. This study also found that the exchange rate was the most crucial variable.

Basu and Chawla (2012) performed an empirical test on the Indian financial market. The period of this study started from 1 January 2003 to 1 February 2008. The macroeconomic factors that were used in this study were treasury bills, wholesale price index

(WPI), price of gold, exchange rate, and market index return. This study figured out that the inflation, exchange rate, wholesale price index, price of gold, and market index significantly impacted the excess return. Hence, this study concluded that the APT was a valid and good fit in the Indian financial market over the sample period.

Ramadan (2012) carried out a study to examine the Arbitrage Pricing Theory validity on stock exchange in Jordan during the period of 2001 to 2011. This study developed the model by using macroeconomic factors and market indicators. The macroeconomic factors were the interest rate term structure, inflation, money supply, and risk premium, while dividend yield and industrial productivity were the market indicators. The results indicated that interest rate term structure, money supply, risk premium together with the growth of industrial productivity can describe 84% of the stock returns variation on the Jordanian stock market. The results also proved the validity and applicability of APT in the Jordanian stock market.

There are also a few of studies studied on the influence of macroeconomics factors on Malaysian stock market based on the Arbitrage Pricing Theory. Nasir et al. (2013) studied the determinants of Malaysian stock returns from year 1996 to year 2011. The KLCI was employed as the dependent variables while lending rate, exchange rate, GDP together with CPI were employed as independent variables. The relationship among those variables were analysed by applying Johansen cointegration test, Vector Error Correction Model (VECM) as well as Granger causality. The findings showed that GDP was the only variables that had significant positive relationship with the stock returns while other variables showed significant negative relationship with the stock returns. This study also found that exchange rate was the variables that had bidirectional causality to stock returns.

In year 2014, Nordin, Nordin and Ismail performed research to study the impact of commodity prices on Malaysian stock market. The period of this study was from December 1997 to September 2012. The commodity price that selected in this study were palm oil price, price of oil together with price of gold. The exchange rate as well as interest rate were used as the control variables to strengthen the analysis. The results stated that the price of palm oil had significant positive relationship to the stock market. The relationship among price of oil and price of gold were insignificant to the stock index. Besides, the findings also indicated that the interest rate together with exchange rate showed negative influences on the stock market. This results further strengthen the result where exchange rate had negative impact on stock performance (Nasir et al., 2013).

Nikmanesh and Nor (2016) performed study to investigate the effect of the macroeconomic variables' volatility on volatility of stock market in Malaysia and Indonesia. The research period was from April 1998 to January 2013. The macroeconomic factors that employed were CPI, exchange rate, interest rate, IPI, money supply together with the trade openness. The results showed that 81% of stock market volatility able to explain by those macroeconomic factors. In this study, trade openness, exchange rate volatility as well as interest rate volatility illustrated significant positive impact to the Malaysian stock market volatility.

2.3.2 The Impact of Severe Acute Respiratory Syndrome (SARS)

Taiwan is one of the areas severely affected by the SARS outbreaks. Chen et al. (2007) conducted a study on hotel stock performance in Taiwan during the SARS pandemic. The event-study method was applied in this study and the study's period was from May 2, 2002, to April 7, 2003. The study's findings indicated that seven publicly traded hotel companies

faced huge losses and declined stock prices during the SARS outbreak. This study stated that the SARS pandemic influenced negatively on the Taiwanese hotel stocks. Additionally, Chen (2011) determined the reactions of hotel stock in Taiwan during crisis events and international tourism development. He further explained that the adverse impact of the SARS pandemic on hotel stock performance was not only caused by the decline of hotel revenue it also caused by the increase in the discount rate.

Other than hotel stock performance, Chen et al. (2009) performed a study to determine the negative and positive influences of the SARS pandemic on Taiwan industries. This study employed with the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) process. The sample period of this study was from September 25, 2002, to May 21, 2003. The result illustrated that the outbreak of SARS impacted negatively on Taiwan's tourism sectors as well as the wholesale and retail sectors. However, the biotechnology industries showed positive shock due to the outbreak of SARS. Hence, Chen et al. (2009) suggested that investors and fund managers can buy and hold the stock of biotechnology industries to maintain portfolio return or minimize the investment losses during the outbreak of SARS.

In the context of China, Chong et al. (2010) performed a study to examine the effect of SARS on the Chinese stock exchange from February 24, 2003, to June 25, 2003. This study chooses five representatives of the A-share stocks from both the pharmaceutical and tourism industries. This study figured out that there was an immediate impact on pharmaceutical industries and tourism industries. The tourism industries showed a negative impact from the outbreak of SARS. However, the findings showed that the SARS outbreak positively correlated with the pharmaceutical industry. This study obtained a similar result

with the study done by Chen et al. (2009), where biotechnology industries performed better than other industries during the outbreak of SARS.

Other than that, Chen et al. (2018) designed a study to determine the impact of the SARS pandemic on the long-run relationship between China and four Asian stock markets (Hong Kong, Taiwan, Singapore, and Japan) from the year 1998 to the year 2008. This study conducted the advanced smooth time-varying cointegration model to examine the presence of a time-varying cointegration relation. This study also conducted the difference-indifferences approach to determine whether or not the outbreak of SARS influence the relationship among China and these four markets. The findings obtained indicated that there was a presence of a time-varying cointegration relation in the aggregate stock price indices. Besides, the outbreak of SARS decreased the long-run relationship among China and the other markets.

2.3.3 The Impact of COVID-19 in Major Stock Indices

Kotishwar (2020) carried out a study to determine the influence of the COVID-19 pandemic on the stock market in the United States, Spain, France, Italy, China, and India from March 11, 2020, to the end of April 2020. A vector error correction model (VECM) was built using the stock market indices and COVID-19 positive cases. The Cumulative Average Abnormal Return Model (CAAR) was also applied to reveal the influence of the coronavirus outbreak on stock market indices return in those countries. The results of this study showed that there was a significant negative long-run relationship between the COVID-19 positive cases and the stock market in those countries and the results from the CAAR model indicated that all chosen stock indices reacted more positively during the pandemic period compared to the pre-pandemic period.

Narayan et al. (2020) conducted a study on the effect of government response to coronavirus pandemic on stock market returns in G7 countries from July 1, 2019, to April 16, 2020. The empirical models were built using the major stock indices from G7 countries as dependent variables, while WTI crude oil return, stock return volatility together with government policies were independent variables. The government policies such as lockdown, the economic stimulus package, and travel bans were used as dummy variables to strengthen this study further. This study's findings showed that lockdown, travel ban, and economic stimulus package indicated a positive relationship with the stock returns in all G7 countries.

He et al. (2020) demonstrated a study to determine the influence of coronavirus pandemic on stock markets in China, Italy, South Korea, France, Spain, Germany, Japan, and the United States from June 1, 2019, to March 16, 2020. This study determined the direct effects and spillovers of coronavirus pandemic on stock markets by using simple heteroscedastic t-tests and non-parametric Mann–Whitney tests with the variables of the daily closing value and daily return indices. This study's findings illustrated that there was a negative short-run relationship between the COVID-19 pandemic and the selected stock market. Other than that, the influence of COVID-19 showed bidirectional spill-over effects between Asian countries and European countries together with American countries.

Topcu and Gulal (2020) studied the effect of COVID-19 outbreak on 26 emerging markets from March 10, 2020, to April 30, 2020. A Pooled ordinary least squares regression model was developed using the stock indices from 26 emerging markets, exchange rate, oil price shocks, and COVID-19 infection rate. This study showed that the coronavirus outbreak impacted negatively on the emerging markets during March, but the impact became insignificant when it extended to April 17. The findings showed that the negative effect of

coronavirus started to decrease by mid-April. They also found that Asian emerging markets faced a more significant impact on the outbreak than Europe's emerging market.

Khan et al. (2020) performed a study to determine the impact of the coronavirus outbreak on the 16 selected stock market from April 9, 2019, to April 3, 2020. The result of this study was estimated by applying Pooled OLS regression and the Mann-Whitney test. The regression model was built using the weekly stock market return in the next week and the weekly growth rate of new cases of COVID-19. The empirical findings showed that the growth rate of weekly new cases of COVID-19 impacted negatively to the return in the stock market. The Mann-Whitney test result showed that investors did not react at the early stage of the COVID-19 outbreak but coronavirus transmission between human was confirmed.

Ashraf (2020) determined the response of stock market to the COVID-19 outbreak using panel date regression with the variables of the daily COVID-19 positive cases, the daily COVID-19 fatal cases together with the stock market returns from 64 countries from January 22, 2020, until April 17, 2020. The result presented that there was a negative relationship between the stock market returns and the growth of COVID-19 positive cases. The stock market returns were more responsive with the growth in the number of positive cases compared to growth in the number of fatalities. Besides, there was a solid and significant adverse reaction among the number of coronavirus positive cases and stock market returns during the early stage of confirmed cases. The results gained by Khan et al. (2020) showed opposite reactions on a stock market return during the early stage.

Liu et al. (2020) conducted research on the COVID-19 pandemic and the response of stock markets for 21 affected countries from February 21, 2019, to March 18, 2020. The result of abnormal return and the global COVID-19 positive cases were then used to build

an empirical model to determine the performance of major stock indices after the pandemic. The findings from the event study method showed that the stock market in countries and areas that affected the most declined rapidly after the coronavirus outbreak. Besides, the result from panel fixed effect regression proved that there was an adverse reaction between the COVID-19 positive cases and stock indices abnormal returns. The study results indicated that Asian countries faced more negative abnormal returns than other countries. These results can be strengthened by the study done by Topcu and Gulal (2020), who found that the Asian emerging markets experience a more significant impact on the outbreak of COVID-19 compared to Europe's emerging market.

Yang and Deng (2021) built a panel regression model with robust standard errors to examine the influence of COVID-19 outbreak and government response on the stock market returns in 20 OECD countries. The sample period of this study was from February 1, 2020, to October 1, 2020. The result of this study showed that there was a negative short-run relationship between the COVID-19 outbreak and stock market returns in those selected countries. The impact of coronavirus outbreak on stock markets showed bidirectional spillover effects among Asian countries and European countries as well as American countries.

Rouatbi et al.(2021) performed a study the determine the influence of COVID-19 vaccination on stock market volatility in 66 countries. The variables that were selected to build the model included volatility, daily vaccination, daily vaccination per 100000, vaccination period, stringency index, book to market ratio, daily trading volume, COVID-19 infected cases, COVID-19 death cases, and the US elections as dummy variables. This study showed that the COVID-19 vaccination was able to stabilize the global stock market where the development of vaccination programs decreases the volatility in the stock market.

Besides, the influence of vaccination in the developed market was more significant than the emerging market. Other than that, this study also found that the COVID-19 pandemic and the policy implemented did not cause the decline of the volatility.

The coronavirus epidemic was the first reported in Wuhan, China. Therefore, plenty of studies was conducted to determine the influence of the COVID-19 pandemic on the stock market in China. One of the studies was done by Al-Awadhi et al. (2020). They carried out a study to identify the impact of the coronavirus pandemic on stock returns from January 10, 2020, to March 16, 2020. A panel data regression model was built using the stock returns, daily growth of total positive cases, daily growth of COVID-19 fatal cases, daily market capitalisation together with daily market-to-book ratio. In this study, the COVID-19 pandemic impacted the stock market returns negatively. Besides, the daily growth of total positive cases and daily growth of COVID-19 fatal cases indicated significant negative relationship with the stock returns. Anh and Gan (2020) also found that the rising of COVID-19 positive cases influenced the stock market returns in Vietnam negatively.

