HOW COVID-19 PANDEMIC AFFECTED MALAYSIAN STOCK MARKET

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 15681 words.

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LIST OF ABBREVIATIONS

CASES	Number of COVID-19 Confirmed Cases
VIX	Chicago Board of Options Exchange Volatility Index
GS	Government Stringency Index
KLCI	Kuala Lumpur Composite Index

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PREFACE

This research project was submitted as a partial fulfilment of the requirements for Bachelor of Finance (Honours) undergraduate graduates from Universiti Tunku Abdul Rahman (UTAR). This research is entitled "How COVID-19 pandemic affected the Malaysian stock market" and is supervised by Mr. Ng Cheong Fatt. The idea for this theme came from the hot issue of COVID-19 pandemic, which has been raging since the beginning of 2020. In fact, there is no denying that the outbreak has triggered an unprecedented global crisis. The powerful infectivity of the virus caused a rapid rise in the number of COVID-19 confirmed cases, combined with blockade policies implemented by governments led to the failure of economic activities and sectors to operate normally, which eventually led to a severe global economic recession. For investors, these negative economic consequences also had a ripple effect on the stock market, triggering a global national panic that led to a sharp rise in stock market instability and a sharp fall in stock prices. This is why the authors wanted to conduct research on this topic, as the aftereffects of the coronavirus are still being felt and related topics and news are still emerging. This research project focuses on investor's perceptions of stock market returns, with independent variables selected including the number of COVID-19 confirmed cases, the Chicago Board of Options Exchange Volatility Index and the government stringency index. This research project is completed solely by the authors based on the research and resources of others cited in the references. Therefore, this study would like to provide the public a better understanding of the epidemic and the current situation of the stock market and can be taken into account by investors when making decisions in the current market.

ABSTRACT

Since the outbreak of the COVID-19 pandemic, the impact of the epidemic on global stock markets has been a hot topic for researchers to explore. Although a large number of studies have discussed this topic by using various empirical techniques, there are few studies specifically investigating the impact of the epidemic on the Malaysian stock market return. Therefore, the aim of this study is to investigate how the COVID-19 pandemic affect the Malaysian stock market by using the linear autoregressive distributed lags (ARDL) technique. This paper analyses the dependent variable, whether there is a relationship between Malaysian stock market price and independent variables, including the number of COVID-19 confirmed cases in Malaysia, Chicago Board of Options Exchange Volatility Index and Malaysian government stringency index. Furthermore, since most of the confirmed cases occurred after the election in Sabah, this study intends to use weekly data instead of daily non-stop data in order to compare the results in different periods and solve the problem of data imbalance. The first phase is from February 2, 2020, to September 27, 2020, and the second phase is from October 4, 2020 to May 30, 2021, with a total of 70 weekly observations. In addition, six diagnostic tests will be used to evaluate the adequacy of the model's dynamic specification, namely serial autocorrelation test, normality test, heteroscedasticity test, Ramsey's RESET test, CUSUM test and CUSUMSQ tests. The results confirm that the presence of co-integration relationship among all underlying variables. Nevertheless, there are still some limitations and suggestions in this study, which will be further discussed in the following chapters.

CHAPTER 1: RESEARCH OVERVIEW

1.1 Research Background

Coronavirus 2019 (COVID-19), a highly infectious and dangerous disease caused by novel coronavirus, which was first detected in a respiratory disease outbreak in Wuhan City, Hubei Province, China. The outbreak was officially declared a global pandemic by the World Health Organization on 11 March 2020. The first COVID-19 case In Malaysia was detected on January 25, 2020 (Elengoe, 2020). However, due to the virus spread across states and local clusters of cases emerged, the number of confirmed cases increased dramatically in less than 2 months. The Sabah state elections held in September 2020 were responsible for the resurgence of COVID-19 infection, as people gathered despite Movement Control Order and returned home without quarantine measures (Hermesauto, 2020). Therefore, it is responsible for governments to strike a delicate balance between the mutually exclusive and competing objectives of protecting their citizens' health and promoting economic activity, which can have an unpredictable impact on stock market conditions. This situation has led the Malaysian government to implement different levels of Movement Control Order to effectively contain the current outbreak.

According to Dashveenjit (2020), the FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBM KLCI) fall 18% in the first quarter of 2020, heading for the biggest decline in a decade with March seeing the index fall 12%. The reason behind was that Malaysia's economy almost completely shut down between March and June 2020 due to the restriction of MCO regulations. As of May 1, 2020, 67.8% of 4,094 Malaysian companies had no sales during the MCO period. Malaysia's overall GDP contracted by 5.6% in 2020, as the second wave of the coronavirus caused by the Sabah election at the end of the year propelled the economy to its worst annual performance since the Asian financial crisis in 1998 (Anand, 2021). It also reflects

the significant impact of government interventions on the Malaysian economy, including the extended lockdown policy, strict social distancing measures and extensive travel restrictions. The effectiveness of these actions has created additional uncertainty, not only tightening domestic stock market conditions, but also a downward trend in private investment due to reduced household income and spending (Flanders, n.d.). However, some findings found that the number of new central depositary system (CDS) accounts opened between January and July 2020 jumped 125%, from about 97,000 a year earlier to about 218,000, as interest in equities became apparent among retail investors (The Edge Markets, 2020).

Besides that, negative news has the potential to derail the market's upward trajectory. According to Zhang (2020), the study showed a significantly increase trend in stock market volatility in February 2020 in the 10 countries with the highest number of COVID-19 confirmed cases: the United States., Italy, China, Spain Germany, France, United Kingdom, Switzerland, South Korea and the Netherlands. In Malaysia, four-digit cases have been recorded every day since the end of November 2020, which led the government to declare a state of emergency in January 2021, causing panic selling among investors. The participation in Bursa Malaysia by retail investors was also reported to be lower than expected (Shankar, 2021). However, there was also evidence that while government intervention could tip the economy into recession, aggressive policy measures could also help provide strong upward momentum for stocks once the economy responds, with lockdowns and social distancing being the classic examples.

According to Shazni (2020), the FBM KLCI has shown an upward trend since the introduction of the MCO. In an effort to shore up investor confidence and increase economic liquidity, the Bank Negara Malaysia cut interest rates twice by 25 basis points, taking its benchmark lending rate to 1.75% in March while the overnight policy rate (OPR) fell to its lowest level since 2010. According to Ee-Lin (2021), the FBM KLCI index has recorded the fastest V-shaped recovery in 2020 despite its poor performance earlier of the year. More than half of the listed companies have

turned a profit and about 120 have seen their share prices more than double since the end of 2019. As of Dec 15, 2020, the market capitalization (cap) of listed companies increased by RM121.08 billion compared to 2019, according to Bloomberg data. This showed that it will take time for the government and monetary authorities to fully recover from the stagnation of the real economy. In other words, the effectiveness of government interventions in economic activity, such as lockdown policies, workplace closures and social distancing measures may initially reduce stock prices, but its long-term impact remains to be seen.

To sum up, more studies have proved that the rapid spread of the epidemic has brought a big shock on global stock markets. The short-term economic impact was restricted economic activity due to strict quarantine policies, resulting in business bottlenecks for most small and medium-sized enterprises (SMEs), while the long-term economic impact was massive unemployment and business closures (Zhang, 2020). These adverse economic outcomes have the ability to influence an investor's psychological quality and investment decisions, which in turn may affect the performance and trends of the stock market. As more COVID-19 cases weigh on market sentiment, coupled with the impact of stringent government measures, these effects could eventually lead to unprecedented level of risk and volatility in Malaysian stock market condition, enabling investors to take these into account to make appropriate decisions.

1.2 Problem statement

In fact, it is undeniable that the dynamics and performance of global stock markets, including Malaysia, has been affected to some extent during the pandemic, either positively or negatively. Therefore, in this topic study, there are three independent variables that considered to have an impact on Malaysian stock market, including the number of COVID-19 confirmed cases, the Chicago Board of Options Exchange Volatility Index and the government stringency index. To sum up the key reasons

for the importance of these three independent variables in this study, the number of diagnosed cases was definitely the focus of public attention during the COVID-19 outbreak. With the increase or decrease of the number, the government also adopted measures of different severity to deal with and contain the rapid spread of the epidemic. In the end, these consequences increased unpredictable volatility in stock market performance, and panic gradually spread among investors. The main problem statement of this research is that although these variables seem to be negatively correlated with the stock market at first glance, the impact and significance of these variables over time remains to be observed.

1.2.1 Number of COVID-19 Confirmed Cases in Malaysia

The major concern of this research is on how the COVID-19 epidemic affects the stock market in Malaysia. In order to find the impact of COVID-19 on stock market, we have observed three independent variables during the COVID-19 pandemic. First of all, the problem statement we concern is the number of COVID-19 confirmed cases in Malaysia. As we mention in background of study, the first positive COVID-19 case is reported on 25, January 2020 in Malaysia. Initially, Malaysian government and citizens did not realize that how dangerous COVID-19 epidemic is. It can show by the Malaysia did not banned the traveler from China even there was a positive COVID-19 case reported on 25, January 2021. However, Shah et al. (2020) had found that Malaysian citizen started panic and government started take action to protect the health of citizen because of the number of COVID-19 positive cases keep increasing in Malaysia. Furthermore, Shah et al. (2020) had stated that the government of Malaysia was implement Movement Control Order (MCO) to encounter the spread of COVID-19 in Malaysia. No doubt, it makes a huge loss on the economy of Malaysia since there are many companies from different sector cannot operate as normal.

Since the Malaysian government worried about the economy of Malaysia cannot afford the losses, so the government have loosened the policy. In consequences, the COVID-19 positive cases keep increasing after the action taken by government, it forces government to lock down again and implemented MCO 2.0. Currently, the government of Malaysia has implemented MCO 3.0 since the outbreak of COVID-19 is exposure again. It can show by there was a total 678,764 COVID-19 positive cases which reported by Ministry of Health Malaysia on 17, June 2021. According to Abdullah (2020), there was a total of 2766 COVID-19 positive cases had been reported by Ministry of Health Malaysia at March 31, 2020. As a comparison, the total cases nowadays are larger and more terrible. In short, the number of new COVID-19 positive cases will directly affect the actions taken by government while might indirectly affected the stock market through influence the revenue from each industry.