Unlike Al-Awadhi et al. (2020), Albulescu (2020) carried out a study on coronavirus and financial volatility in China 40 days after starting the international monitoring of coronavirus 2019. This study estimated three models. The first model focused on the reported cases in China, the second model focused on the reported cases outside China, and the last model focused on the overall situation. A regression model was built using financial volatility as the dependent variable during the coronavirus measurements as independent variables. The result of this study indicated that the new cases reported outside China impacted the financial volatility positively, and there was a significant positive relationship among the financial volatility and the COVID-19 death ratio for all tested models.

Sansa (2020) studied the effect of the coronavirus pandemic on the financial market in China and the United States in March 2020. The Shanghai Stock Exchange is selected as China's major stock indices, while the New York Dow Jones is selected as the major indices for the United States. A simple regression model was built using the major stock indices as the dependent variable and the positive cases of COVID-19 as the independent variable. The findings of this study showed that the COVID-19 positive cases showed significant positive relationship with the financial markets in China and the United States. Besides, the impact of COVID-19 positive cases was significant with the financial markets within the duration of this study. However, the results obtained in this study were different from the results obtained by Ahmed (2020) in Pakistan.

The studies related to the influence of the coronavirus outbreak on the stock market in the United States were often discussed and compared with other countries. Baek et al. (2020) developed a study to identify the relationship among COVID-19 pandemic and stock market volatility in the United States from January 2, 2020, to April 30, 2020, with the variables of stock index values, the daily number of confirmed cases, WTI crude oil price, Federal Target Range, Overnight LIBOR, and Effective Federal Fund Rate (EFFR). The result was estimated using the Markov Regime Switching AR model, CRSP value-weighted Stock Index Return, and auxiliary regression analysis. The findings indicated that the volatility was responsive to news that related with COVID-19. Both positive and negative related news was significant, and the negative news is more impactful on stock market volatility.

Xu (2021) conducted a study to determine the movement of stock return to the unexpected changes in the coronavirus cases and the uncertainty associated with the pandemic in Canada and the United States from January 27, 2020, to July 2, 2020. This study

employed the GARCH-in-Mean VAR technique. This study figured out that the rising of COVID-19 cases impacted the stock markets negatively. The responses of stock returns were asymmetric with the changes the COVID-19 cases in Canada. The asymmetry happened because of the negative influences of uncertainty due to the coronavirus pandemic.

India has the second-largest population in the world. Hence, the outbreak of COVID-19 brought massive impact to India, especially the stock market in India. Alam et al. (2020) developed a study on India's stock market's response during the COVID-19 lockdown period from February 24, 2020, to April 17, 2020. A total of 35 days sample period was taken, with 20 days before the COVID-19 outbreak and 15 days during the COVID-19 outbreak. The result of the study indicated that the market reacted significantly positively during the present lockdown period. However, the market responded negatively during the pre-lockdown period, and they found a positive abnormal return during the present lockdown period, which meant that the lockdown impacted the stock market positively. The studies done Anh and Gan (2020) together with the study done by Chia et al. (2020) also figured out that lockdown showed significant positive influence on the stock performance.

Prabheesh and Kumar (2021) employed the structural vector autoregression (SVAR) model to analyse the dynamic relationship among the returns of oil price, exchange rates, stock returns, and uncertainty index during the COVID-19 outbreak in India. The duration of this study was from December 31, 2019, to April 28, 2021. The results of this study found that the coronavirus outbreak induced uncertainty dampened the oil and stock markets except for the foreign exchange market. This study suggested that the uncertainty distorted movement of stock returns and returns of oil price in the initial periods of the COVID-19 outbreak was affected by the cautionary approach of investors.

In the context of Pakistan, Ahmed (2020) developed a study on the influence of COVID-19 outbreak on Pakistan stock performance for the first half of 2020. A regression model was built using the daily COVID-19 positive cases, the daily COVID-19 fatal cases, the daily COVID-19 recovery cases as independent variables, and the daily closing price of the Pakistan Stock Exchange as dependent variables. The result of this study showed that there was a significant positive relationship between the COVID-19 recovery cases and the stock performance in Pakistan, but the COVID-19 fatal cases and the COVID-19 positive cases indicated insignificant relationship with the stock performance in Pakistan.

Ellahi et al. (2021) adopted a panel regression model to examine the impact of the coronavirus outbreak on stock returns in Pakistan from December 2019 to October 2020. The result of this study indicated that the coronavirus outbreak impacted negatively on the daily market returns and liquidity. The result also illustrated that most of the sectors experienced a massive degree of volatility during the COVID-19 pandemic. The findings of this study were similar with the study done by Ahmed (2020), where the spread of COVID-19 influenced the stock market performance in Pakistan negatively.

Back to Southeast Asia countries, Indonesia is one of the countries severely influenced by COVID-19 pandemic in Southeast Asia. Hence, Machumuddah et al. (2020) developed an event study on the stock market's response to the outbreak of the coronavirus in Indonesia. The sample of this study included data of daily closing stock prices and volume of stock trade from September 20, 2019, to March 20, 2020. This study studied the reaction of the stock market in Indonesia 90 days before the occurrence of the coronavirus pandemic and 90 days after the coronavirus outbreak. This study applied Wilcoxon signed ranks test and regression analysis. This research indicated that the daily closing price and stock trade

volume after the coronavirus outbreak was significant difference compared to the stock performance before the outbreak of coronavirus.

Besides Indonesia, Vietnam also suffered from the impact of the COVID-19 outbreak. Anh and Gan (2020) employed panel data analysis to study the impact of lockdown due to COVID-19 pandemic on Vietnam's stock performance from January 30, 2020, to May 30, 2020. The results indicated that the increasing daily COVID-19 positive cases impacted negatively on stock returns in Vietnam. Besides, the stock market reacted in opposing ways during the coronavirus pandemic and before the coronavirus pandemic. There was a significant positive influence on the stock market during the lockdown period, which is related to the results obtained by Chia et al. (2020), where the lockdown influenced positively on all the stock returns.

Hung et al. (2021) also conducted panel data analysis to examine the influence of COVID-19 outbreak on stock market returns in Vietnam from January 2, 2020, to December 13, 2020. This study showed that the daily coronavirus positive cases in Vietnam was impacted negatively on the stock returns in Vietnam. This study found that the impact was more significant during the pre-lockdown and the second wave of the pandemic. This scenario may be explained by Anh and Gan (2020) study, where lockdown indicated a significant positive impact. This study also figured out that the most influenced sector was the financial sector.

Malaysia is one of the strongest economics in Southeast Asia, Malaysia economy also faced huge impact during the COVID-19 pandemic. Therefore, there are studies conducted to determine the impact of COVID-19 pandemic on Malaysia's economy. Chia et al. (2020) demonstrated a study to determine the relation among stock market returns in Malaysia and

the COVID-19 pandemic from January 2, 2020, to April 30, 2020. An ordinary least squares technique was used in this study. The dependent variables of this study were KLCI composite index and eight selected main indices, while the independent variables were the dummy variable of Movement Control Order (MCO) and market volatility index. This study showed that the daily new positive cases and death cases showed insignificant negative influence on the stock market returns. There was a significant positive relationship between the MCO and the stock returns, but overseas financial risk negatively affected these returns.

Mustaffa et al. (2021) developed a study to determine the effect of COVID-19 cases on Malaysian economic performance. The univariate regression analysis was employed in this study, and the period of study was from January 1, 2020, to September 30, 2020. This study also estimated the economic performance for upcoming three months by employing linear trend forecasting model. The findings of this study illustrated that the unemployment rate, GDP, CPI, foreign exchange rate, and the stock market index was significantly affected by the COVID-19 cases. This study forecasted the unemployment rate, GDP, foreign exchange rate, and the stock market index will increase in upcoming three months while the consumer price index was estimated to decrease.

Furthermore, Gamal et al. (2021) also conducted a study to investigate the influence of coronavirus on Malaysia stock exchange from January 27, 2020, to May 12, 2020. This study employed Autoregressive Distributed Lag Bound Testing (ARDL) technique to determine the impact of COVID-19 on the stock exchange in Malaysia. The findings showed that the daily increase of positive cases in domestic and global showed a significant negative influence on the daily trading size of the stock market in Malaysia. Although there was a

significant negative effect on the Malaysian stock market, the results of this study suggested that the outbreak of coronavirus maybe have an asymmetric influence on the stock market.

Jaapar et al. (2021) built a panel regression model to study the effect of COVID-19 pandemic on Malaysian large-cap stocks from December 31, 2019, to June 9, 2020. The dependent factors in this study were stock returns of the selected companies in Malaysia while the independent variables were Malaysia cases, Malaysia COVID-19 fatal cases, Malaysia COVID-19 cumulative cases, Malaysia COVID-19 cumulative fatal cases, Singapore positive cases, Singapore COVID-19 fatal cases, exchange rate, crude oil price and volatility index. The study found that there was a significant positive impact between the coronavirus variables in Malaysia and the stock returns, but the impact was small. The Singapore positive cases and fatal cases showed negative effect on the stock returns. The results also showed that the stock returns in Malaysia were more sensitive to the local fatal cases due to COVID-19.

Ngu et al. (2021) studied the effect of COVID-19 outbreak on volatility of stock market returns Malaysia and Singapore. This study used daily closing price from July 1, 2019, to August 31, 2020. This sample divide into pre-coronavirus outbreak and during the coronavirus outbreak. This study employed GARCH, GARCH-M, TGARCH, EGARCH and PGARCH model. The finding of this study showed indicated that the stock market return in Malaysia and Singapore was persistent, but the persistent was decline during the pandemic period. This study also found that the leverage effect existed when stock market returns were correlated negatively to the stock returns volatility.

2.3.4 The Impact of COVID-19 in Sectoral Stock Indices

During the COVID-19 pandemic, the financial industry in worldwide was seriously affected. Herwany et al. (2021) studied the effect of the COVID-19 outbreak on Indonesian sectoral stock returns. This study also employed the event study method, and the result was strengthened by employing the Ordinary Least Square (OLS) regression. The sample period was from January 20, 2020, to April 15, 2020. This study found that there was a declined abnormal return value in financial property, real estate together with construction sectors while the abnormal return value was constant in infrastructure, utilities, and transportation sectors. According to the cumulative abnormal returns values, financial, trade, service, as well as investment sectors were the sectors that influenced the most by the COVID-19 pandemic.

Lee et al. (2020) carried out a similar study on the effect of COVID-19 on the stock performance in Malaysia from January 1, 2020, to April 18, 2020. An ordinary least squares regression model was performed using Brent oil price, the volatility index, number of positive cases, number of death cases in Malaysia, China, and United States as independent variables while Kuala Lumpur Composite Index (KLCI) and 13 sectoral indices in Malaysia as dependent variables. The results presented that almost all sectors in the Malaysian stock market are significantly influenced by the number of positive cases, which is dissimilar from the result obtained by Chia et al. (2020). Besides, the fatal cases in China displayed a lagged and mixed effect on Malaysian stock performance.

Australian stock market was also influenced by the outbreak of the coronavirus epidemic. The study done by Alam et al. was to determine the influence of the COVID-19 outbreak on the Australian sectoral stock indices. This study employed an event study

method with a sample period from February 13, 2020, to March 12, 2020. The result of this study showed that food, pharmaceuticals, and healthcare sectors illustrated positive returns on the day of the declaration of the COVID-19 pandemic. After the announcement of the COVID-19 outbreak, telecommunications, pharmaceuticals, and healthcare sectors remained an excellent performance, but the transportation industry showed a poor performance. The results obtained were similar to the study done by Chong et al. (2010) during the outbreak of SARS.

Saad et al. (2020) also performed a study to identify the interaction between share price and COVID-19 cases in Malaysian sectoral stock market from January 24, 2020, until August 24, 2020. This study employed random effect robust regression model to determine the variation of stock price. This study found that consumer, construction, energy, industrial product, property, technology, telecommunication together with transportation had significant negative relationship with the share price performance. These results were similar to the findings from Lee et al. (2020) where most of the sectoral stock returns in the Malaysia were significantly influenced by the coronavirus cases. This study concluded that the increase of coronavirus cases caused the declined of share price.

He et al. (2020) conducted an event study to identify the impact of COVID-19 outbreak on stock prices across different sectors in China. This study's sample period was from June 3, 2019, to March 13, 2020, and the data was collected from Shanghai and Shenzhen A-share markets. This study applied abnormal return (AR) and cumulative abnormal return (CAR) techniques. This study figured out that transportation, mining, environmental industries, electricity, and heating had adversely impacted the coronavirus outbreak but there were few

sectors remained resilient during the outbreak which were manufacturing, information technology, education together with healthcare sectors.

During COVID-19 pandemic, health-related industries is the one of industries that severely influenced. Jeremiah et al. (2023) performed a study to determine the impact of the COVID-19 vaccination on the healthcare stock indices in selected Southeast Asia countries including Indonesia, Malaysia, Singapore, and Thailand. This study employed the Feasible Generalized Least Square (FGLS) model to determine the relation between the variables. The variables were healthcare stock indices price, vaccine dose trend, vaccine hesitancy, global fear index, sentiment index, panic index and exchange rate. The data collected from 1 March 2021 to 19 November 2021. This study found that healthcare stock became defensive sector during the later period of the COVID-19 pandemic.

Cai et al. (2023) conducted research to determine the impact of COVID-19 pandemic on the medical industry in China by employing Ordinary Least Squared (OLS) model. The research period was from 6 December 2017 to 11 March 2022 and the variables including the Shanghai Composite Index, Shenzhen Component Index, A-share banking sector and medical sectors. The result of this study showed that the COVID-19 pandemic had negative impact on banking industry while the COVID-19 pandemic had positive impact on medical industry. This research also found that those impact were stabilized after the implementation of policy due to COVID-19 by the Chinese government.

Mustafa et al. (2022) carried out a study to examine the impact of COVID-19 pandemic on Malaysia's healthcare index by using multiple linear regression method. The data collected were the daily data from 18 March 2020 to 31 December 2020. The dependent variable in this study was the healthcare index return while the independent variables were

the COVID-19 cases, COVID-19 death cases, financial market volatility index and money supply. This study found that all independent variables have significant relationship with the healthcare index return. The COVID-19 cases showed positive significant relationship with the healthcare index return but the COVID-19 death cases showed negative significant relationship with the healthcare index return.

Market volatility index is also one of the measurements to determine the stock performance other than the stock returns. The study done by Mahussin et al. (2021) examined the volatility of technology and healthcare sector in Malaysia before and during the COVID-19 pandemic. This study determined the volatility by using GARCH model and data collected were daily data from September 2019 to September 2020. This study found that the healthcare sector illustrated a steady increase in volatility from March 2020 to the end of September 2020 during the COVID-19 pandemic. However, the technology sector only showed a volatility jump in March 2020 and back to normal in the middle of April 2020.

Other than financial sectors and healthcare sectors, telecommunication sectors are also affected by the COVID-19 pandemic due to the rising demand of telecommunication services for remote work and online services. Ben-Ahmed et al. (2022) conducted a dynamic panel model to determine the influence of the COVID-19 on 90 top digital companies located in 24 countries worldwide. The panel model built up from the growth in coronavirus confirmed cases, the growth in coronavirus death cases, the total number of common shares, corporate risk factor, and volatility index. This study period was from 1 January 2020 to 17 July 2020. The result of this study found that the growth in coronavirus confirmed cases and death cases had significant positive impact on the stock returns of the digital companies.

Nasution and Junaidi (2022) carried out an event study to determine the stock price reactions of telecommunication sector the COVID-19 pandemic in Southeast Asia countries. The data were collected from 37 companies from the telecommunication sector in Indonesia, Malaysia, Thailand, Singapore, Vietnam, Myanmar and the Philippines. The study period were 10 months before the announcement of the COVID-19 pandemic and after 10 months after the announcement of the COVID-19 pandemic. The findings of this study concluded that there was no significant difference in stock prices before and after the announcement of the outbreak of COVID-19 Southeast Asia.

Ariantika and Davianti (2021) determined the impact of the COVID-19 pandemic on the stock performance of the Indonesia's telecommunication sectors by using event study approach. This research applied average abnormal return techniques to analyse the stock performance before and after the first cases of COVID-19 in Indonesia. The period of study were 15 days before and 15 days after the first cases detected. The findings showed that the stock react insignificant positive to the announcement of the first cases in Indonesia. These findings similar to the study done by Nasution and Junaidi (2022) in Southeast Asia where there no significant difference in stock prices before and after the declaration of the COVID-19 outbreak.

2.4 Research Gaps

This study is purposed to figure out the impact of the COVID-19 outbreak on selected sectoral stock returns in Malaysia. After reviewing past studies, some research gaps from those past studies provide the opportunity to conduct this study. Most of the past studies and research studied on the major indices (Ahmed, 2020; Al-Awadhi, 2020; He et al., 2020; Khan et al., 2020; Sansa, 2020; Topcu & Gulal, 2020) or single sector (Liew, 2020a & 2020b)

only. Major indices only can present the overall stock performance during the COVID-19 outbreak while sectoral studies help to identify which sectors are severely impacted by the coronavirus pandemic and which sectors are slightly affected by the pandemic. There are limited studies that studies the impact of the COVID-19 on sectoral returns in Malaysia which conducted by Zulkify et al. (2024) and Al-dhamari (2023). The study done by Zulkify et al. (2024) employed paired sample t-tests while Al-dhamari employed event study method. Hence, there is an opportunity to conduct a study on the impact of the COVID-19 pandemic on selected sectoral stock return in Malaysia by employing the OLS technique.

Secondly, limited past studies included government policies or government responses when conducting the study on the influence of the coronavirus pandemic on stock market (Alam et al., 2020; Anh & Gan, 2020; Chia et al., 2020; Liew, 2020a & 2020b; Machmuddah et al., 2020; Narayan et al., 2021). The Malaysian government-imposed Movement Control Order (MCO) to avoid the transmission of coronavirus. Conditional Movement Control Order (CMCO) and the Recovery Movement Control Order (RMCO) are enforced to regenerate the economic activities. Therefore, this is a chance to identify the impact of the coronavirus outbreak on Malaysian sectoral stock return with distinct periods. The implementation of government policies will affect the decisions of financial institutions and investors. According to Pastor and Veronesi (2012), the decline of stock return should be significant if the uncertainty of government policies is considerable.

Thirdly, few studies and research included the COVID-19 recovery cases as one of the variables when performing the study related to the coronavirus pandemic and financial market performance. Most studies only included the COVID-19 positive cases and COVID-19 fatal cases. A previous study conducted by Ahmed (2020) in Pakistan found that the

COVID-19 recoveries showed a significant relationship with Pakistan's stock market's performance while the study done by Choo et al. (2024) in Malaysia found that COVID-19 recoveries rate had a long-term effect in explaining the Malaysia stock return. However, the study done by Choo et al. (2024) and Ahmed (2020) only focus on the major indices like FBM KLCI and Pakistan Stock Exchange.

Other than that, the COVID-19 vaccination is one of the variables that is rarely included in the studies regarding the coronavirus pandemic and stock performance. There are limited studies study on the influence of COVID-19 vaccination on stock performance. Rouatbi et al. (2021) found that the vaccination for coronavirus able to stabilize the global financial market. The influence of vaccinations is more impactful in developed markets as compared to emerging markets. Therefore, this is an opportunity to find out the influence of COVID-19 vaccination on Malaysia stock returns.

Although Lee et al. (2020), Saad et al. and Al-dhamari (2023) already conducted studies on the influence of COVID-19 outbreak on Malaysian sectoral stock returns, but those studies did not consider COVID-19 recovery cases, government responses, and vaccination as COVID-19 variables and those studies only focus on certain period of studies like study done by Al-dhamari (2023) focus on the period of MCO. The study done by Choo et al. (2024) covered from 18 March 2020 to 31 March 2022, but this study only focused on the major indices which is the FBM KLCI. Moreover, the study done by Saad et al. (2020) only employ COVID-19 positive cases as independent variables without including control variables. Hence, there are an opportunity to study the impact of the COVID-19 pandemic on the sectoral stock return in Malaysia.

2.5 Conclusion

The theoretical reviews highlighted in this study are the Efficient Market Hypothesis (EMH), the Capital Asset Pricing Model (CAPM), the Arbitrage Pricing Theory (APT), and the Black Swan Theory. The EMH together with the APT are commonly be used when conducting studies related to stock returns. The Black Swan Theory are usually be used when an expected event has happened and causes massive impact. In empirical reviews, most past studies showed a significant influence of the COVID-19 positive cases and death cases on the stock market performance. However, the results obtained were dissimilar due to various data, techniques, and geographical locations. Hence, there is an opportunity to conduct a study on the impact of the COVID-19 outbreak on Malaysian sectoral stock returns.

CHAPTER THREE

DATA AND METHODOLOGY

3.1 Introduction

The influence of coronavirus outbreak on selected Malaysian sectoral stock returns will determine start in January 2020 and end December 2022. The dependent variables are the selected sectoral indices and the major stock index in Malaysia. The independent variables are the coronavirus variables and the control variables. The coronavirus variables include positive cases, death cases recovery cases, vaccination, and lockdown while control variables include oil price, gold price, exchange rate, volatility index, United States stock index. The Ordinary Least Square (OLS), Granger causality test and correlation analysis will apply in this study. This chapter will be divided into conceptual framework, empirical model, empirical testing procedure, data description and the concluding remarks of this chapter.

3.2 Conceptual Framework

The purpose of this study is to determine the influence of the coronavirus outbreak on Malaysian sectoral stock returns. The COVID-19 variables and control variables are used to examine the impact of the COVID-19 on sectoral stock return in Malaysia. Figure 3.1 below show the conceptual model for this study.

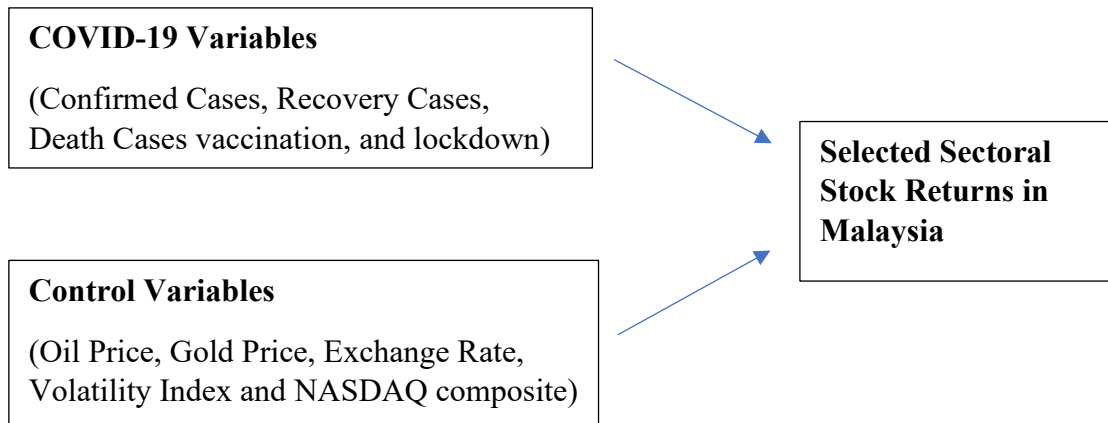


Figure 3.1: The Conceptual Model

The control variables are selected to strengthen the model. The study done by Bundoo (2009) found that the oil price and the exchange rate were statistically significant with the stock performance. Besides, Basu and Chawla (2012) found that the gold price and exchange rate significantly impacted the stock returns in India. The study done by Nasir et al. (2013) further strengthened the results of Bundoo (2009) as well as Basu and Chawla (2012) where the exchange rate had significant relationship with the stock return. The study done by Qadan et al. (2019) in United States and Wang et al. (2014) in China discover that the volatility index impacted negatively on the stock return. The global market indices will also affected Malaysian stock return. Yeoh and Sundram (2022) found that North America market indices had significant relationship with the Malaysian tech stocks. Mohd Roosdi et al.(2022) also discover that some of the global indices had significant positive relationship with the Kuala Lumpur Composite Index. Those previous studies showed that the selected control variables have significant relationship with stock returns.