1.2.2 Chicago Board of Options Exchange Volatility Index (VIX)

First of all, we chose this index as our variable because the U.S. market is one of the largest stock markets in the world, so the index is considered to have the ability to influence stock markets around the world, including Malaysia. Secondly, as an indicator in the trading and finance sector, the index provides a quantitative measure of market risk and investor sentiment, which can help investors to use the index to measure the level of risk, fear or stress in the market when making investment decisions. It is worth noting that the Malaysian VIX is not used in this study, as the index only provides annual data, which cannot meet the requirements of weekly data that we need to use for data analysis. In fact, although the CBOE VIX is derived from the price of S&P 500 (SPX) index options, there is sufficient evidence from previous studies that this indicator can be adopted to investigate and validate the impact of the COVID-19 pandemic on the Malaysian stock market. According to Lee. et. al (2021), as Malaysia is an oil exporter, it is

important for investors to consider external factors during the COVID-19 pandemic, and the CBOE VIX is one example. Their research proves that the Malaysian stock market is significantly influenced by the VIX. Specifically, the index has a significant negative correlation with all sector indices and KLCI except for the Real Estate Investment Fund (REIT) sector, indicating that higher financial market volatility has negatively impacted Malaysian stock market performance.

Therefore, the problem statement is how the CBOE VIX affects Malaysia's stock index (KLCI) during the COVID-19 pandemic. As of mid-June 2020, the novel coronavirus has infected approximately 8.5 million people worldwide, resulting in more than 450,000 deaths. Most of the governments in different country has implemented a variety of lockdown-type tools during the pandemic to prevent the spread of COVID-19 (Just, 2020). As a result, this will affect the investor's emotion to do the decision-making. Besides, when the government keeps repeated announcements of new cases and deaths to the public and announces the rapid contamination and high death rates, this created a significant amount of uncertainty in the market. Hence, this will create panic in financial markets because there is a shock in supply and demand and at the end, it increased the severity of stock market volatility (Uddin et al., 2021). In short, the number of cases of COVID-19 is increasing, it will increase the public fear and the uncertainty in the market. Therefore, when the market is in uncertainty, our group think that the volatility index will be increased and affect KLCI negatively. Based on the previous research done by the researcher, they found that there is a negative relationship between VIX and the global stock market. It's because more volatility correlates, the larger possibility of a stock market downturn, whereas lower volatility correlates, a higher probability of a stock market rise (Easterling, 2021). The study's gaps include how the COVID-19 case influences volatility and how volatility indirectly affects the stock market.

1.2.3 Government Stringency Index

The third problem statement is how the government stringency index affects Malaysia's stock index (KLCI) during the COVID-19 pandemic. According to Ritchie et al. (2020), government stringency index is used to records the strictness of government policy based on nine metrics which includes school and workplace closures, public event cancellations, public gathering limitations, public transportation closures, stay-at-home mandates, public information campaigns, internal mobility restrictions and foreign travel controls during COVID-19. Due to the outbreak of COVID-19, all of the government from different countries had implement the different level of social distancing measure on their country to prevent the spread of COVID-19. Although it can help to protect human health and reduce mortality rate, it also hurt most of the industry and bring a negative effect on economy. Then, stock market became volatile due to the uncertainty factor. According to Anh & Gan (2020), the research show that there is a positive relationship between lockdown and stock market return in Vietnam. It is because investors are confidence with Vietnam's government action and believe that the government can perform well in preventing virus outbreak. In the case of Malaysia, one of the factors supporting investor confidence is the government's efforts to reach out to existing investors to understand the needs of the industry during the implementation of MCO. As a result, investor sentiment towards Malaysia remains strong despite the pandemic (MIDA, 2021).

Furthermore, another study had shown that there is a direct negative relationship between government social distancing measure and stock market return because the measure has a negative influence on economy, however, there are also an indirect positive relationship between government social distancing measure and stock market return because the measure can help to reduce the cases of COVID-19 (Ashraf, 2020). In short, the index is updated with a frequency of each day and is based on a

composite measure of nine response indicators in a country's response to the COVID-19 pandemic. It is recorded on a scale that reflects the extent of government action, adjusted from 0 to 100, where 100 is the most stringent response. Even in the case of weekly basis, the indicator has the ability to reflect the actual situation in the sampling period, as the data can help investors understand the government's response in a consistent way and aid the effort to combat the pandemic. It's important to note that the index only records how strict government policies are. It does not measure or imply whether a country's response is appropriate or effective. A high score does not necessarily mean a country is "better" than a country with a lower index. Therefore, the result of our study can be positive or negative. The gap in this study is how the COVID-19 pandemic affect the level of government stringency and the level of government stringency affect the growth of COVID-19 confirm cases then affect the stock market.

1.3 Research Objectives

Our general objective of proposed this study is trying to identify the factors that might influenced Malaysian stock market during the COVID-19 pandemic. Next, the specific objective is trying to determine the relationship between the three independent variables proposed in this study and the condition of the stock market in Malaysia (Kuala Lumpur Composite Index) during the outbreak of the COVID-19 pandemic, whether their relationship is positive, negative or no relationship.

1.3.1 To examine the relationship between the condition of Malaysian stock market and the number of COVID-19 confirmed cases in Malaysia

First of all, the reason this study intends to investigate is that the large number of COVID-19 diagnosed cases in Malaysia indicates that the epidemic is spreading rapidly in the country. Furthermore, COVID-19 as one of the dangerous and new epidemics will affect the people afraid of it since it is the new uncertainty the people never face before. In logically, the businessman who also the investors will keep more funds and cash to support their own business. It means that the investors might less concern and invest in stock market and at the end there are less liquidity in the stock market Malaysia.

1.3.2 To investigate the relationship between the condition of Malaysian stock market and the Chicago Board Options Exchange Volatility Index

Next, this study intends to investigate this variable because the Chicago Board Option Exchange Volatility represents the volatility and fear of investors when investing in the US market. As we know, United Stated America as a strong country which have strong influencing power toward many countries in the worldwide. There are several index of USA might affect other countries' economy which included S&P 500, Gross Domestic Product and exchange rate of US dollar. According to Arora & Vamvakidis (2001), the economy growth of America has significant impact on the countries in the worldwide.

1.3.3 To identify the relationship between the condition of Malaysian stock market and the Malaysian government stringency index

Thirdly, government as a policy maker of a country, it was playing an important key role in the economy. The stock market and bond market are quickly response to the government's actions. For example, the government adjusted the interest rate by using the monetary policy and the bond price will be affected by the interest rate. In this case, the government Malaysia have implemented the social distancing policy, and travel restriction in order to prevent and control the spread of COVID-19. Thus, we would like to identity the relationship whether is positive or negative.

1.4 Research Questions

1. Will the number of COVID-19 confirmed cases in Malaysia affect the condition of stock market in Malaysia?

2. Will the condition of Malaysian stock market affected by the changes of Chicago Board Options Exchange Volatility Index?

3. Will the Malaysian government stringency level toward COVID-19 influence the condition of stock market Malaysia?

1.5 Significance of Study

In general, we conduct the research to help us identified and provided the investigation of factors that may affected the stock market Malaysia during the COVID-19 pandemic. We believe that it can be useful for academic and researchers to develop further research topics. As we mention in the background of study, we found that there was some evidence and studies had proved that the pandemic is caused by the occurrence of COVID-19 in Malaysia, and it have hit heavily on the

Malaysian economy. During the COVID-19 pandemic, we have found that there were some factors that might influence the Malaysian stock market as well as we mention in problem statements.

In this research paper, we have explored some new factors and gather them together to run the test in order to explore more details and information related to our topic. The combination of the factors in this research paper is different compared with previous studies. It can help the researchers uncover and explore new fields that they have not explore before. Besides, this study is useful for the market practitioners such as investors and speculators. It is because our research mainly focuses on the relationship between the factors and stock market Malaysia, the investors as well as the speculators can take this research as their consideration when they trade during the COVID-19 pandemic. Furthermore, the policy maker and government of Malaysia can understand how the government regulation affected the stock market Malaysia since one of the factors is government stringency.

CHAPTER 2: LITERATURE REVIEW

2.1 Relevant Theories/Concepts/Models

Risk perception will be the first theory to be applied in this research proposal. According to Wachinger et al. (2012), risk perception refers to the process of gathering, adopting, and interpreting signals about the unpredictable outcomes of events, activities, or technologies. Such signals can be categorized to direct experience (for example, witnessing a landslide) and indirect experience (for example, external information such as hearing about a disease outbreak from TV news).

While Ning et al. (2020) described risk perception as a personal intuitive risk assessment which reflects public attitudes or beliefs regarding potential harm. It is commonly acknowledged that perceived risk is the basis for triggering changes in behavior. Those who underestimate the potential harm of a risk occurrence, on the other hand, are less likely to adopt targeted measures in order to prevent it from happening. The outbreaks of H1N1 influenza and Ebola in the past few years have demonstrated the importance of risk perception in predicting behavioral changes. Knowledge typically shapes a person's risk perception, and it facilitates adequate self-assessment of the risk of an occurrence and its associated repercussions. Behavioral decisions may deviate from rationality as a result of biased risk perception, leading to severe social and economic implications eventually.

There are two exclusive forms of risk perceptions, which are affective and cognitive responses. Both of these forms may exhibit unusual patterns of modifications and adaptations over the course of public health crises. According to Slovic and Peters (2006), affective responses are defined as emotional reactions to risk, whereas cognitive elements comprise the perceived level of the threat and estimated coping efficacy of a person. While Cameron and Leventhal (2003) proposed that the affective responses are experiential, immediate, and intuitive; the cognitive

responses are deliberate, slow, and rule based. However, Brug et al. (2004) suggested that increased perceptions of risk or danger may only predict defensive behaviors, especially when the public believes that effective responses and defensive measures are easy to come by (response efficacy), and when they have high level of confidence in their abilities to interact and engage in such defensive measures (self-efficacy).

The other theories imposed in this research is **aggregate demand and supply.** According to Krishna & Skott (2006), this theory explains how the aggregate demand and aggregate supply interact at the macroeconomic level. Aggregate supply refers to the total quantity of production produced by enterprises in a nation, whereas aggregate demand refers to the total amount of money spent in a country on domestic goods and services. When aggregate demand equals aggregate supply and the prices of goods and services remain stable, the economy is said to be in equilibrium.

In this theory, when the price level of product rises, the firms are more likely to produce more product because they can earn more profit, while the consumers are less likely to consume the products because it is more expensive, hence supply rises and demand falls. According to Corporate Finance Institution (2021), aggregate demand would be affected by several factor which includes changes in consumer preferences, changes in interest rate, changes in inflation rate, changes in household wealth's level and foreign currency risk.

Following that, aggregate supply is elastic in the short run but inelastic in the long run. In the short run, the aggregate supply will be affected by the price level. In the long run, the aggregate supply will only be affected by technology, capital and labour. The aggregate demand also called real GDP which consist of four components includes consumer consumption, investments, government spending and net export.