3.3 Empirical Model

The stock returns model is derived from the models built by Bundoo (2009), Basu and Chawla (2012), Wang et al. (2014) as well as Nizar et al. (2022). The study done by Bundoo found that the price of oil and exchange rate showed significant effect on stock returns while the study done by Basu and Chawla (2012) figured out that the price of gold and exchange rate significantly influenced the stock returns. Wang et al. (2014) found that volatility index brought negative impact on stock markets. The study conducted by Nizar et al. (2022) determined that the return spillover was found to be unidirectional from the US stock market to the Malaysia stock market. Hence, this study includes NASDAQ composite index as one of the variables. During COVID-19 pandemic, the demand for telecommunication service and technology services like Zoom, Microsoft and Amazon are increases. Therefore, this study employed NASDAQ composite index rather than S&P 500 index. Since NASDAQ composite index acts as a technology focused benchmark which more suitable for capturing the influence of US stock market on Malaysia stock market during the COVID-19 pandemic (Volos Portfolio Solutions, 2020).

The model for stock returns built is shown as below:

$$R = f(OP, GP, EXC, VIX, NASDAQ) \quad (3.1)$$

where, R = returns of stock,

OP = oil price,

GP = gold price,

EXC = exchange rate,

VIX = volatility index,

$NASDAQ$ = NASDAQ composite index (United States stock market index).

The empirical model that built to determine the influence of coronavirus pandemic on Malaysian stock returns is derived from Lee, Jais and Chan (2020). The model is built by adding the COVID-19 variables into the stock returns model in Equation 3.1. The COVID-19 variables that employed are COVID-19 confirmed cases, deaths cases, recovery cases, vaccination, and lockdown. The model for studying the impact of COVID-19 pandemic on Malaysian sectoral stock returns is shown below:

$$R = f(OP, GP, EXC, VIX, NASDAQ, CC, DC, RC, VAC, LD) \quad (3.2)$$

where, R = returns of stock,

OP = oil price,

GP = gold price,

EXC = exchange rate,

VIX = volatility index,

$NASDAQ$ = NASDAQ composite (United States stock market index),

CC = COVID-19 confirmed cases,

DC = COVID-19 death cases,

RC = COVID-19 recovery cases,

VAC = COVID-19 vaccination,

LD = COVID-19 lockdown which included MCO, CMCO, RMCO, FMCO and National Recovery Plan.

Equation 3.1 is the model that built to determine the stock returns while Equation 3.2 is the extension of Equation 3.1 by adding the COVID-19 factors to identify the effect of coronavirus outbreak on the stock returns.

3.4 Data Descriptions

The study period in this study is from January 2020 to December 2021. The data collected are daily data. The daily COVID-19 confirmed cases, death cases and recovery cases are obtained from Ministry of Health, Malaysia. Besides, the Kuala Lumpur Composite index, stock indices from selected sectors, oil price, gold price, exchange rate, volatility index together with NASDAQ composite index are obtained from the Investing.com. The volatility index illustrates the expectations of volatility in stock market for the next thirty days. The volatility index helps investors to access the investment risk before making a decision (Kuepper & Scott, 2021). The previous studies that done by Tursoy and Faisal (2018) found that the performance of stock returns was significantly affected by the price of oil and price of gold. In this study, the lockdown policy and the vaccination are acted as binary indicators. The implementation of lockdown during MCO, CMCO and FMCO is 1, and 0 otherwise. The day started and after for vaccination of COVID-19 are 1 and the days before the vaccination are 0.

3.5 Empirical Testing Procedures

3.5.1 Descriptive Statistic

This study conducts descriptive statistical analysis to determine and summarise the characteristic of the surveyed variables which including the stock returns and the COVID-19 variables such as confirmed cases, recovery cases and the death cases. The measurement of descriptive statistic including mean, median, maximum, minimum, standard deviation, skewness and kurtosis. This descriptive statistic helps to determine the patterns, outlier, and data dispersion of the surveyed data. According to Gujarati and Porter (2009), the descriptive

analysis is conducted to ensure the suitability of the data and detect the irregularities of the data which may affect the regression results.

3.5.2 Correlation Analysis

The correlation analysis is employed to determine interaction between two variables. The correlation analysis is basically following the assumption of linear relationship among the quantitative variables (Gogtay & Thatte, 2017). The correlation analysis measures the strength of the linear relationship between the quantitative factors. The value of coefficient indicates zero means there is no interaction among the two surveyed variables. The coefficient that greater than zero means there is a positive relationship among the variables while the coefficient that less than zero means there is a negative relationship between those surveyed variables. The coefficient of correlation analysis is among -1 to 1. The closer the value of correlation coefficient to 1, the stronger the positive relationship. Meanwhile, the closer the value of correlation to -1, the stronger the negative relationship.

3.5.3 Ordinary Least Square (OLS) Estimation

This study applies the Ordinary Least Square (OLS) estimation technique to ascertain the impact of COVID-19 outbreak on Malaysian stock returns. OLS estimation is a statistical method for investigating the interaction among one or more independent variables and a dependent variable. The difference of the observed and expected values for the sum of squares residuals (RSS) is used to estimate the relationship (Hutcheson, 2011). This study employs OLS techniques because OLS estimation focuses on the short-term impact by using stationary variables. Unlike Vector Error Correction Model (VECM) and Autoregressive Distribution Lag (ARDL) capture both long-run and short-run dynamics. The OLS

estimation provides an effective and simple framework when studying the impact of the COVID-19 pandemic on the stock performance.

There are few assumptions for OLS estimation. The first assumption is the model is linear in the parameters. The second assumption is the independent variables' values are fixed in repeated sampling. The next assumption is the zero-mean value of disturbance. Besides, the model should not have heteroscedasticity and autocorrelation issues. Moreover, the model should correctly specify, and normality issue does not appear. Lastly, there is not multicollinearity issue in the model. This technique is commonly be used to in the studies that determine the effect of coronavirus outbreak on stock performance. Those related studies that applied OLS are done by Lee, Jais, and Chan (2020); Chia et al., (2020); Liew (2020a) as well as Liu et al. (2020).

The Equation 3.3 shows below is the OLS regression for stock returns.

$$r_t = \beta_0 + \beta_1 OP_t + \beta_2 GP_t + \beta_3 EXC_t + \beta_4 VIX_t + \beta_5 NASDAQ_t + \varepsilon_t \quad (3.3)$$

r_t = the stock returns at day t ,

OP_t = the oil price at day t ,

GP_t = the gold price at day t ,

EXC_t = the exchange rate at day t ,

VIX_t = the volatility index at day t ,

$NASDAQ_t$ = the NASDAQ composite index at day t ,

β_0 = the constant term,

$\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 = the coefficient to estimated,

ε_t = the stochastic error terms.

The coefficient of oil price is expected to be positive. According to study done by Degiannakis et al. (2018), they found that although more evidence supports the theoretical premise of the increase of oil price caused the decrease of stock return, but this scenario only happened in oil-importing countries. This scenario would be reverse in oil-exporting countries where the increase of oil price lead to increase the stock returns since increase of oil price was positive news for oil-exporting countries. This study can be strengthen by the study done by Salisu and Isah (2017), where price of oil and price of stock showed significant positive relationship while study done by Hadi et al. (2009) figured out that the price of oil impacted positively on Malaysia financial market. The coefficient of gold price is expected to be negative. This is because investors who faced decline in stock market will switch to gold market in future to protect their future investment. Hence, gold price has an inverse relationship with stock market and gold is the most value preservation asset (Chugan, 2008). Samontaray and Alanuzi (2015) together with Tursoy and Faisal (2018) found that gold price influenced negatively on the stock performance. The coefficient of exchange rate is estimated to be negative. The increase of exchange rate (MYR/USD) means that the domestic currency is depreciate which will cause negative impact on domestic stock market. Nasir et al. (2013) and Nordin et al. (2014) found that the exchange rate impacted negatively on stock performance. The coefficient of volatility index is estimated to be negative. According to Easterling (2021), increase of volatility often related to the decline of the stock markets. The study done by Wang et al. (2014) found that volatility index had negative influence on the Chinese financial market. The coefficient of NASDAQ represents the United States stock market which expected to be negative. Ibrahim (2003) together with Yusof and Majid (2006) figured out that there was negative relationship between United

States stock markets and Malaysian stock markets since United States stock markets were competing with Malaysian stock markets.

The Equation 3.4 below shows the OLS regression to identify the influence of coronavirus outbreak on Malaysia sectoral stock returns:

$$R_t = \beta_0 + \beta_1 CC_t + \beta_2 DC_t + \beta_3 RC_t + \beta_4 VAC_t + \beta_5 LD + \beta_6 OP_t + \beta_7 GP_t + \beta_8 EXC_t + \beta_9 VIX_t + \beta_{10} NASDAQ_t + \varepsilon_t \quad (3.4)$$

R_t = the KLCI and selected sectoral stock indices in Malaysia at day t ,

CC_t = the COVID-19 confirmed cases in Malaysia at day t ,

DC_t = the COVID-19 deaths cases in Malaysia at day t ,

RC_t = the COVID-19 recovery cases in Malaysia at day t ,

VAC_t = the COVID-19 vaccination in Malaysia at day t ,

LD_t = the lockdown in Malaysia due to the COVID-19 outbreak at day t ,

OP_t = the oil price at day t ,

GP_t = the gold price at day t ,

EXC_t = the exchange rate (MYR/USD) at day t ,

VIX_t = the volatility index at day t ,

$NASDAQ_t$ = the NASDAQ composite index at day t ,

β_0 = the constant term,

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ and β_{10} = the coefficient to estimated,

ε_t = the stochastic error terms.

The Equation 3.4 is employed to Model 1 through Model 4 where KLCI, and selected sectoral indices are selected as dependent variable. The coefficient of the COVID-19 confirmed cases and deaths cases are estimated to be negative in all sectors except for healthcare and telecommunication. From past studies done by Chen et al. (2009) on the SARS pandemic, healthcare sector showed positive shock during the pandemic. This scenario happened because there was more investment on the biotechnology and pharmaceutical industry. Besides, Urazbaeva et al. (2020) found that telecommunications service sector in Russia showed positive impact during 2020 pandemic due to the demand of telecommunication services increase. Other than that, study done by Herwany et al. (2021) figured out that the coronavirus pandemic impacted negatively in financial, property, real estate, as well as construction sector. The coefficient of COVID-19 recovery cases and vaccination are estimated to be positive in all sectors. Ahmed (2020) figured out that COVID-19 recoveries illustrated significant positive effect on the Pakistan's stock market. The study done by Rouatbi et al. (2021) discover that that the COVID-19 vaccination can stabilize the global equity markets. Other than that, the coefficient of lockdown in Malaysia is estimated to be positive to all sectors. Previous studies that done by Anh and Gan (2020) together with Alam et al. (2020) found that lockdown showed significance positive impact on stock performance.

3.5.4 Diagnostic Tests

In regression analysis, there is a set of classical assumptions for OLS technique to illustrate desirable property. If those assumptions unable to fulfil, the interpretation of the estimated regression will become invalid. Those assumptions are related with the explanatory variables and error term of the model. The estimated regression models the fulfil

the assumptions are known as Classical Linear Regression Model (CLRM). Jarque - Bera normality test builds to investigate the residual normality, homoscedasticity, and serial independence. This study will employ Variance Inflation Factors (VIFs) to determine the multicollinearity problem. The multicollinearity test is designed to figure out the existence of exact or inexact linear relationship between those independent variables. The threshold value to deviate small from large is generally taken as 10 (Alin, 2010). The higher the VIF, the more serious of the multicollinearity problem. The model should not have exact collinearity among those independent variables in order to fulfil CLRM. Autocorrelation also known as serial correlation, which mean that the error term from one time period is determine by an error term from other time period in some systematic way. In this study, Breusch-Godfrey (BG) Lagrange Multiplier (LM) test conducts to figure out the existence of serial correlation issues. The error terms in the model must be equal and constant variance which is homoscedastic to fulfil the assumptions of CLRM. If the error terms do not have constant variance, the model will face heteroscedasticity problem. The White's heteroscedasticity test is employed to determine the heteroscedasticity problem in this study.

3.5.5 Granger Causality Test

Granger causality is employed to identify that another surveyed variable able to forecast other variable or not. Other than that, this technique able to detect the causality direction among those surveyed variables. The null hypothesis of Granger causality test is the independent surveyed variable does not granger cause the dependent surveyed variable while the alternative hypothesis is the independent surveyed variable granger causes the dependent surveyed variable. The null hypothesis able to be rejected when the probability value obtained is smaller than the selected significant level. Thus, the result can be concluded

as the independent surveyed variable granger cause the dependent surveyed variable in the short-run at the selected significant level. It is important to identify the suitable lag length for obtaining valid result of Granger causality test. According to Lutkepohl (2005), too few of lag orders may omit relevant information while too many lag orders may cause the efficiency of model decrease. In the study, the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC/BIC) are used as the standard selection criteria to determine the lag order. The result can be led to biased or misleading due to an incorrect lag order. The Equation 3.5 to the Equation 3.13 are the bivariate VAR model where each endogenous variable is regressed on lagged values of itself and all other variables in the model.

The Granger causality test is specified as follows:

$$\begin{aligned}
 R_t = & \alpha_1 + \sum_{z=1}^w \beta_{1z} R_{t-z} + \sum_{z=1}^w \beta_{2z} CC_{t-z} + \sum_{z=1}^w \beta_{3z} DC_{t-z} + \sum_{z=1}^w \beta_{4z} RC_{t-z} + \sum_{z=1}^w \beta_{5z} OP_{t-z} \\
 & + \sum_{z=1}^w \beta_{6z} GP_{t-z} + \sum_{z=1}^w \beta_{7z} EXC_{t-z} + \sum_{z=1}^w \beta_{8z} VIX_{t-z} + \sum_{z=1}^w \beta_{9z} NASDAQ_{t-z} \\
 & + \varepsilon_{1t}
 \end{aligned} \tag{3.5}$$

$$\begin{aligned}
 CC_t = & \alpha_2 + \sum_{z=1}^w \gamma_{1z} R_{t-z} + \sum_{z=1}^w \gamma_{2z} CC_{t-z} + \sum_{z=1}^w \gamma_{3z} DC_{t-z} + \sum_{z=1}^w \gamma_{4z} RC_{t-z} + \sum_{z=1}^w \gamma_{5z} OP_{t-z} \\
 & + \sum_{z=1}^w \gamma_{6z} GP_{t-z} + \sum_{z=1}^w \gamma_{7z} EXC_{t-z} + \sum_{z=1}^w \gamma_{8z} VIX_{t-z} + \sum_{z=1}^w \gamma_{9z} NASDAQ_{t-z} \\
 & + \varepsilon_{2t}
 \end{aligned}$$

(3.6)

$$\begin{aligned}
DC_t = & \alpha_3 + \sum_{z=1}^w \delta_{1z} R_{t-z} + \sum_{z=1}^w \delta_{2z} CC_{t-z} + \sum_{z=1}^w \delta_{3z} DC_{t-z} + \sum_{z=1}^w \delta_{4z} RC_{t-z} + \sum_{z=1}^w \delta_{5z} OP_{t-z} \\
& + \sum_{z=1}^w \delta_{6z} GP_{t-z} + \sum_{z=1}^w \delta_{7z} EXC_{t-z} + \sum_{z=1}^w \delta_{8z} VIX_{t-z} + \sum_{z=1}^w \delta_{9z} NASDAQ_{t-z} \\
& + \varepsilon_{3t}
\end{aligned}$$

(3.7)

$$\begin{aligned}
RC_t = & \alpha_4 + \sum_{z=1}^w \theta_{1z} R_{t-z} + \sum_{z=1}^w \theta_{2z} CC_{t-z} + \sum_{z=1}^w \theta_{3z} DC_{t-z} + \sum_{z=1}^w \theta_{4z} RC_{t-z} + \sum_{z=1}^w \theta_{5z} OP_{t-z} \\
& + \sum_{z=1}^w \theta_{6z} GP_{t-z} + \sum_{z=1}^w \theta_{7z} EXC_{t-z} + \sum_{z=1}^w \theta_{8z} VIX_{t-z} + \sum_{z=1}^w \theta_{9z} NASDAQ_{t-z} \\
& + \varepsilon_{4t}
\end{aligned}$$

(3.8)

$$\begin{aligned}
OP_t = & \alpha_7 + \sum_{z=1}^w \xi_{1z} R_{t-z} + \sum_{z=1}^w \xi_{2z} CC_{t-z} + \sum_{z=1}^w \xi_{3z} DC_{t-z} + \sum_{z=1}^w \xi_{4z} RC_{t-j} + \sum_{z=1}^w \xi_{5z} OP_{t-z} \\
& + \sum_{z=1}^w \xi_{6z} GP_{t-z} + \sum_{z=1}^w \xi_{7z} EXC_{t-z} + \sum_{z=1}^w \xi_{8z} VIX_{t-z} + \sum_{z=1}^w \xi_{9z} NASDAQ_{t-z} \\
& + \varepsilon_{5t}
\end{aligned}$$

(3.9)

$$\begin{aligned}
GP_t = & \alpha_8 + \sum_{z=1}^w o_{1z} R_{t-z} + \sum_{z=1}^w o_{2z} CC_{t-z} + \sum_{z=1}^w o_{3z} DC_{t-z} + \sum_{z=1}^w o_{4z} RC_{t-z} + \sum_{z=1}^w o_{5z} OP_{t-z} \\
& + \sum_{z=1}^w o_{6z} GP_{t-z} + \sum_{z=1}^w o_{7z} EXC_{t-z} + \sum_{z=1}^w o_{8z} VIX_{t-z} + \sum_{z=1}^w o_{9z} NASDAQ_{t-z} \\
& + \varepsilon_{6t}
\end{aligned} \tag{3.10}$$

$$\begin{aligned}
EXC_t = & \alpha_9 + \sum_{z=1}^w \pi_{1z} R_{t-z} + \sum_{z=1}^w \pi_{2z} CC_{t-z} + \sum_{z=1}^w \pi_{3z} DC_{t-z} + \sum_{z=1}^w \pi_{4z} RC_{t-z} \\
& + \sum_{z=1}^w \pi_{5z} OP_{t-z} + \sum_{z=1}^w \pi_{6z} GP_{t-z} + \sum_{z=1}^w \pi_{7z} EXC_{t-z} + \sum_{z=1}^w \pi_{8z} VIX_{t-z} \\
& + \sum_{z=1}^w \pi_{9z} NASDAQ_{t-z} + \varepsilon_{7t}
\end{aligned} \tag{3.11}$$

$$\begin{aligned}
VIX_t = & \alpha_{10} + \sum_{z=1}^w \rho_{1z} R_{t-z} + \sum_{z=1}^w \rho_{2z} CC_{t-z} + \sum_{z=1}^w \rho_{3z} DC_{t-z} + \sum_{z=1}^w \rho_{4z} RC_{t-z} \\
& + \sum_{z=1}^w \rho_{5z} OP_{t-z} + \sum_{z=1}^w \rho_{6z} GP_{t-z} + \sum_{z=1}^w \rho_{7z} EXC_{t-z} + \sum_{z=1}^w \rho_{8z} VIX_{t-z} \\
& + \sum_{z=1}^w \rho_{9z} NASDAQ_{t-z} + \varepsilon_{8t}
\end{aligned} \tag{3.12}$$

$$\begin{aligned}
NASDAQ_t = & \alpha_{11} + \sum_{z=1}^w \sigma_{1z} R_{t-z} + \sum_{z=1}^w \sigma_{2z} CC_{t-z} + \sum_{z=1}^w \sigma_{3z} DC_{t-z} + \sum_{z=1}^w \sigma_{4z} RC_{t-z} \\
& + \sum_{z=1}^w \sigma_{5z} OP_{t-z} + \sum_{z=1}^w \sigma_{6z} GP_{t-z} + \sum_{z=1}^w \sigma_{7z} EXC_{t-z} + \sum_{z=1}^w \sigma_{8z} VIX_{t-z} \\
& + \sum_{z=1}^w \sigma_{9z} NASDAQ_{t-z} + \varepsilon_{9t}
\end{aligned}
\tag{3.13}$$

where,

R_t = the KLCI and selected sectoral stock indices in Malaysia at day t ,

CC_t = the COVID-19 confirmed cases in Malaysia at day t ,

DC_t = the COVID-19 deaths cases in Malaysia at day t ,

RC_t = the COVID-19 recovery cases in Malaysia at day t ,

OP_t = the oil price at day t ,

GP_t = the gold price at day t ,

EXC_t = the exchange rate (MYR/USD) at day t ,

VIX_t = the volatility index at day t ,

$NASDAQ_t$ = the NASDAQ composite index at day t ,

α 's, β 's, γ 's, δ 's, θ 's, ξ 's, ρ 's, π 's, ρ 's and σ 's = the coefficient to be estimated,

z = the lag index ($z = 1, 2, 3, \dots, w$),

w = optimal lag for the series,

ε_t = random error terms.

3.6 Concluding Remarks

This study is expected to determine the influence of coronavirus 2019 outbreak on Malaysian sectoral stock returns. The correlation analysis is conducted to determine the correlation among the COVID-19 variables and selected sectoral stock returns in Malaysia. The OLS technique is employed to determine the impact of the coronavirus outbreak on Malaysian sectoral stock returns. The response of selected stock returns due to the COVID-19 vaccination and lockdown are determined by the OLS technique. The diagnostic test is conducted to make sure that the model fulfils the assumptions of CLRM. The Granger causality test is conducted to identify the short-run causal relationship among the daily confirmed cases, death cases together with recovery cases of COVID-19, and selected sectoral stock returns in Malaysia. The empirical testing procedures that employed in this study are design to achieving the objective of the study.

CHAPTER FOUR

EMPIRICAL FINDINGS AND DISCUSSION

4.1 Introduction

The results of the empirical findings and analysis are presented in this chapter. The method employed in this study included descriptive statistics, correlation analysis, Ordinary Least Square (OLS) estimation, diagnostic test, and Granger Causality test. The result obtained throughout the analysis will discuss in this chapter. This chapter also compare the empirical findings by using previous studies.