Lastly, the theory that we will apply in this research is government intervention during the COVID-19 pandemic. **Government intervention** is defined as any

action implemented by the government with the direct objective of influencing the economy of a country on contract regulation and public goods and services (Gallego, n.d.). As in most imperfect competitive markets, a corporation may engage in abusive behavior especially monopolistic ones, which may result in a loss of welfare. In such instances, government intervention may be praised by consumers and businesses seeking cheaper prices and a profitable business portion. So, the government can implement some regulations such as price-fixing, taxation, and subsidies that may be used to restore and enhance the initial efficiency of natural monopoly. However, the government must exercise prudence while implementing and enforcing these rules and regulations. A misconception of market structure might result in a higher societal cost than the predicted benefit (Gallego, n.d.).

Government interventionists argue for the implementation of a variety of economic policies to address the flaws in the financial system that cause severe economic imbalances. They believe that the Law of Demand and Supply is inadequate to preserve equilibrium of the economy, so the government intervention is required to guarantee that the economy functions properly. It is because the extremely infectious COVID-19 pandemic struck without warning, producing unprecedented uncertainty regarding the disease's severity and whether a vaccine would be available worldwide. So, the emergency measures such as travel restrictions, lockdown, quarantining and testing, and economic packages were pushed in by governments throughout the globe to guarantee the country's economy and citizen health could be balanced (Ashraf, 2020).

2.2 Literature Review

Author	Model/ Methodology	Findings
Lee et al. (2020)	• Ordinary least squares regression	• The number of COVID-19 confirmed cases has a significant impact on nearly

	analysis • Multicollinearity • Autocorrelation • Heteroscedasticity problem	all sectors in the Malaysian stock market. • CBOE VIX have negative correlation with all sector indices Malaysia and KLCI but excluded REit fund sector.
Ashraf (2020)	• Pooled panel ordinary least squares regression model • Fixed-effects dummy variables	• The stock market reacts negatively to the number of COVID-19 confirmed cases. • A strong negative market reaction is observed, especially between 40 and 60 days after the initial reported cases. • Social distancing policies have both direct negative and indirect positive effects on stock market results.
Chia et al. (2020)	• Ordinary least squares (OLS) • Dummy variable	• The number of daily deaths has no significant relationship with the stock market returns. • The number of daily new COVID-19 cases would affect the returns on the indices significantly. • Malaysian stock market are response negatively toward movement control order announce by government.
Tissaoui & Zaghdoudi (2020)	• Spatial regression models • Benchmark OLS regression	• A significant positive geographical spillover effect between the financial markets of the United States and Europe and Asia.
Bahrini	• Panel data	• Suggested that investors in the GCC

& Filfilan (2020)	regression analysis	stock markets are more concerned with reports of COVID-19 related deaths than the number of daily COVID-19 confirmed cases.
Wang et al. (2021)	• OLS method • LARS method	• The USD and the VIX are both negatively influence the returns on the S&P 500 stock index.
Hoshikawa & Yoshimi (2021)	• VAR estimation • GARCH estimation	• When the number of COVID-19 confirmed cases increases, the South Korean stock market is expected to become more volatile. • Lead to depreciation of the KRW against the USD.
Zaremba et al. (2021)	• Panel data regression analysis • Two-way fixed effects cluster-robust standard errors	• Government policies have a small and limited impact on the stock market liquidity. • Closure of workplaces or schools may reduce stock market liquidity, whereas public information campaigns promote additional trading.
Keh & Tan (2021)	• Ordinary least squares model	• The increment in COVID-19 confirmed cases has a negative relationship with the stock prices in Malaysia. • Government Stringency Index had reduced the risk of infection and the negative stock market reaction to the pandemic, having a positive and significant impact on share prices.
Yang &	• Panel regression	• A gradual increase in the number of

Deng (2021)	model with robust standard errors	COVID-19 confirmed would still result in a negative effect on stock market returns. • government interventions can negatively affect stock market returns.
Topcu & Gulal (2020)	• Pooled ordinary least squares regression model • Unit root test	• The first two sub-samples were found to be experiencing negative impact caused by the COVID-19 pandemic. • When the period is extended to April 17, 2020, the impact of COVID-19 falls gradually and begins to taper off.
KHAN et al. (2020)	• Pooled ordinary least squares regression model • T-test • Mann-Whitney test	• The weekly growth rate of new infections will significantly reduce weekly stock market returns.
Grima et al. (2021)	• Unit root test • Fully Modified Ordinary Least-Square (FMOLS) • Co-integration Test • VAR model	• The CBOE VIX index are negatively influence the stock market indices which included the DJIA, DAX, FTSE100, SSEC and Nikkei225 significantly.
Anh & Gan (2020)	• Panel-data regression model with random-effects estimation	• The daily increase in the number of COVID-19 confirmed cases will adversely affect stock market returns in Vietnam. • a negative influence on Vietnam's stock return before to the COVID-19 lockout

		period.
O'Donnell et al. (2021)	• multiple linear regression analyses. • linear regression model	• Volatility was more essential compared to growth of Covid-19 cases in order to explain the stock price. • early government intervention in China and the government intervention can affect the investor's sentiment.

2.2.1 The Impact of the Number of COVID-19 Confirmed Cases on the Stock Market

The number of COVID-19 confirmed cases is on the rise all across the world. The study by Lee et al. (2020) found evidence that increased COVID-19 confirmed cases may result in a significant impact on nearly all sectors in the Malaysian stock market. Before entering the Malaysian stock market, investors are encouraged to pay close attention to changes in the number of COVID-19 confirmed cases. Ashraf (2020) examined the stock market's response to the COVID-19 pandemic. Daily data of COVID-19 confirmed cases and stock market returns data from 64 countries were gathered, the findings showed that stock market returns decline when there is an increase in the number of COVID-19 confirmed cases in a country. Also, the author observed a strong negative market reaction in the early stages of reported cases, especially between 40 and 60 days after the initial reported cases.

The next study by Chia et al. (2020) argued that the number of daily deaths had no significant effect, but the number of daily new COVID-19 cases would affect the returns on the indices severely, specifically FTSE Bursa Malaysia KLCI Index, FTSE Bursa Malaysia Top 100 Index (T100), FTSE Bursa Malaysia Mid 70 Index (M70), EMAS Index (EMAS), EMAS Shariah Index (ESH) and Hijrah Shariah Index (HSH). Bahrini and Filfilan (2020) attempted to study the impact of COVID-19 by focusing on the stock

markets in the Gulf Cooperation Council (GCC) countries. Unlike previous study by Chia et al. (2020), it was found that the number of COVID-19 confirmed deaths has a negative relationship with the GCC stock markets; nevertheless, no significant response is found between the number of daily COVID-19 confirmed cases and GCC stock markets.

While Hoshikawa and Yoshimi (2021) revealed that an increase in the number of COVID-19 confirmed cases would cause sharp volatility in the South Korean stock market, resulting in rapid capital flight from foreign investors. This will further cause the South Korean won (SKW) to depreciate against the USD. However, the authors believed that the value of KRW will rise again as investors are likely to buy back the KRW seven days after an increase in new cases. The next findings contributed by Keh and Tan (2021) showed that the increment in COVID-19 confirmed cases would lead to a drop in Malaysian stock prices. Since the pandemic had created widespread uncertainty across the stock market, investors were apprehensive and pessimistic about future returns.

Yang and Deng (2021) tried to analyze the relationship between the COVID-19 pandemic and stock market returns. Data from 20 OECD countries, including the number of COVID-19 confirmed cases and stock market returns, were used in their study. They proved that stock market returns would be affected despite a gradual increase in number of COVID-19 confirmed cases. This results in in line with the findings by Ashraf (2020) and Chia et al. (2020). Topcu and Gulal (2020) divided sample periods into three sub-samples (i) March 10 – 31, 2020, (ii) March 10 - April 10, 2020, and (iii) March 10 - April 17, 2020, to investigate the impact of COVID-19 on emerging stock markets. The main results indicated that the pandemic has a significant negative impact on the emerging stock markets for the sub-samples of (i) and (ii), yet the impact of COVID-19 becomes insignificant when the time period extends to April 17, 2020. This is because the local governments took prompt action in time and announced larger stimulus packages in response to the rising number of COVID-19 confirmed cases.

The study conducted by KHAN et al. (2020) evidenced that the growth rate in weekly new cases has a considerable impact on weekly stock market returns. The COVID-19 pandemic wreaked havoc on the main stock indices of the following countries: the United States, China, Japan, South Korea, Spain, Italy, Germany, France, the United Kingdom, Canada, Belgium, Denmark, Netherland, Norway, Sweden and Switzerland. According to Anh and Gan (2020), the daily increase in the number of infections would cause a detrimental effect on stock returns in Vietnam. In conclusion, most studies discovered a significant negative relationship between the number of COVID-19 confirmed cases and stock market returns.

2.2.2 The impact of Chicago Board of Options Exchange Volatility Index on the Stock Market

As we mention in part 1.2.1, we will select and review Chicago Board of Options Exchange Volatility Index as independent variable of our research due to the lack of daily Malaysia VIX data. In fact, we had found that there were previous researchers agreed that the Chicago Board of Options Exchange Volatility Index (CBOE)VIX will affect the worldwide stock market which include Malaysia stock market. According to Lee et al. (2020), since Malaysia is an oil-exporting country, the are many external factors which include CBOE VIX are required investors to consider when the Covid-19 pandemic. In addition, Lee et al. (2020) had found that CBOE VIX as one of the financial market volatility indices has a significant impact on Malaysian stock market. It is important to point out that the researchers have proved that CBOE VIX might be a factor that affecting the stock market in Malaysia. It can be showed by Lee et al. (2020) had found that there was a negative correlation between CBOE VIX with many sector indices in Malaysia which included Kuala Lumpur Composite Index (KLCI) significantly. However, the result show that only Real Estate Investment Fund (REIT) sector is the exception indices in Malaysia.

Subsequently, we have found that the study conducted by Grima et al. (2021) which stated that the CBOE VIX index are negatively influence the stock market indices which included the DJIA, DAX, FTSE100, SSEC and Nikkei225 significantly. However, the researchers have stated that the impact of VIX index on the China stock market indices is the weakest among the stock market indices. Besides, the fear in the market which caused by the COVID-19 pandemic have indirect effect on the market. According to Wang et al (2021), the USD index and VIX index are both negatively associated to the returns on the S&P 500 stock index. Nevertheless, the S&P 500 stock index returns are positively related to the newspaper-based infectious illness "equity market volatility tracker". However, Wang et al (2021) had mentioned that the findings were limited to daily-frequency data, which cannot further provide additional information about the financial market effects of COVID-19-related uncertainty.