4.2 Descriptive Statistic

Table 4.1 below shows the descriptive statistic for the surveyed variables in this study. The average returns of KLCI are 1525.83 points during the study period. The average returns of KLFI, KLHC and KLTC are 14949.26 points, 2502.888 points and 629.53 points. The average cases of COVID-19 confirmed cases, recovery cases and death cases are 4706 cases, 4660 cases and 35 cases on daily basic. During the study period the average oil price are 278.65 points, and the average of gold price are 7631.92 points. The average exchange rate of US dollar and Malaysia Ringgit are 4.25 points. Besides, the average volatility index are 25.05 points while the average NASDAQ composite index are 52321.85 points during the study period.

Table 4.1: Result of Descriptive Statistic

Descriptive Statistic	KLCI	KLFI	KLHC	KLTC	CC	RC	DC	OP	GP	EXC	VIX	NASDAQ
Mean	1525.830	14949.260	2502.879	629.531	4706.142	4660.096	34.505	278.650	7631.915	4.251	25.050	52321.850
Median	1531.315	15205.190	2313.768	624.275	2324.000	2312.500	6.000	288.444	7612.511	4.195	23.305	52752.370
Maximum	1684.580	16926.800	4456.090	747.720	33406.00	33872.00	592.000	539.601	8644.268	4.746	82.690	67152.210
Minimum	1219.720	10885.450	1142.400	483.540	0.000	0.000	0.000	33.949	6380.981	4.004	13.680	29748.430
Std. Dev.	72.711	1441.400	858.339	53.610	6607.860	6553.357	71.706	128.750	389.408	0.159	8.559	8213.411
Skewness	-0.846	-0.667	0.395	0.210	2.168	2.160	3.423	-0.122	-0.504	1.068	2.588	-0.420
Kurtosis	3.787	2.337	1.987	2.091	7.231	7.201	16.343	2.102	3.672	3.732	13.464	2.676
Observations	1068	1068	1068	1068	1068	1068	1068	1068	1068	1068	1068	1068

4.3 Correlation Analysis

Table 4.2 illustrates the result of the correlation analysis between Kuala Lumpur Composite Index (KLCI), finance industry (KLFI), healthcare industry (KLHC), telecommunication industry (KLTC), the COVID-19 variables and the control variables. The COVID-19 confirmed cases and recovery cases show a strong positive correlation. Besides, the KLFI shows strong positive correlated with the oil price mean that when oil price increases the financial sectors perform better. The NASDAQ composite index also show positive correlation relationship with the COVID-19 death cases. On the other hand, the exchange rate illustrates a strong negative correlation relationship with the KLHC and KLCI which mean that when Malaysia Ringgit depreciate, the stock performance of KLCI and health sectors will perform better. The volatility index and NASDAQ composite index show negative correlation relationship which mean the increase of volatility index cause the decline of NASDAQ composite index performance.

In the aspect of sectoral stock market, the KLHC tend to move in the opposite direction of the KLFI and oil price. Moreover, the KLTC positive correlated with the KLCI but negative correlated with the gold price. This might be due to the shifting investor preferences between defensive assets. The pandemic variables all are highly correlated with each other and these variables strongly positive correlated with the NASDAQ composite index. Since KLHC and KLFI is negatively correlated, investor that holding both can reduce the overall portfolio risk mean that when one performs unwell, the other may provide gain or stability which reduce the losses.

Table 4.2: Result of Correlation Analysis

	KLCI	KLFI	KLHC	KLTC	CC	RC	DC	OP	GP	EXC	VIX	NASDAQ
KLCI	1.000	-	-	-	-	-	-	-	-	-	-	-
KLFI	0.104** (0.000)	1.000	-	-	-	-	-	-	-	-	-	-
KLHC	0.466** (0.000)	-0.317** (0.000)	1.000	-	-	-	-	-	-	-	-	-
KLTC	0.469** (0.000)	0.013 (0.513)	0.311** (0.000)	1.000	-	-	-	-	-	-	-	-
CC	0.160** (0.000)	0.293** (0.000)	0.039 (0.059)	0.237** (0.000)	1.000	-	-	-	-	-	-	-
RC	0.170** (0.000)	0.347** (0.000)	0.010 (0.609)	0.250** (0.000)	0.816** (0.000)	1.000	-	-	-	-	-	-
DC	0.166** (0.000)	0.221** (0.000)	0.108** (0.000)	0.324** (0.000)	0.744** (0.000)	0.731** (0.000)	1.000	-	-	-	-	-
OP	-0.056** (0.000)	0.710** (0.000)	-0.370** (0.000)	-0.091** (0.000)	0.414** (0.000)	0.429** (0.000)	0.304** (0.000)	1.000	-	-	-	-
GP	-0.026 (0.204)	0.288** (0.000)	0.029 (0.151)	-0.324** (0.000)	0.065** (0.002)	0.079** (0.000)	-0.022 (0.297)	0.321** (0.000)	1.000	-	-	-
EXC	-0.506** (0.000)	0.211** (0.000)	-0.557** (0.000)	-0.456** (0.000)	-0.031 (0.125)	-0.010 (0.609)	-0.103** (0.000)	0.255** (0.000)	0.236** (0.000)	1.000	-	-
VIX	-0.304** (0.000)	-0.118** (0.000)	-0.198** (0.000)	-0.438** (0.000)	-0.307 (0.000)	-0.304** (0.000)	-0.382** (0.000)	-0.092** (0.000)	0.143** (0.000)	0.261** (0.000)	1.000	-
NASDAQ	0.236** (0.000)	0.288** (0.000)	0.136** (0.000)	0.338** (0.000)	0.647 (0.000)	0.652** (0.000)	0.668** (0.000)	0.356** (0.000)	-0.011 (0.601)	-0.128** (0.000)	-0.481** (0.000)	1.000

Notes:**. Correlation is significant at the 0.01 level (2-tailed).

4.3 Ordinary Least Square (OLS) Estimation and Diagnostic Test

Table 4.3: The Result of OLS Estimation

Model	KLCI	KLFI	KLHC	KLTC
Intercept	2651.6110***	14668.1000***	6734.4350***	1708.0270***
	0.0000	0.0000	0.0004	0.0000
CC	-0.0010	-0.0084	-0.0045	-0.0004
	0.3315	0.5294	0.5405	0.4671
DC	-0.1713***	-2.8596***	1.7321***	0.0106
	0.0020	0.0002	0.0000	0.6895
RC	0.0027***	0.0339***	-0.0352***	0.0014***
	0.0039	0.0068	0.0000	0.0083
OP	0.0278	8.0722***	-2.4883***	-0.1287***
	0.6006	0.0000	0.0000	0.0003
GP	0.0297***	-0.4894***	0.9981***	-0.0367***
	0.0002	0.0000	0.0000	0.0000
EXC	-292.7185***	668.1005**	-2906.8450***	-168.4190***
	0.0000	0.0304	0.0000	0.0000
VIX	-3.2844***	-38.5254***	-3.9020	-2.4424***
	0.0000	0.0000	0.4685	0.0000
NASDAQ	-0.0007	-0.0059	0.0319***	-0.0006
	0.3710	0.5598	0.0022	0.3086
LD	-40.1854***	-340.7013***	-454.4334***	22.3863***
	0.0004	0.0017	0.0025	0.0025
VAC	4.7731	345.0696	-310.0641*	64.8678***
	0.7045	0.1218	0.0640	0.0000
R-Square	0.7429	0.8657	0.7897	0.7804
VIF	6.74	6.74	6.74	6.74

Notes: $p^{***} < 0.01$, $p^{**} < 0.05$, $p^* < 0.10$

The Ordinary Least Square (OLS) estimation is conducted to determine the impact of the COVID-19 outbreak on selected Malaysian stock returns. Table 4.3 above show the result of the OLS estimation after the adjustment of Heteroskedasticity and Autocorrelation Consistent (HAC). Before the adjustment, the residuals of this study fail the heteroskedasticity and autocorrelation test. Hence, this study employs HAC adjustment. The HAC is valid under non-normality in large sample, and HAC standard error shows consistency under heteroskedasticity and autocorrelation without normality assumption (Newey & West, 1987).

The COVID-19 confirmed cases has negative impact to all the dependent variables. However, the COVID-19 confirmed cases showed insignificant negative impact to all selected sectoral stock return and major indices. This result similar to the findings of Chia et al. (2020), where the daily new confirmed COVID-19 confirmed cases had insignificance negative impact on the stock market returns. The study done by Liu (2021) in China also obtained the similar outcomes where the COVID-19 has an insignificant negative impact on the overall Chinese stock market. On the other hand, the results from Topcu & Gulal (2020) for the impact of COVID-19 on emerging stock markets found that the negative impact of the COVID-19 on emerging stock markets during March 2020, but become insignificant when the period extend to April 2020.

The COVID-19 death cases showed significant negative impact in KLCI and finance industry, while the COVID-19 death cases showed significant positive impact in healthcare industry. The research done by Al-Awadhi, Al-Saifi, Al-Awadhi, and Alhammadi (2020) in China found that the stock market returns showed significantly negative relationship with the daily growth in total cases of death due to COVID-19. The reason of significant positive impact in healthcare industry can be explained by the studies done by Chen et al. (2009) in

Taiwan, and Chong et al. (2010) during the outbreak of SARS. Both studies found that the SARS pandemic had positive relationship with the pharmaceutical industry and biotechnology industry which highly related with healthcare industry.

The COVID-19 recovery cases showed significant positive impact in almost all selected sectors except healthcare industry. This result similar to the findings of Ahmed (2020) in Pakistan where the COVID-19 recoveries showed significant relationship with the stock market performance in Pakistan while the COVID-19 confirmed cases had non-significant relationship with the stock market performance in Pakistan. The significant negative impact of the COVID-19 recovery cases in healthcare industry may be due to the recovery from COVID-19 reduce the urgency for healthcare product and service (Buszko et al., 2021).

The lockdown due to COVID-19 illustrates significant negative impact in all selected sectors but it shows significant positive impact in telecommunication industry. The study done by Alam et al. (2021) in Australia found that telecommunications sectors remain a good performance during the COVID-19 outbreak. Other than Australia, research that conduct by Urazbaeva et al. (2020) in Russia found that telecommunications service sector in Russia have positive impact during 2020 pandemic due to the demand of telecommunication services increase.

The vaccination of the COVID-19 cases showed positive impact in telecommunication sectors but showed significant negative impact in healthcare industry. The study done by Rouatbi et al. (2021) can explain the positive impact in stock market, since they found out that the COVID-19 vaccination able to stabilize the global equity markets. On the other hand, the study done by Nguyen (2022) found that the COVID-19 related services companies such

as vaccine production facing reduced of the demand. The increase of vaccination rate causes the demand for vaccine decrease. The decline for demand of vaccine and high vaccination rate affected the production and revenue of the COVID-19 related service which affect the stock performance in healthcare industry.

The result obtained illustrate that the oil price shows significant negative impact in in healthcare and telecommunication industries which similar to the findings of Mohd Fikri Ismail (2016) where the inflation and interest rates in exacerbating the effect of oil price shocks on the stock market. Hence, the increase of oil price, increase the production cost which bring negative impact to not oil related industry. However, the oil price has significant positive impact in financial industry. This finding similar to the results of Degiannakis et al. (2018) where the oil price and stock market had positive relationship in oil exporting countries like Malaysia. The study done by Salisu and Isah (2017) also found that stock price and oil price showed significant positive relationship.

The gold price showed significant negative relationship with stock indices in finance sectors and telecommunication sector during the COVID-19 pandemic. This finding can be strengthened by the study done by Chugan (2008) where gold price and stock market have an inverse. Therefore, more investors will switch from stock market to gold market during pandemic because gold is the most value preservation asset. On the other hand, the gold price has significant positive impact in healthcare industry and KLCI. This might be due to healthcare industries are more stable and essential especially during the COVID-19 pandemic. Thus, the stock indices in healthcare sectors and gold price will show positive relationship.