On the other hands, Tissaoui & Zaghdoudi (2020) had found that the relationship of fear index from US financial market to European financial markets for the European case is positive. It indicates that fluctuations in the fear index in Europe and Asia have a geographical influence on the changes of fear index in US, and vice versa. In simple words, when the fear index from US financial market increase, the fear index in Europe and Asia will also increase, vice versa. Besides, Tissaoui & Zaghdoudi (2020) had mentioned that the amount of fear in the American market (VIX) can be utilized to forecast the level of worry in the Euro-Asian markets. This implies that investors and asset managers with implied volatility positions may gain from the increased emphasis on implied volatility in the US and Euro-Asian indices. It is not hard to see O'Donnell et al. agree with the researchers, they had stated that volatility, which is commonly used to measure investor mood, was more important in explaining stock price than growth of COVID-19 cases. In short, most of the studies we found show the result of CBOE VIX have negative impact on the stock market.

2.2.3 The Impact of the Government Stringency Index on the Stock Market

As shown in previous study, government intervention had an impact on its stock market. Ashraf (2020) examine the stock market's response to government intervention. Over the period from January 22, 2020, to April 17, 2020, the daily data of Covid-19 confirmed cases, stock market return and government stringency index from 77 countries were gather, the finding showed that government announcements about the execution of social distancing policies have both direct negative and indirect positive effects on stock market results. Investors are pessimistic toward stock market because they predicted that these policies will lead an unfavourable impact on the economy. In other hand, investors are optimism toward stock market when they found that these policies had effective on reduction on Covid-19 confirm cases. It also found that public awareness programs, swab testing and quarantine policies, and salary assist plan have positively affected the stock market return in general.

The next study by Chia et al. (2020) found that the Malaysian stock market are response negatively toward movement control order announce by government due to the negative impact on business financial earning. However, the study argues that the positive impact to the favourable market sentiment resulted from the government's efforts to prevent the spread of COVID-19. The next study by Zaremba et al. (2021) examine the response of government policy toward stock market liquidity. The daily data were gathered from 49 countries over the period from January 2020 to April 2020. The finding showed that government policies such as closure of school and office and internal mobility restriction have a small and limited impact on the stock market liquidity. Some closure of workplaces or schools may reduce stock market liquidity, whereas public information campaigns promote additional trading. It is because closure of workplace and schools may cause a reduce on household income as it lower investors motivation

to invest in hazardous investment. Nonetheless, all these effects are solely driven by emerging markets and literally play no role in modern countries.

Moreover, Keh & Tan (2021) had found that Government Stringency Index includes International Travel Control and Stay at Home Requirements policies had reduced the risk of infection and the negative stock market reaction to the pandemic, having a positive and significant impact on share prices. By banning individuals from other countries from entering the country through strict travel restrictions, it is decreasing the number of COVID-19 cases from foreign country, not only helps reduce sentiment of uncertainty, but also increases investor confidence, a positive sentiment that will help stock prices rise. By staying at home, the stock market's negative reaction to COVID-19 was reduced, as it would reduce the risk of mortality, and instead investors developed a liking for "stay at home" stocks, such as technology stock, leading to a rise in stock prices. By deterring economic actors from conducting business and making investors gloomy about the stock market, other social distancing measures, such as the restriction of gatherings and the workplace closure policies, have negatively impacted stock prices.

Furthermore, Yang & Deng (2021) had found that government interventions such as social distancing and containment measures, can negatively impact stock market returns. However, the study only reflects market reactions in the short term. Since the time span covered is longer, it better reflects the counterproductive impact of government intervention on stock market returns. Besides, Yang & Deng (2021) had also stated that the stringency index, government response index, and containment and health index all had a substantial positive influence on stock market returns but the economic support index did not. According to Anh & Gan (2020), there is a negative influence on Vietnam's stock return before to the COVID-19 lockout period. The COVID-19 lockout, on the other hand, had a beneficial influence on Vietnam's stock performance. The reason for this is that investors trust the Vietnam government's reactions to Covid-19, and the

undervalued stock price has enticed investors to invest. According to O'Donnell et al. (2021), the impact of COVID-19 on stock market indices in Italy, Spain, the United Kingdom, and the United States was enormous. However, the rise in COVID-19 has had no discernible impact on the prices of the Chinese SSE 180 index and the MSCI World index. It is because of the early government intervention in China and the government intervention can affect the investor's sentiment. It showed us the impact on stock market index will be different when there was different level of government intervention toward Covid-19.

2.3 The Study's Theoretical Framework

Risk perception has a significant relationship with the behavior of investors during the COVID-19 pandemic. Nearly all countries today are experiencing unprecedented economic impact as a result of the novel coronavirus. According to Wang et al. (2021), the outbreak of COVID-19 has increased the awareness of investors, the public, and policymakers that external uncertainties may result in tremendous economic damage, with unforeseeable repercussions. Whereas the pandemic has caused an aggregate impact on the stock market all over the world, and there is a shift in the spending behavior of households as well since they become more defensive and resistant to making investments.

Meanwhile, government interventions such as lockdown and the temporary closure of institutes and offices have rapidly disrupted people's daily lives, limiting the earnings of most individuals as well as investors. As a result, the investment behavior of investors in the financial market is heavily affected. The adverse impact of this global uncertainty has brought more instability for the investors. Wang et al. (2021) also stated that increased uncertainty may result in higher risk over various financial securities anticipated by financial investors. Since the functioning of financial markets is severely disrupted as a result of widespread uncertainty in general, risk perception in the financial market causes volatility in their decision-making process. Consequently, many financial investors are less likely to make

investments in order to secure their cash or to reduce the risk of a financial return failure.

According to Samudra & Burghate (2012), individual decision making related to investing is heavily influenced by cognitive characteristics. Such psychological attributes include the capability to take risk, mental calculation, willingness to embrace financial risk and degree of risk aversion. Major events such as the financial crisis of 2007-2009 had caused a substantial influence on individual investors. The decline in investor wealth, along with market volatility, resulted in a shift in the individual investor perception and attitude (Hudomiet et al., 2010). Even Bucher-Koenen & Ziegelmeyer (2011) highlighted that investor might have been driven to become over cautious when it came to investing in stocks. Investor attitude and behavior are expected to change especially during pandemic, with the priority shifting from return expectations to risk-aversion.

The **aggregate demand and supply theory has an indirect relationship with Malaysian stock market.** When the COVID-19 epidemic struck, most countries, including Malaysia, imposed a lockdown strategy to prevent the spread of COVID-19. This strategy forced practically all businesses to shut down their operations in a specific period, affecting the overall supply chain and economy. When the firm stopped and employees were unable to go to work, the manufacturing line was forced to stop, causing the aggregate supply to fall significantly.

According to The World Bank (n.d.), Malaysia's GDP decreased by 5.647 percent in 2020 compared to 2019. Due to the decline in aggregate supply, most businesses' profit margins have decreased, and they are facing financial struggles. The majority of businesses then proceeded to lay off people, causing the unemployment rate to rise. According to O'Neill (2022), the unemployment rate in year 2020 had risen to 4.55%, compare with the preceding 20 years' unemployment rate hovering around 3%. Moreover, the increase in unemployment rate had affected the household wealth’s level. It causes a drop in consumer spending since customers cannot afford to spend much money. As a result, aggregate demand falls.

Next, the bad economy and the massive decline in revenue of most companies influenced investor behavior as they are less likely to invest their money in the stock market in this uncertainty period. In short, consumers and investors are more likely to save their money rather to spend it. According to Investopedia (2021), the economic data, interest rate and corporate result are the main factors affecting the demand of stock. Aggregate demand and supply can be used to measure a country's economic performance. As a result, when aggregate demand and supply decrease, the economy will suffer, and investors' attention will shift from return expectations to risk-aversion as mentioned in previous theory.

The **government's intervention** would have an impact on Malaysian stock market results, **either directly or indirectly**. The extremely infectious COVID-19 pandemic occurred unexpectedly, causing unparalleled uncertainty regarding the disease's severity and if a vaccine would be available. In response to the COVID-19 pandemic, governments throughout the world have implemented unprecedented steps. According to Duan et al. (2020), they mentioned that government intervention will directly affect the market. If health responses and containment, as well as economic assistance packages, have a beneficial influence on market growth, the future negative economic consequences will be reduced, and the market will expand as a result (Bo et al., 2021).

However, the result of long-term government interventions has a considerable detrimental influence on general economic and social well-being, including higher unemployment and company failures, there is an unavoidable trade-off between sickness management and economic repercussions (Coibion et al., 2020). Governments everywhere across the world immediately implemented emergency legislation to limit the spread and minimize risk exposures. Three primary kinds of government activities are economic assistance packages, immediate steps such as lockdown, and containment strategies. Surprisingly, these efforts heightened public concern, as many worried about the consequences of the abrupt shifts. Although the

policies' long-term impacts are still being investigated, the trickle-down effect has resulted in fewer new diseases, job losses, and cost-cutting (Bo et al., 2021).

2.4 Hypotheses Development

In this study, we test hypotheses on the impact of proposed variables on Malaysian stock market conditions. Since the level of information efficiency in the market is the key to the profiteering by strategic participants, investors will use all the information they have when making investment decisions (Okorie & Lin, 2021). However, it is difficult to predict the trend of stock prices, especially during the epidemic. The main reason behind is that the stock market is constantly changing due to unpredictable events and unstable information. Taking previous empirical studies as reference, the following are the three variables that this study considers having the power to affect the Malaysian stock market throughout the pandemic.

2.4.1 Number of COVID-19 Confirmed Case in Malaysia

H_0: A significant relationship does not exist between the condition of Malaysian stock market and the number of COVID-19 confirmed case in the country.

H_1: A significant relationship exists between the condition of Malaysian stock market and the number of COVID-19 confirmed case in the country.

As long as the coronavirus is contagious and immigrants exist, this virus has the ability to simultaneously affect the performance of enterprises in many of the world's economies and the dynamics of their stock markets. According to Okorie and Lin (2021), the study shows that the spread of COVID-19 pandemic has a substantial fractal contagion effect on the stock market. At the initial stage of COVID-19 pandemic, there was no effective

vaccine developed to control its spread. As the result, the rapid spread of the epidemic announced a large number of deaths and positive results of diagnosis. In particular, due to the wake of the COVID-19 outbreak, citizens in economies with large numbers of confirmed Coronavirus cases are panicked, while businesses are temporarily shutting down or even exits the market. For investors, the fear of future stock market performance and the fear of possible global recession make it difficult for them to make decisions and take actions easily in the current market. Most investors liquidate their positions in order to have sufficient resources to resume normal business or make ends meet if necessary. This trend gradually spread among investors and affected the stock market. As many previous studies have pointed out, stock markets reacted negatively as the rise in diagnosed cases. However, Ashraf (2020) suggests that with the improvement of healthcare measures and policies, especially the successful development of vaccines, and the gradual improvement of the government's ability to control the epidemic, investors' confidence and trust in them will gradually be restored and strengthened. Suppose, for example, that people are relatively less likely to contract and die from the Coronavirus once they have been vaccinated completely. Along with this phenomenon, businesses in many of the world's economies will be allowed to resume operations by local governments, and economic activity between countries will gradually resume after a temporary suspension. In other words, based on these predictions, it cannot be ruled out that the number of cases diagnosed in a country will not have much impact on its stock market in the future.

2.4.2 Chicago Board of Options Exchange (CBOE) Volatility Index

H_0: A significant relationship does not exist between the condition of Malaysian stock market and the CBOE Volatility Index.

H_1: A significant relationship exists between the condition of Malaysian stock market and the CBOE Volatility Index.

While the first wave of the epidemic in early 2020 caused economies in almost every country into a panic, the second wave of the COVID-19 pandemic in early 2021 led to similar actions, but at the city level. Not only did the rapid outbreak of COVID-19 create great uncertainty for the global economy, but the fear that this uncertainty caused spread among investors, ultimately contributing to the volatility of the stock market. As a measure of investor fear, the Chicago Board of Options Exchange (CBOE) Volatility Index, also known simply as the VIX or "Fear Index", can be factored into investors' decisions to help gauge expected volatility and future stock performance. For example, investors can use the volatility index to determine whether the market as a whole will rise or fall in the future. In general, a strong negative correlation exists between the VIX and stock market conditions. As Grima et al. (2021) pointed out, the stock market has a significantly negative reaction to the VIX. An increase in the VIX could be a sign of market volatility or growing investor concern, pointing to future declines in stock prices. That is why the CBOE volatility index can be a way to help investors profit from such forecasts. However, it should not be ignored that the VIX, while historically moving in the opposite direction of the stock market, has also moved in tandem with the stock market. Therefore, this also means that investors should not use this variable as an absolute indicator of their investment decisions.

2.4.3 Malaysian Government Stringency Index

H_0: A significant relationship does not exist between the condition of Malaysian stock market and the government stringency index in the country.

H_1: A significant relationship exists between the condition of Malaysian stock market and the government stringency index in the country.

In response to the COVID-19 pandemic, governments in almost all economies have implemented emergency measures to effectively contain the outbreak, including lockdowns, travel restrictions, social distancing, and more. According to Ashraf (2020), the effectiveness of these measures is expected to generate additional uncertainty on the stock markets. In terms of immediate impact, the implementation of lockdown and stay-at-home policies strategically separates the population into infected and non-infected groups, thus allowing the rest of the population to resume normal life and saving lives. However, the fact is that it can impose huge costs on society in terms of reduced economic activity. Ultimately, these adverse valuation effects can be factored in or priced in by investors, leading to lower stock returns. Conversely, the study also suggests that stock markets may respond positively to government measures related to containment by reducing the risk of new infections and deaths, despite the direct negative impact on economic activity of strict measures imposed by the government. According to Yang and Deng (2021), the stock market has reacted negatively to the number of diagnosed cases and the opposite to various government interventions. As suggested by Greenstone and Nigam (2020), government interventions related to containment could in turn bring significant economic benefits to the country by reducing new infections and deaths. In other words, the implementation of these measures may not only mitigate the negative impact on the stock market caused by the rise in diagnosed cases but may even improve it. The main reason is that people are more likely to carry out these actions efficiently in countries with strict government practices, especially social distancing policies.

CHAPTER 3: METHODOLOGY

3.1 Research design

The approach we used in our topic research is quantitative approach since we have collected secondary data on variables, namely Malaysian stock market indices, Malaysian government stringency index, the number of COVID-19 confirmed cases in Malaysia and Chicago Board of Options Exchange Volatility Index (VIX). We will explain the ways we collected the data in part 3.2. After that, we analytic all collected data through Autoregressive Distributed Lag (ARDL) model. It had fulfilled the idea that mention by Bhandari (2020) which quantitative approach is acquiring the data then analytic the data. According to Bhandari (2020), there are three approaches under quantitative approach which are descriptive research, experimental research, correlation research. Specifically, the correlation research will be conduct for this research paper. It is because correlation research is design for investigate the correlation between the independent and dependent variables.

3.2 Data Collection Method

Table 3.2:

Data collection method

Variable	**Proxy**	**Unit measurement**	**Source**
Kuala Lumpur Composite Index (Malaysian Stock Market Index)	$KLCI_t$ / Y_t	Index	Yahoo Finance
Malaysian Government Response Stringency Index	GS_t	Ordinal scale (Range: 0 to 100)	Oxford Coronavirus Government Response Tracker

			(OxCGRT)
The Number of COVID-19 Confirmed Cases in Malaysia	$CASES_t$	Case	World Health Organization (WHO)
Chicago Board of Options Exchange Volatility Index	VIX_t	Index	Yahoo Finance

In this study, secondary data will be collected to understand and identify the relationships between proposed variables, as well as the changes of dependent variable in different periods. We selected the time period based on an independent variable in our proposed model, which is the number of COVID-19 confirmed cases. Since most of the confirmed cases occurred after the election in Sabah (26 September 2020), this study intends to use October as the dividing line to see the time effect. We decided to use the weekly data instead of daily non-stop data. In order to compare the results of the different periods and solve the problem of data imbalance, we will select the weekly data with the same amount of observation in the two periods. In other words, the first period observation will be the same as the second period we chose. The first phase is from February 2, 2020 to September 27, 2020, and the second phase is from October 4, 2020 to May 30, 2021. There are 35 observations in each period, amounting to total of 70 observations.

In terms of the sources of data collection, the dependent variable, Kuala Lumpur Composite Index, was downloaded from finance.yahoo.com. For independent variables, data on the number of COVID-19 confirmed cases in Malaysia were obtained from the database on the website of the World Health Organization (WHO). The Malaysian government stringency index, a composite measure of the government's nine response indicators, was extracted from the Oxford Coronavirus Government Response Tracker (OxCGRT), the global panel database of pandemic policies. Historical data from the CBOE Volatility Index will be sampled using the same principles and resources as our dependent variable (Yt). In addition, the impact of COVID-19 on Malaysian stock market conditions can be seen by

comparing weekly data from two different periods before and after the Sabah election. Since each independent variable is obtained from a trusted source, it can be considered that the data collected is very reliable and the possibility of inaccurate data is very small.

3.3 Model Specification

The econometric model for our research can be expressed as follow (Equation 1):

$$\boldsymbol{LnY_t = \beta_0 + \beta_1 LnX_{1t} + \beta_2 LnX_{2t} + \beta_3 LnX_{3t} + D_t + \varepsilon_t} \quad (1)$$

Where,

LnY_t =Natural Logarithm of Kuala Lumpur Composite Index (KLCI)

LnX_{1t} =Natural Logarithm of Malaysian government stringency index

LnX_{2t} =Natural Logarithm of Number of COVID-19 weekly accumulated confirmed cases in Malaysia

LnX_{3t} =Natural Logarithm of Chicago Board of Options Exchange Volatility Index (VIX)

D_t =1 if after Sabah election, otherwise, =0

β_k =Parameter, where k= 0,1,2,3

ε_t =Error term

Our research will be conducted time series data analysis and the model equation 1 will be our econometric model. According to Shrestha and Bhatta (2018), there are three most basis model selection for time series data which are Ordinary Least Square model (OLS), Vector autoregressive model (VAR) and Autoregressive Distributed Lag (ARDL) model. In this case, we think that Autoregressive Distributed Lag (ARDL) model will be the most suitable for our econometric model among these three basis models. It is because the ARDL model allow us to take a substantial numbers of lag terms to describe the data generating process. Furthermore, we do not choose the VAR model or SVAR model is due to it have limitation on the length of lag terms (Shrestha & Bhatta, 2018). Although Ordinary

Least Square model (OLS) is more easier to run for the research but it only applicable when the variable is stationary. However, ARDL model is an OLS based model, but it can applicable when there have mixed variables of stationary and non-stationary variable. Besides, we can access the long-term connection between the independent and dependent variables without suffer in loss of the long run information based on ARDL model concept (Engle and Granger, 1987). It is not hard to see how Shrestha and Bhatta agree with Engle and Granger, they have mention that there was an error correction model which able easily derived from ARDL model to avoid the problem.

3.4 Estimation procedure

3.4.1 Unit Root Test

Since all variables proposed in our model belong to time series data, unit root testing is the first and essential test to be carried out in our research. In statistics, the unit root test is used to check the stationarity of a variable in a given time series, as it is essential for researchers to understand the characteristic of variables correctly. According to Shrestha and Bhatta (2018), while graphs are a preliminary tool that can give us a rough idea of stationary, the final decision basically requires statistical tests. In this study, we decided to use Augmented Dickey–Fuller (ADF) test because it is the most common method for testing unit root. The null hypotheses (H_0) is defined as the existence of unit roots, while the alternative hypotheses (H_1) is defined as the time series is trend stationary. In other words, if a time series is trend non-stationary, which indicates that the unit root process contains stochastic components. However, it is worth noting that non-stationary time series can be transformed into stationary time series by de-trending process. When a time series becomes stationary after a first-order difference, it is called a first-order integral, denoted as I(1). In this study, the main purpose of ADF test on level data and first-order difference to

detect logarithmic and non-logarithmic series is to determine the integration order of the four variables proposed and select an appropriate framework for analyzing time series data.