The result in Table 4.3 illustrated that the exchange rate and volatility index show significant negative impact in almost all sectors. The research done by Nasir et al. (2013) and Nordin et al. (2014) figured out that exchange rate impacted negatively on performance of stock. The increase of exchange rate brings depreciate of local currency which cause negative impact on domestic stock market. In the case of volatility index, Wang et al. (2014) and Easterling (2021) found that the increase of volatility in stock market often related to the decline of the stock markets which mean the volatility index and stock market have negative relationship.

In this study, the selected independent variable able to explain at least 74.29% of the variation in KLCI. The highest variation is in financial sectors, 86.57% of the variation in KLFI is explained, followed by KLHC (78.97%) and KLTC (78.04%). Other than that, the model estimated in this study does not facing multicollinearity problem. The Variance Inflation Factors (VIFs) of 6.74 which lesser than the threshold value of 10 means that the multicollinearity problem is not present in this study.

4.4 Granger Causality Test

Granger causality test is designed to determine the short-run causal relationship between the variables to prevent the misspecification problem and detect the direction of causality between those variables (Granger, 1988). In this study, the long run relationship will become less relevant when policy or behaviour shift rapidly. Hence, this study more focus on short run causal relationship. The Granger causality test is employed for all the estimated model in this study. The null hypothesis for the Granger causality test is the independent variable does not granger cause the dependent variables while the alternative hypothesis is the independent variable granger causes the dependent variable. In this analysis,

the 5% of significance level is selected. Thus, the null hypothesis will be rejected when the F-statistic obtained is greater than the F-statistic at 5% of significance level. The null hypothesis rejected indicates that the independent variable granger causes the dependent variable. The result of the Granger causality test for this study is showed in at table below.

The result in table 4.4 below shows that the impact of COVID-19 factors on the KLCI is limited. The confirmed cases of COVID-19 granger caused KLCI is no significant at 5% level but significant at 10% level. This suggesting that the impact of changes in confirmed cases on KLCI is marginally. Besides, both death cases and recovery cases of COVID-19 do not granger caused the KLCI which indicate there is not causal relationship. From economic perspective, gold price, volatility index and NASDAQ composite index granger caused KLCI significantly. Besides, the KCLI and oil price show bidirectional causal relationship. This suggesting that those variables are a strong predictor of the stock market movements.

From Table 4.5, the confirmed cases of COVID-19 significantly granger caused KLFI at 5% significance level which mean the rising of confirmed cases of COVID-19 able to forecast the movements in financial sectors due to the economic uncertainty related to the impact of the pandemic. The Table 4.5 show that oil price, volatility index and NASDAQ composite index granger cause the KLFI. The result in table 4.5 illustrates that the KLFI and the oil price exhibit a bidirectional granger causality while the KLFI granger caused the exchange rate.

Table 4.6 shows the granger causality test in healthcare industry (KLHC). Thes result illustrate that there is no causal relationship between KLHC and COVID-19 variables. Other than that, the oil price and NASDAQ composite index also exhibit a unidirectional granger causality with KLHC which indicates that the fluctuation of oil price and global stock market

able to forecast the future movement of healthcare indices. On the other hand, the KLHC show bidirectional causal relationship with gold price. This scenario might be due to the COVID-19 pandemic where the demand for health services and gold increase.

The result in Table 4.7 like the result in Table 4.6 where there is no causal relationship exhibit between KLTC and COVID-19 variables. On economic perspective, the oil price, gold price, NASDAQ composite index and volatility index show significant causal relationship with the KLTC. This suggests that the movement of global stock markets as well as the price of oil and gold influence the movement of telecommunication indices in Malaysia.

From the result in Table 4.4 to Table 4.7, the confirmed cases of COVID-19 granger caused the death cases of COVID-19 and recovery cases of COVID-19 significantly. This indicates that the increase of confirmed cases leads to the subsequent increase of death and recoveries cases of COVID-19. Conversely, the death cases and recovery cases does not granger cause the confirmed cases means that the death cases and recovery cases unable to predict the future confirmed cases. There is a significant bidirectional relationship between the death cases of COVID-19 and recovery cases of COVID-19 where the changes in recoveries and deaths affect each other over time. Furthermore, Table 4.4 to Table 4.7 indicates that the exchange rate and volatility index exhibit a bidirectional causal relationship. Besides, the gold price granger caused the exchange rate which suggests that the movements in gold price are strong predictor for the movements of exchange rate.

Table 4.4: The Result of Granger Causality Test (KLCI)

	KLCI	CC	RC	DC	OP	GP	EXC	VIX	NASDAQ
	F-statistic (<i>p</i> -value)								
KLCI		0.8429 (0.4308)	0.1138 (0.8925)	0.1515 (0.8594)	4.0763** (0.0172)	1.4961 (0.2245)	4.7638*** (0.0087)	0.0058 (0.9943)	0.0335 (0.9670)
CC	2.7744* (0.0628)		86.0608*** (0.0000)	7.3213*** (0.0007)	1.4278 (0.2403)	0.6025 (0.5471)	0.1382 (0.8709)	1.5149 (0.2203)	0.8916 (0.4103)
RC	1.5023 (0.2231)	0.0416 (0.9593)		5.0297*** (0.0067)	1.6018 (0.2020)	0.4141 (0.6610)	0.0159 (0.9842)	1.2123 (0.2979)	0.9386 (0.3915)
DC	0.3441 (0.7089)	0.9357 (0.3926)	11.9168*** (0.0000)		0.3125 (0.7317)	0.5256 (0.5914)	1.3562 (0.2581)	0.6511 (0.5217)	0.7441 (0.4754)
OP	8.6422*** (0.0002)	1.3316 (0.2645)	0.4002 (0.6703)	0.0472 (0.9539)		2.0397 (0.1306)	4.1867** (0.0154)	0.3761 (0.6867)	0.8064 (0.4468)
GP	6.4267*** (0.0017)	0.2432 (0.7841)	1.2262 (0.2938)	0.1745 (0.8399)	0.5325 (0.5873)		39.1247*** (0.0000)	0.4601 (0.6313)	0.7474 (0.4738)
EXC	0.3117 (0.7322)	0.5982 (0.5500)	0.3792 (0.6845)	0.4764 (0.6212)	0.9055 (0.4047)	1.8033 (0.1653)		3.2888** (0.0377)	1.5792 (0.2066)
VIX	45.6532*** (0.0000)	0.2444 (0.7833)	0.9371 (0.3921)	1.1107 (0.3297)	1.6773 (0.1874)	0.9633 (0.3820)	21.5016*** (0.0000)		1.3067 (0.2711)
NASDAQ	55.0622*** (0.0000)	1.4577 (0.2332)	3.1625** (0.0427)	2.0109 (0.1344)	3.2454** (0.0393)	0.4304 (0.6503)	45.8875*** (0.0000)	1.9150 (0.1478)	

Notes: $p^{***} < 0.01$, $p^{**} < 0.05$, $p^* < 0.10$

Table 4.5 The Result of Granger Causality Test (KLFI)

	KLFI	CC	RC	DC	OP	GP	EXC	VIX	NASDAQ
	F-statistic (<i>p</i> -value)								
KLFI		0.1824 (0.8333)	0.1139 (0.8924)	0.1288 (0.8792)	4.0613** (0.0175)	0.6281 (0.5338)	4.9236*** (0.0074)	0.00657 (0.9935)	1.0922 (0.3358)
CC	3.0877** (0.0460)		86.0608*** (0.0000)	7.3213*** (0.0007)	1.4278 (0.2403)	0.6025 (0.5471)	0.1382 (0.8709)	1.5149 (0.2203)	0.8916 (0.4103)
RC	1.0536 (0.3491)	0.0416 (0.9593)		5.0297*** (0.0067)	1.6018 (0.2020)	0.4141 (0.6610)	0.0159 (0.9842)	1.2123 (0.2979)	0.9386 (0.3915)
DC	0.2844 (0.7525)	0.9357 (0.3926)	11.9168*** (0.0000)		0.3125 (0.7317)	0.5256 (0.5914)	1.3562 (0.2581)	0.6511 (0.5217)	0.7441 (0.4754)
OP	6.3667*** (0.0018)	1.3316 (0.2645)	0.4002 (0.6703)	0.0472 (0.9539)		2.0397 (0.1306)	4.1867** (0.0154)	0.3761 (0.6867)	0.8064 (0.4468)
GP	1.2985 (0.2734)	0.2432 (0.7841)	1.2262 (0.2938)	0.1745 (0.8399)	0.5325 (0.5873)		39.1247*** (0.0000)	0.4601 (0.6313)	0.7474 (0.4738)
EXC	0.1009 (0.8959)	0.5982 (0.5500)	0.3792 (0.6845)	0.4764 (0.6212)	0.9055 (0.4047)	1.8033 (0.1653)		3.2888** (0.0377)	1.5792 (0.2066)
VIX	31.4778*** (0.0000)	0.2444 (0.7833)	0.9371 (0.3921)	1.1107 (0.3297)	1.6773 (0.1874)	0.9633 (0.3820)	21.5016*** (0.0000)		1.3067 (0.2711)
NASDAQ	28.5625*** (0.0000)	1.4577 (0.2332)	3.1625** (0.0427)	2.0109 (0.1344)	3.2454** (0.0393)	0.4304 (0.6503)	45.8875*** (0.0000)	1.9150 (0.1478)	

Notes: $p^{***} < 0.01$, $p^{**} < 0.05$, $p^* < 0.10$

Table 4.6 The Result of Granger Causality Test (KLHC)

	KLHC	CC	RC	DC	OP	GP	EXC	VIX	NASDAQ
	F-statistic (<i>p</i> -value)								
KLHC		0.1928 (0.8247)	0.1397 (0.8696)	0.5607 (0.5710)	2.3126* (0.0995)	4.5738** (0.0105)	9.9312*** (0.0000)	0.9176 (0.3998)	1.1924 (0.3039)
CC	1.1581 (0.3145)		86.0608*** (0.0000)	7.3213*** (0.0007)	1.4278 (0.2403)	0.6025 (0.5471)	0.1382 (0.8709)	1.5149 (0.2203)	0.8916 (0.4103)
RC	1.2303 (0.2926)	0.0416 (0.9593)		5.0297*** (0.0067)	1.6018 (0.2020)	0.4141 (0.6610)	0.0159 (0.9842)	1.2123 (0.2979)	0.9386 (0.3915)
DC	1.1355 (0.3216)	0.9357 (0.3926)	11.9168*** (0.0000)		0.3125 (0.7317)	0.5256 (0.5914)	1.3562 (0.2581)	0.6511 (0.5217)	0.7441 (0.4754)
OP	7.4996*** (0.0060)	1.3316 (0.2645)	0.4002 (0.6703)	0.0472 (0.9539)		2.0397 (0.1306)	4.1867** (0.0154)	0.3761 (0.6867)	0.8064 (0.4468)
GP	4.2876** (0.0140)	0.2432 (0.7841)	1.2262 (0.2938)	0.1745 (0.8399)	0.5325 (0.5873)		39.1247*** (0.0000)	0.4601 (0.6313)	0.7474 (0.4738)
EXC	1.2203 (0.2956)	0.5982 (0.5500)	0.3792 (0.6845)	0.4764 (0.6212)	0.9055 (0.4047)	1.8033 (0.1653)		3.2888** (0.0377)	1.5792 (0.2066)
VIX	1.1356 (0.3216)	0.2444 (0.7833)	0.9371 (0.3921)	1.1107 (0.3297)	1.6773 (0.1874)	0.9633 (0.3820)	21.5016*** (0.0000)		1.3067 (0.2711)
NASDAQ	5.9377*** (0.0027)	1.4577 (0.2332)	3.1625** (0.0427)	2.0109 (0.1344)	3.2454** (0.0393)	0.4304 (0.6503)	45.8875*** (0.0000)	1.9150 (0.1478)	