3.4.2 Autoregressive Distributed Lag (ARDL) Bounds Test

In general, methods for analyzing time series data are selected based on the results of unit root test. The reason is that if the proposed model is described incorrectly or using the wrong methods, it may provide biased results and unreliable estimates. There is a simple method to analyze the relationship by differentiating the non-stationary time series and making all variables stationary, namely the Ordinary Least Squares (OLS) method. However, its differences only represent short-term changes in time series and completely ignore long run information. Therefore, the Autoregressive Distributed Lag (ARDL) Bounds testing is the second test to be carried out in this study. The main purpose of this test is to determine whether there is a long-term relationship between the proposed variables by performing an F-test on the joint significance of the lag level coefficient of each variable (Peseran et al., 2001). In the case of small sample size, it is more effective to adopt the ARDL test for identity co-integration verification. Regression variables can tolerate different optimal lags, which allows researchers to obtain realistic and valid long run model estimates (Thao, 2016). The decision rule is to reject H_0 if the F-statistic is greater than the value of upper critical bound, I(1). Conversely, H_0 cannot be rejected if the F-statistic is less than the lower critical bound, I(0). However, it is worth nothing that the test is inconclusive if the F-statistic falls within the critical range, which is worthless. The hypotheses testing of the ARDL Bounds test is as follows:

H_0: A co-integration relationship does not exist between the proposed variables.
H_1: A co-integration relationship exists between the proposed variables.

The error correction version of the normal ARDL bound co-integration test model of Equation (1) can be framed as:

$$\triangle LnKLSE_t = \beta_0 + \beta_1 LnKLSE_{t-1} + \beta_2 LnGS_{t-1} + \beta_3 LnCASES_{t-1} + \beta_4 LnVIX_{t-1} + D_t + \sum_{i=0}^{P} \alpha_1 \triangle LnKLSE_{t-i} + \sum_{i=0}^{P} \alpha_2 \triangle LnGS_{t-i} + \sum_{i=0}^{P} \alpha_3 \triangle LnCASES_{t-i} + \sum_{i=0}^{P} \alpha_4 \triangle LnVIX_{t-i} + u_t$$

3.5 Diagnostic Checking

3.5.1 Serial Autocorrelation Test

Serial correlation, also known as temporal correlation, is a special case of correlation that describes the relationship between the values of the same variables over successive time intervals. Rather than dealing with variables X and Y, serial correlation focuses on lagged values of the same variables. However, most linear regression models assume error terms to be identically and independently distributed which means that there is no correlation between consecutive error terms. The violation of this assumption in the context of time-series research designs would result in serial correlation, where the errors are said to be autocorrelated or dependent (Abdulhafedh, 2017). There are several ways to detect the presence of serial correlation such as the residual scatter plots, the Durbin-Watson test, the Durbin h test and the Breusch-Godfrey LM test. Among the available tests, we are going to use the Breusch-Godfrey LM test to check for serial correlation problems in our research model. In addition to testing for serial correlation of any order, the LM test can also be applied to models with or without lagged dependent variables, making it one of the most commonly used tests (Uyanto, 2020). The decision rule is to reject H_0 if the P-value is less than the significance level. Otherwise, do not reject H_0. The hypothesis testing of the Breusch-Godfrey LM test is as follows:

H_0: Autocorrelation problem does not exist in the model.

H_1: Autocorrelation problem exists in the model.

3.5.2 Heteroscedasticity Test

Heteroscedasticity refers to the data with unequal variability (scatter) across the range of values of a second variable that predicts it. A significant part of the inference theory for the linear regression model is based on the assumption that the error terms are independently identically distributed. In particular, the errors terms are said to be homoscedastic when they are independently identically distributed. Nonetheless, this assumption may not always be guaranteed in practice, and it is well-known that heteroscedasticity can arise from misspecification as a result of overlooked nonlinear predictor terms or unobserved predictors that are not included in the model (Li & Yao, 2019).The introduction of the Breusch-Pagan test by Breusch and Pagan (1979) was found to be the first and perhaps most classic test that helps to determine whether there is heteroscedasticity existing in the regression model. Other than the Breusch-Pagan test, there are still many tests which can provide the same outcome such as the White test, the Park's test, the Glejser Test and the Speaeman's rank correlation test. For this paper, we use the Breusch-Pagan test to check for the problem of heteroscedasticity in our research model. The decision rule is to reject H_0 if the P-value is less than the significance level. Otherwise, do not reject H_0. The hypothesis testing of the Breusch-Pagan test is as follows:

H_0: Heteroscedasticity problem does not exist in the model.

H_1: Heteroscedasticity problem exists in the model.

3.5.3 Normality Test (Jarque-Bera Test)

Normality test is used to determine whether or not a data set follow the normal distribution (Jarque, 2014). The research result will be less reliability

if the data set are not normal distributed. Next, the type of normality test includes Shapiro–Wilk test, Kolmogorov–Smirnov test, Lilliefors test, Cramer–von Mises test, Anderson–Darling test, D'Agostino–Pearson test, Jarque-Bera test and chi-squared test (Yap & Sim, 2011). Among the available tests, we are going to use the Jarque-Bera test to determine the normality of our research data. According to Thadewald & Buning (2004), Jarque-Bera test calculate the Skewness and Kurtosis from a data set to determine the normality. Next, Skewness indicates the degree to which the distribution of a data set is symmetrical while Kurtosis indicate the degree to which the distribution of data set is peak. According to Stephanie (2021), the skew of a normal distribution is zero, whereas the kurtosis is three. Moreover, if Kurtosis are more than 3 means that the distribution is narrow while it less than three means that the distribution are flat. The decision rule is Reject H0 if the P-value is less than the significance level. Otherwise, do not reject H0. The hypotheses testing of the Jarque-Bera test is as follows:

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

3.5.4 Ramsey's RESET Test

It's a broad misspecification test that looks for missing variables as well as an incorrect functional form published by Ramsey in 1969. This test is based on the Lagrange Multiplier principle, and this usually performed using the values of the F-critical distribution. (Shukur & Mantalos, 2004) According to Thursby and Schmidt (1977), they used Monte Carlo methods to investigate the properties of eight different variants of the Rest test in systems with one to ten equations. When using the critical values of the F-distribution, they find that the Rao's F-test has the best performance in terms of the correct size. However, when they use the critical values of the χ^2 -distribution, they find that the commonly used LRT (uncorrected for degrees-of-freedom), as well as the LM and Wald tests (both corrected and uncorrected), behave badly even in a single equation situation, and as the

RESET proxies get smaller and resulting in the power of test decreases. (Shukur & Mantalos, 2004) As the result, the researcher will prefer to use the F test for functional form. The null hypothesis is that the correct specification is linear. The alternative hypothesis is the correct specification is non-linear (Boyd, n.d.). In short, misspecification tests such as the Ramsey RESET test is a misspecification tests that have to pass because it may show that there is some sort of misspecification, but it does not specify what the right specification should be (Boyd, n.d.).

3.5.5 /3.5.6 Cumulative Sum (CUSUM) and CUSUM of Squares (CUSUMSQ) Test

There are two most commonly used parameter constancy tests are Cumulative Sum and Cumulative Sum of Squares (CUSUMSQ) tests, which were introduced by Brown et al. (1975). They are widely used because they are intended to test the null hypothesis of parameter stability against numerous alternatives (Caporale & Pittis, 2004). The CUSUM test is one of the methods for researchers to diagnostic the stability of the regression relationship over time when the regression model is under time series analysis. Cumulative sum test refers to the cumulative sum of the recursive residuals while the recursive residuals need to have constants variance and uncorrelated with zero means. We can determine that the stability of parameter of our research model by observe the present of cumulative sum is outside or inside the two critical lines. The cumulative sum will be presented outside the two 5% significance line when the parameter of the equation is instability. Otherwise, the parameter of the equation is stable if the cumulative sum inside between the two significance lines. If a researcher wants to detect random movement (those that do not necessarily come from structural changes in the coefficients), the CUSUMSQ test is suggested. As with CUSUM tests, moves outside the critical boundary imply parameter or variance instability. The cumulative sum of squares is usually within the 5% significance line, indicating that whether the residual is relatively stable or

unstable. Therefore, we choose Ccumulative Sum and Cumulative Sum of Square tests as stability diagnostic tests for our research model.

CHAPTER 4: DATA ANALYSIS

4.1 Estimation Procedure

In order to fulfil the requirement for the boundary testing procedure, all the four proposed variables in our research model, whether taking log or not, must become stationary at the level data, I(0) or at the first difference, I(1).

Table 4.1:

Unit Root Test – Augmented Dickey–Fuller (ADF) Test Result

Series	**Intercept**		**Trend and Intercept**	
	T-stat	P-value	T-stat	P-value
Level				
KLCI	-1.5726	0.4911	-2.6038	0.2801
LNKLCI	-1.5824	0.4861	-2.6155	0.2750
GS	-3.1537**	0.0273	-3.3211*	0.0715
LNGS	-3.2288**	0.0225	-3.2474*	0.0841
CASES	0.9381	0.9955	-0.6806	0.9703
LNCASES	-1.8339	0.3614	-2.6545	0.2585
VIX	-2.5530	0.1079	-3.7976**	0.0225
LNVIX	-2.6472*	0.0887	-4.3239***	0.0052
First Difference				

△KLCI	-7.2968***	0.0000	-7.2473	0.0000***
△LNKLCI	-7.3104***	0.0000	-7.2621	0.0000***
△GS	-5.7042***	0.0000	-5.7091	0.0001***
△LNGS	-5.3593***	0.0000	-5.4001	0.0002***
△CASES	-2.2115	0.2042	-2.6554	0.2582
△LNCASES	-8.3948***	0.0000	-8.3434	0.0000***
△VIX	-8.1695***	0.0000	-8.2011	0.0000***
△LNVIX	-8.7711***	0.0000	-8.9062	0.0000***

Note. The selection of lag length for ADF test is based on Schwarz Criterion (SC), with a maximum allowable lag length of 10. ***, **, * represents null rejection at 1%, 5% and 10% level of significance (α), respectively.

As shown in Table 4.1, the ADF test for stationary summarizes that if the test equation contains trend or trend and intercept, whether the series is logarithmic or not, some of them are not trend stationary at the level data, as the p-values are not lesser than or equal to the 5% level of significance, indicating the existence of a unit roots. However, it is worth noting that, except for the series of CASES that does not take logarithms, the other series are trend stationary at the first difference with or without logarithms. As the result, we decide to use the logarithmic series as the underlying variables in the research model.

In this case, the logarithmic series may be co-integrated, but without validation, it may provide biased results and unreliable estimates. Therefore, the weekly series of LNKLCI, LNGS, LNCASES and LNVIX are adopted for the F-bound test. In order to proceed the ARDL modelling approach, the long-run model can be expressed as below:

$$\boldsymbol{LnKLCI_t = c_0 + c_1 LnGS_t + c_2 LnCASES_t + c_3 LnVIX_t + D_t + \varepsilon_t} \quad (1)$$

Table 4.2:

Autoregressive Distributed Lag (ARDL) Bounds Test – F-Bound Test Result

k = 3, Finite Sample: n = 70	**Wald F-statistics**	**8.287022**
Significance Level	**Critical Value**	
	Lower Bound – I(0)	**Upper Bound – I(1)**
10%	2.482	3.31
5%	2.924	3.86
1%	3.916	5.088

Note. Given 70 observations, critical values for bound test (Case II) are obtained from Narayan (2005) assuming restricted intercept and no trend.

From Table 4.2, the ARDL Bounds test for co-integration shows that the Wald F-statistic of the proposed variables (8.287022) is jointly greater than the value of the upper critical bound, I(1), indicating a long run relationship between the Malaysian stock market conditions and its determinants, namely the Malaysian Government Stringency Index (GS), the number of COVID-19 diagnosed cases in Malaysia (CASES) and the Chicago Board of Options Exchange Volatility Index (VIX).

Once the co-integration relationship between variables is determined, the next step is to model the short-run dynamic relationship by establishing error correction mechanism. Error correction model (ECM), which combines short-run dynamic and long-term equalization without losing long-run information. Therefore, the error correction term (ECT) must be included in the model as a regression, because its value represents the residuals from the ARDL co-integration model and the rate at which the previously unbalanced state is adjusted to the long-term equilibrium state (Engle and Granger, 1987). We take the coefficient value of the normalized co-integration equation as the error correction mechanism of the short-run

disequilibrium to see whether the long-run relationship is significant. All the estimation results for the selected ARDL model are shown in Table 4.3.

Table 4.3:

Estimation Results for the Selected ARDL Model

Dependent Variable: LNKLCI		
Automatic selection of 4 lags dependent variable and 4 lags for regressors		
Variable	**Estimate / Coefficient**	**Prob. / P-value**
Long-run Relations		
LNGS	0.176888***	0.0096
LNCASES	-0.028630**	0.0247
LNVIX	-0.153010***	0.0001
Dummy	0.027974**	0.0414
Constant	7.259855***	0.0000
Short-run Dynamics		
△ LNKLCI	1.941356***	0.0002
△ LNGS	0.079898***	0.0012
△ LNCASES	-0.004353	0.1080
△ LNVIX	-0.040916***	0.0004
ECT	-0.267410***	0.0000

Note. Above model is estimated by using EViews. The ARDL (1,1,2,0) model selection method is based on Akaike Information Criterion. ***, **, * represents null rejection at 1%, 5% and 10% level of significance (α), respectively.

As shown in Table 4.3, the estimates of proposed variables in the long-run relationship are significant and robust. Based on the above results, Malaysian government stringency index (GS) and the Chicago Board of Options Exchange Volatility Index (VIX) have a significant long-term impact on Malaysian stock market (KLCI) at the 1% level, while the number of COVID-19 confirmed cases in Malaysia (CASES) is at the 5% level. Among the variables, the long-run estimates show that the stock market have responded positively to GS, while negatively to CASES and VIX. Specifically, the elasticity of KLCI with respect to GS is about 0.1769, suggesting that if government stringency index increases by 1%, on average, stock prices increase by 0.18% in the long run, ceteris paribus. However, all else being equal, for every additional 1% increases in the number of COVID-19 diagnosed cases in Malaysia and the CBOE Volatility Index, stock prices will decrease on average by 0.03% and 0.15%, respectively.

As for the dummy variable (D), the purpose of this study to place it in the independent variable side of the model is to determine the impact of COVID-19 pandemic on the Malaysian stock market in two different periods, especially the rapid increase in COVID-19 confirmed cases after the Sabah elections held on September 26, 2020. As previous studies have shown, an increase in the number of diagnosed cases leads to a decline in stock market performance, while lockdown policies imposed by governments in the initial stages of an outbreak disrupt economic activity and sectors, ultimately leading to a severe global recession. These negative economic consequences had a ripple effect on the stock market, causing investor sentiment to panic because of the unpredictable volatility of the stock market. In short, the dummy variable of this study takes into account not only the impact of the number of diagnosed cases and investors' sentiment on the Malaysian stock market at different times of epidemic severity, but also the series of strict measures implemented by the local government after the outbreak.

By comparing the weekly data with two periods of the same amount of observations, the dummy variable of this study is to express the joint influence of

these three determinants on the Malaysian stock market before and after the Sabah election, and the results show that there is a significant positive effect at the 5% level. The coefficient of the dummy variable is 0.02797, which reflects the 2.8% rise in the Malaysian stock market after the Sabah election. The results show that the measures taken and implemented by the Malaysian government in response to the COVID-19 outbreak have been effective over time. In other words, by reducing the number of new infections and deaths, these measures not only helped mitigate the negative impact of the number of confirmed cases on the Malaysian stock market, but also helped restore investor confidence and trust in the local government and stock market with the successful development of the vaccine in the later stage. Therefore, the long-run equation can be written as below:

$$\boldsymbol{LnKLSE_t = 7.2599 + 0.1769LnGS_t - 0.0286LnCASES_t - 0.1530LnVIX_t + 0.02797D_t}$$

Considering the short-run dynamics, the estimate suggests that GS has a significant and positive short term impact at the 1% level, while VIX is the opposite example with a significant and negative short term effect at the 1% level. No significant short-run effect on stock price is found in CASES. For the coefficient of error correction term (ECT), it is only allowed to be significant and within the range of -1 to 0, indicating the existence of long-term causality. If the coefficient is out of range or not significant, the model is considered inappropriate, and the model specification needs to be modified. If the value is equal to zero, there is no adjustment process, claiming that the long-term relationship is no longer meaningful (Anwar et al., 2020). The results showed that ECT with a value of -0.267410 was significant at the 1% level, suggesting that long-term relationship was a valid error correction mechanism in all specifications. In other words, any short-term deviation in stock prices will be corrected back to equilibrium. Since there is a co-integration, the error correction model (ECM) representation is specified as:

$$\triangle LnKLSE_t = \beta_0 + \beta_1 LnKLSE_{t-1} + \beta_2 LnGS_{t-1} + \beta_3 LnCASES_{t-1} + \beta_4 LnVIX_{t-1} + \beta_5 D_t + \sum_{i=0}^{P} \alpha_1 \triangle LnKLSE_{t-i} + \sum_{i=0}^{P} \alpha_2 \triangle LnGS_{t-i} + \sum_{i=0}^{P} \alpha_3 \triangle LnCASES_{t-i} + \sum_{i=0}^{P} \alpha_4 \triangle LnVIX_{t-i} + \varphi ECT_{t-1} + u_t$$

After using EViews to calculate and analyze the data, the results of all variables are consistent with most previous research results. According to Lee et al. (2020), their research mentioned that investors will always depend on the change of confirmed cases before they make any investment decision. Most researchers claim that a rise in the number of COVID-19 diagnosed cases has a negative impact on the stock market, mainly because investors were worried and pessimistic about the future performance and returns of companies. Besides, the research done by the previous researchers said that the CBOE VIX has a negative relationship to the stock market. According to Grima et al. (2021), this research noted that the COVID-19 pandemic was caused fear in the market and indirectly affected the stock market since there is uncertainty in the market. According to Yang & Deng (2021), they argue that the longer the time span, the better the response of the government intervention indicators to the stock market, with a country's government stringency index being one example that has a significant impact on the country's stock market.

4.2 Diagnosis Checking

In addition to carrying out the above test, most importantly, evaluating the adequacy of the model's dynamic specifications against the various diagnostic tests is a step that must not be overlooked before making further inference. A total of six diagnostic tests will be adopted, namely the Breusch-Godfrey LM test, Breusch-Pagan test, Jarque-Bera test, Ramsey's RESET test, as well as Cumulative Sum (CUSUM) and CUSUM of Squares (CUSUMSQ) tests (95% bound). All the results of the diagnostic tests are shown in Table 4.4.

Table 4.4:

Results of Diagnosis Tests

Breusch-Godfrey Serial Correlation LM Test			
	Value		**Probability**
F-statistic	0.18859	Prob. F (2, 57)	0.8286
Obs *R-squared	0.447011	Prob. Chi-Square (2)	0.7997

Heteroscedasticity Test: Breusch-Pagan-Godfrey			
	Value		**Probability**
F-statistic	1.107828	Prob. F (8, 59)	0.3712
Obs *R-squared	8.880568	Prob. Chi-Square (8)	0.3525

Normality Test: Jarque-Bera			
	Value		**Probability**
Skewness	-0.016872	Prob.	0.4192
Kurtosis	3.782638		

Ramsey Reset Test			
	Value		**Probability**
t-statistic	0.235596	Prob. T (58)	0.8146
F-statistic	0.055551	Prob. F (1, 58)	0.8146
Likelihood ratio	0.065044	Prob. (1)	0.7987

CUSUM and CUSUM Square Test	
Empirical model: LnKLCI = f (LnGS, LnCASES, LnVIX)	**Remarks**
CUSUM (Figure 4.4.1)	*S*
CUSUM SQUARE (Figure 4.4.2)	*S*

Note. *S* indicates Stable.

For the Breusch-Godfrey serial correlation LM test, it is necessary that the p-value must be greater than the significance level in order to get rid of the autocorrelation problem. Based on the results given, the estimation model passes the serial correlation test with a P-value of 0.8286, which is greater than the significance levels of 1%, 5% and 10%. Therefore, the estimation result of the serial correlation is not rejected at these three levels. In other words, this test does not reject the null hypothesis. In short, the estimated model does not encounter the problem of serial correlation.

For the Breusch-Pagan-Godfrey test for heteroscedasticity, it is essential that the significance level must be less than the p-value in order to get rid of the heteroscedasticity problem. Based on the results given, the estimation model passes the heteroscedasticity test with a P-value of 0.3525. Therefore, the estimation result of the heteroscedasticity is not rejected at these three levels. As with the LM test above, this test does not reject the null hypothesis. In summary, the estimated model does not encounter the problem of heteroscedasticity, or the model is said to be homoscedasticity. Besides that, the results obtained from Jarque-Bera Test show that its P-value is more than the significance level of 1%, 5% and 10%, which is 0.4192. Therefore, it can be judged that the error term is normally distributed. Its skewness is -0.0168, close to zero, and its kurtosis is 3.7826, close to 3, which also indicates that the sample data we obtained are symmetric and moderate. Therefore, the research findings are reliable.

This Ramsey Rest test is supposed to discover both incorrect functional form and omitted parameters. This is the test we have to pass because it may show that there is some sort of misspecification. In other words, means that it indicates that the model is no misspecification of incorrect functional forms, omitted variables, and the relationship between the independent variables and also the error terms. In this case, our group decided to use F-statistic and does not consider the t-statistic values because our model is more than one independent variable since t-test is only applicable for the model that only has one variable. As Table 4.4 shows above, we can see that, since the P-value of F-statistic more than 0.1, our group conclude that

we do not reject the null hypothesis since our model does not face misspecification with result 0.8146, which is more than 0.1.