Notes: $p^{***} < 0.01$, $p^{**} < 0.05$, $p^* < 0.10$

Table 4.7 The Result of Granger Causality Test (KLTC)

	KLTC	CC	RC	DC	OP	GP	EXC	VIX	NASDAQ
	F-statistic (<i>p</i> -value)								
KLTC		0.5405 (0.5826)	0.2995 (0.7413)	1.9251 (0.1464)	0.9251 (0.1464)	2.0258 (0.1324)	2.5093* (0.0818)	0.2542 (0.7756)	0.6214 (0.5374)
CC	1.4617 (0.2323)		86.0608*** (0.0000)	7.3213*** (0.0007)	1.4278 (0.2403)	0.6025 (0.5471)	0.1382 (0.8709)	1.5149 (0.2203)	0.8916 (0.4103)
RC	0.8487 (0.4282)	0.0416 (0.9593)		5.0297*** (0.0067)	1.6018 (0.2020)	0.4141 (0.6610)	0.0159 (0.9842)	1.2123 (0.2979)	0.9386 (0.3915)
DC	0.0248 (0.9755)	0.9357 (0.3926)	11.9168*** (0.0000)		0.3125 (0.7317)	0.5256 (0.5914)	1.3562 (0.2581)	0.6511 (0.5217)	0.7441 (0.4754)
OP	7.0992*** (0.0009)	1.3316 (0.2645)	0.4002 (0.6703)	0.0472 (0.9539)		2.0397 (0.1306)	4.1867** (0.0154)	0.3761 (0.6867)	0.8064 (0.4468)
GP	7.6362*** (0.0005)	0.2432 (0.7841)	1.2262 (0.2938)	0.1745 (0.8399)	0.5325 (0.5873)		39.1247*** (0.0000)	0.4601 (0.6313)	0.7474 (0.4738)
EXC	0.6103 (0.5434)	0.5982 (0.5500)	0.3792 (0.6845)	0.4764 (0.6212)	0.9055 (0.4047)	1.8033 (0.1653)		3.2888** (0.0377)	1.5792 (0.2066)
VIX	31.4031*** (0.0000)	0.2444 (0.7833)	0.9371 (0.3921)	1.1107 (0.3297)	1.6773 (0.1874)	0.9633 (0.3820)	21.5016*** (0.0000)		1.3067 (0.2711)
NASDAQ	41.9623*** (0.0000)	1.4577 (0.2332)	3.1625** (0.0427)	2.0109 (0.1344)	3.2454** (0.0393)	0.4304 (0.6503)	45.8875*** (0.0000)	1.9150 (0.1478)	

Notes: $p^{***} < 0.01$, $p^{**} < 0.05$, $p^* < 0.10$

4.5 Concluding Remarks

This chapter employed Ordinary Least Squared (OLS) estimation to determine the impact of the coronavirus outbreak on selected sectoral stock returns. The descriptive statistic shows the pattern and the characteristic of the surveyed data. The correlation analysis employs to determine the correlation relationship between those surveyed variables. The result obtained showed that the COVID-19 variables impacted significantly in almost all selected sectoral stock indices. The VIF test for multicollinearity problem indicated that there is no multicollinearity problem in all estimated models. Lastly, the Granger causality test is conducted to determine the causality between those surveyed variables.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study of the impact of COVID-19 pandemic on selected sectoral stock returns in Malaysia will be concluded in this chapter. This chapter will summarize the empirical findings and discussion in this study. Other than that, this chapter will suggest some policy implications and recommendation for policymakers. Besides, the limitations of this study will be enlightened and the direction for future study will be suggested in this chapter. Lastly, this chapter will be concluded by concluding remarks.

5.2 Summary of Empirical Findings and Discussion

The purpose of this study is to determine the impact of the COVID-19 pandemic on selected sectoral stock returns in Malaysia from 28 January 2020 until 30 December 2022. The dependent variables for this study included the major indices and selected sectoral stock indices in Malaysia such as Kuala Lumpur Composite Index (KLCI) as major indices and healthcare sector index (KLHC), financial sector index (KLFI) as well as telecommunication sector index (KLTC) as selected sectoral stock indices. The independent variable in this study can be divided into two categories which is COVID-19 variables and control variables. The COVID-19 variables included the COVID-19 confirmed cases, recovery cases death cases, COVID-19 vaccination and lockdown due to COVID-19 while the control variables that selected in this study are gold price, oil price, exchange rate, volatility index, as well as NASDAQ composite index.

From the result of correlation analysis, the correlation between the pandemic variables is all highly correlated between each other but the correlation with the selected stock indices is moderate. The exchange rate shows negative correlation with the KLCI and the healthcare industry which mean the exchange rate can become a warning signal for potential downturn in overall stock market and healthcare industry. Besides, the positive correlation of oil price and KLFI indicates that the increase in oil price will benefit the financial sectors. Hence, the monitoring of oil price trend can help to analyse the timing for investing in financial market.

The OLS estimation examined the interaction between one or more independent variables and a dependent variable. This study found that the confirmed cases of COVID-19 had a negative impact in all the estimated model, but the impact was insignificant which support by the studies of Chia et al. (2020) and Liu (2021). On the other hand, the death cases of COVID-19 had a significant negative impact on KLCI and KLFI but showing significant positive impact in KLHC which consistent with the findings on SARS outbreak by Chen et al. (2009) and Chong et al. (2010). Unlike the COVID-19 death cases, the COVID-19 recovery cases showed significant positive impact on almost all sectors except for healthcare sectors. The study done by Buszko et al. (2021) able to explain it where the increase of recovery cases reduced the demand for healthcare service.

In this study, the lockdown due to COVID-19 pandemic showed significant negative impact on most sectors, expect for telecommunication indicated positive impact. This can be explained by the increase of demand for telecommunication service due to lockdown policy which support by the studies done by Alem et al. (2021) and Urazbaeva et al. (2020). The vaccination of COVID-19 showed similar result with the COVID-19 cases where the vaccination of COVID-19 had positive impact in most sectors but illustrated a negative

impact in healthcare sectors which can be explained by the reduce demand for COVID-19 related service (Nguyen, 2022).

For the control variables, the oil price positively impacted in financial sector, but it showed negatively influenced in healthcare and telecommunication sectors. These findings consistent with the previous studies done by Degiannakis et al. (2018) as well as Salisu and Isah (2017). The gold price showed positive impact in financial, telecommunication and healthcare sectors. While the exchange rate, volatility index, and NASDAQ composite index illustrated negative influence in almost all selected sectors which support by the previous research done by Nasir et al. (2013), Wang et al. (2014) and Easterling (2021). From the result obtained, this Efficient Market Hypothesis (EMH) valid in this study. Since the implementation of lockdown policy and the COVID-19 related cases show significant impact on the selected sectoral stock returns.

The last empirical test that conducted in this study is Pairwise Granger Causality test. The granger causality test result revealed that the impact of COVID-19 confirmed cases on KLCI is marginally while death cases and recovery cases showed no causal relationship. Almost all the control variables granger caused the KLCI because these control variables are widely recognized as global indicators that affected investor sentiment and the market performance. Besides, the KLCI and oil price indicate a bidirectional causal relationship. This indicates that oil price, gold price, volatility index, and the NASDAQ composite index, are strong predictors for movement of KLCI. In financial sectors, the COVID-19 confirmed cases granger cause KLCI significantly. However, KLHC and KLTC didn't have causal relationship with COVID-19 confirmed cases, death cases and recovery cases.

The granger causality test showed that the COVID-19 confirmed cases forecast both death and recovery cases significantly mean that increase of confirmed cases lead to increase of death and recovery cases. This study found that death cases and recovery cases exhibit bidirectional relationship. Besides, the bidirectional relationship is presented in exchange rate and volatility index. Lastly, the price of gold plays a key role in predicting the fluctuations of the currency. This Granger causality test help to investigate the short-run causal relationship among the daily confirmed cases, death cases together with recovery cases of COVID-19, and selected sectoral stock returns in Malaysia which is one of the objectives of this study

5.3 Policy Implications and Recommendations

From the findings of this study, there are few policy implications and recommendations that could be applied to Malaysia when faced with a similar crisis. The government can develop an early warning system where government can built a real-time data analytic system using big data and Artificial Intelligence (AI) to detect abnormal cases in financial or health sectors. This system can help to prevent the crisis become more serious.

Besides, government can design a pre-agreed policy response framework between fiscal and monetary authorities which able to help the targeted sectors during the crisis. Other than that, government should conduct a post crisis evaluation to identify the weakness and further strengthen it in facing future crisis. Implementation of crisis simulator involving government and private sectors also can help government and investors to design a more suitable policy or frameworks to overcome future crisis.

Besides, the government can introduce a short-term tax exemption for the sectors that severely impact due to the pandemic. This policy able to help them to recover faster during and after the pandemic. The reduce of tax burden help the companies in severely impact sectors to retain more liquidity to allocate funds on covering essential operational expenses. This policy also can help companies to reinvest in their operations and increase the recovery process when the economy rebound. The government also adjust the monetary policies likes to lower the interest rate and increased the market liquidity for specific industries during the pandemic. This policy able to encourage the investment and consumer spending. The reducing of borrowing cost, companies are more likely to invest in long-term project. The lower interest rate also reduces the consumer loan which able to increase the consumer spending. The consumer spending help to stimulate the demand for goods and services.

5.4 Limitation of The Study

In this study, there are a few limitations that can be improved for the future studies. The first limitation is that this study only selected few sectoral indices in Malaysia. Another sector might also severely impact due to the pandemic. This may cause the study to overlook the cross-sectoral interactions between those sectors. The reason of this is because including all sectors would significantly increase the complexity of the analysis which may dilute the depth of insight for each sector.

Another limitation of this study is the period of the study. This study only studies the impact of COVID-19 pandemic on stock market during the pandemic period. The pre and post COVID-19 pandemic is also vital when conducting an impact study. This study employed the COVID-19 confirmed cases, recovery cases, death cases, COVID-19 vaccination and the lockdown policy as the COVID-19 variables in this study. However, the

COVID-19 related variables are not available in end of 2019 and 2020 which limit the feasibility of including the pre-COVID period in this study.

5.5 Suggestion for the Future Study

This study only studied the impact of COVID-19 pandemic on selected sectoral stock return in Malaysia. In future study, researcher can conduct the impact of COVID-19 in all sectoral indices in Malaysia. This able to offer a more holistic view of the impact of COVID-19 in stock markets and allow for more accurate predictions. This also provide a clear picture of the economy responded and covered from the pandemic. Therefore, policymakers and government can use the latest information to come out with new policies to minimize the negative impact on the stock performance.

Besides, future study can study on the pre and post COVID-19 pandemic on stock performance. This will provide a more complete timeline, which can help to understand the market condition before the pandemic, the immediate impact during the pandemic and the long-term recovery patterns. The future studies should more focus on the long-term recovery in order to fully understand the impact of COVID-19. This help to understand the sectors adapted or transformed during and after the pandemic.

5.6 Concluding Remarks

This study on the impact of COVID-19 pandemic on sectoral stock returns in Malaysia has been fully accomplished, and the objective of the study is archived. This chapter provide some policy implications and recommendation are provided to reduce the negative impact that caused by the coronavirus pandemic. The limitations of the study and direction for future study can be the guidance for future researchers.

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