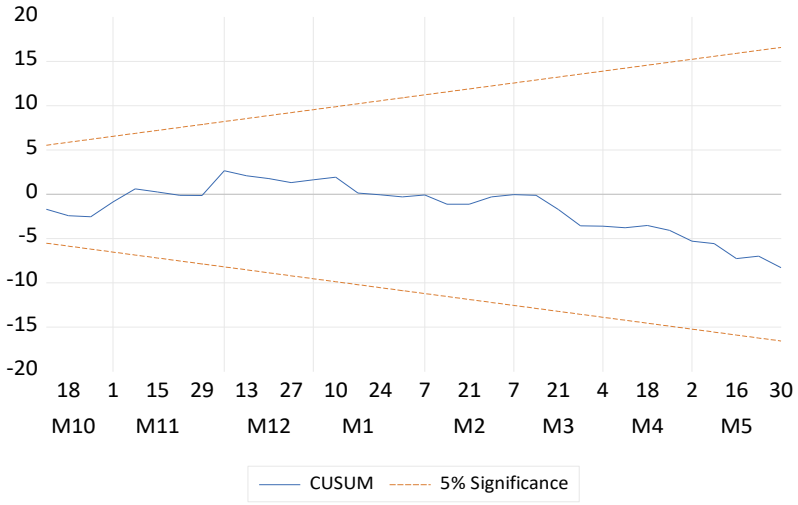

Figure 4.4.1. Result of CUSUM Test

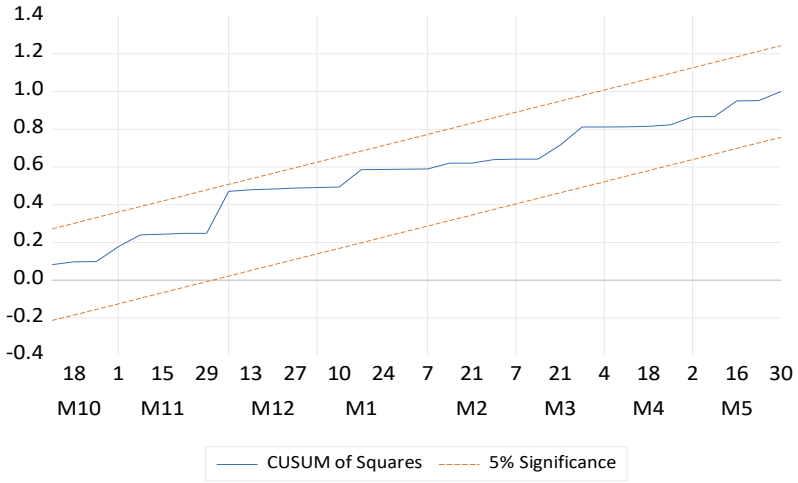

Figure 4.4.2. Result of CUSUM SQUARE Test

From Figure 4.4.1, it can be found that the cumulative sum for the empirical model is within the critical area at the significance level of 5%. It means that the parameter of the research model is stable during the sample period. Next, the cumulative sum of square test we run shown that it inside the two critical lines at 5% significance level (refer to Figure 4.4.2). This result implies that the residual of the model proposed in this study is stable during the sample period.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.1 Conclusion

Table 5.1:

Summary of ARDL

Hypotheses	Statement	Coefficient	P-value	Result
H_1	There is a significant relationship between the KLCI and the number of COVID-19 confirmed cases in Malaysia.	−0.0286	0.0247 < 0.05, Reject H_0	Accept H_1, Negative
H_2	There is a significant relationship between the KLCI and the Chicago Board of Options Exchange Volatility Index.	−0.1530	0.0001 < 0.05, Reject H_0	Accept H_1, Negative
H_3	There is a significant relationship between the KLCI and the Malaysian government stringency index.	0.1769	0.0096 < 0.05, Reject H_0	Accept H_1, Positive

Note. Collated by researchers.

As shown in Table 5.1, all p-value of independent variables in this proposed model, including the number of COVID-19 confirmed case in Malaysia, the CBOE Volatility Index and the Malaysian government stringency index, are below 0.05, showing that there is a significant relationship between the dependent variables, KLCI and the associated independent variables. In other words, this study rejects all the null hypotheses proposed in the previous section. Moreover, since the proposed model is estimated by using ADRL technique, it also proves that there is a co-integration relation between the dependent variable and underlying independent variables. In addition, the model has passed all the proposed diagnostic tests, so it can be judged that this study is worthy of further discussion and consideration by scholars and researchers, especially investors who are active in the stock market.

Based on the empirical results, this research paper suggests that investors who are interested to invest in Malaysia should pay attention to the number of confirmed cases before investor decide any investment involving in Malaysian stock market. In addition, investors should also be aware of the CBOE Volatility Index because it has a higher effect on the security market than the case, as demonstrated in Chapter 4. The most interesting is the Malaysian government stringency index. When the government imposes measures, such as a lockdown, investors assume that this will prevent the spread of the virus and accelerate the country's economy, thus making the Malaysian stock market return (KLCI Index) rise. These are external factors that investors should consider before making any investment decisions, especially during the pandemic.

5.1.1 Number of COVID-19 Confirmed Cases in Malaysia (H1)

According to data obtained by EViews, the data indicate it is a significant relationship between the KLCI and the number of COVID-19 confirmed case in Malaysia, as its P-value is less than 0.05, which is 0.0247. This study thus rejects the null hypothesis and accepts the alternative hypothesis. A coefficient of -0.0286 indicates that Malaysia's stock market returns are negatively correlated with the number of confirmed cases Malaysia. In other words, this research suggests that the increase in the number of confirmed cases in Malaysia has contributed to the decline in the country's stock market returns. This result is consistent with several previous studies mentioned in Chapter 2 (Lee et al.,2020; Keh & Tan, 2021; Ashraf, 2020; KHAN et al., 2020)

5.1.2 Chicago Board of Options Exchange (CBOE) Volatility Index (H2)

The results collected by using EViews show the relationship between KLCI and the CBOE Volatility Index is significant since the P-value is lower than 0.05, which is 0.0001. Therefore, this study rejects the null hypothesis and accepts the alternative hypothesis. The coefficient of -0.1530 is indicating a negative relation of KLCI to the CBOE Volatility Index. Which means, when the rise in the CBOE Volatility Index will caused the decline in Malaysian stock market returns, and this finding is consistent to previous research stated in Chapter 2 (Tissaoui & Zaghdoudi, 2020; Wang et al., 2021; Grima et al. 2021; O'Donnell et al. 2021).

5.1.3 Malaysian Government Stringency Index (H3)

Based on the results provided by EViews, it indicates a significant relationship between KLCI and the government's stringency index, as its p-value is less than 0.05, which is 0.0096. As a consequence, this study accepts the alternative hypothesis. Its coefficient of 0.1769 represents a positive reaction of Malaysian stock market returns to the government's stringency index. Therefore, this study shows that the rise in the Malaysian government's stringency index due to an increase in the KLCI. This result is consistent with several previous studies mentioned in Chapter 2 (Ashraf, 2020; Chia et al., 2020; Zaremba et al., 2021; Yang & Deng, 2021).

5.2 Contribution to the Literature

The study contributes to the existing literature in several important ways. Due to the lack of adequate studies that investigate the influence of pandemics on Malaysian economic activity, the study is intended to contribute to the understanding of this issue by looking at the impact of the COVID-19 pandemic on the Malaysian stock market. We analyze the relationship between Kuala Lumpur Composite Index (FBM KLCI), the number of COVID-19 cases, Chicago Board of Options Exchange Volatility Index (VIX), government stringency index (GS), using the weekly observations from February 2, 2020 until May 30, 2021 (a total of 70 weekly observations); we applied the autoregressive distributed lag (ARDL) model to identify the relationship between variables. The next contribution of this study is that it not only considers the effects of the domestic spread pattern of COVID-19 on the Malaysian stock market, but also the impacts on the Malaysian stock market before and after the Sabah election. To the best of our knowledge, our study is the one that includes pre-Sabah election and post-Sabah election as a dummy variable in our research model, which helps to provide explicit empirical evidence about whether and how it affects the Malaysian stock market. Thus, this

sets our study different from others since this variable has not yet been considered by the previous authors. In addition, this study adds values to the empirical literature on the COVID-19 pandemic that has caused a severe impact on global economies, including that of Malaysia, and contributes to the science of pandemic economies. This would be a fruitful research study which provides a reference for academics, governments and investors in dealing with future unexpected circumstances or pandemics.

5.3 Policy Contribution

In this study, our group focused on analysing how the COVID-19 pandemic affected on KLCI Our group thinks that our study contributes to the existence of knowledge by investigating the unanticipated effect of a COVID-19 onset on KLCI. From the investor perspective, the finding of our study result illustrates (1) number of COVID-19 confirmed cases (CASES) have significant long-term negative effect on the KLCI. (2) The Chicago Board of Options Exchange Volatility Index (VIX) have a significant long-term negative effect on the KLCI. (3) The Malaysian Government Stringency Index (GS) have a significant long-term positive effect on the KLCI. Since the COVID-19 cases keep increasing, our group believe that there is a butterfly effect in number of confirmed cases. So, this research not only considers the future public health problem but also public financial status as well.

First, our study contributed how CASES, VIX, GS affect to KLCI due to the increases in the cases, the fears of the COVID-19 pandemic were resulted in the global supply shock, especially for the manufacturing sector who needs labour intensive. Secondly, our study contributed the definition and the function of the ARDL model, which is the model most suitable for the applications that have mixed variables of the stationary and non-stationary variables. Thirdly, our study may as a guideline to Malaysian policymakers to implement a suitable strategy and at the same time ensure the country's health care system. For example, the Malaysian

government implemented the Movement Control Order (MCO) that required the factories and offices to reduce the activities such as decrease labour force and productivity, it was ultimately negatively affected the profitability of companies. However, it was soothed investor sentiment and made the market become more confident. Lastly, our research may help the government in mitigating the effects of COVID-19 in the future since our research included dummy variable to represents the joint influence of the three independent variable before and after Sabah election on the Malaysian stock price. It is because if the authority does not handle it correctly, it will cause companies to shut down entirely and that is why the financial market in global was in panic mode.

In short, our study has a significant policy implication to the policymakers. The government institution and investment bank regulation should be collaborated to tackle this challenge by implementing several actions to manage the effect carried by the COVID-19 such as lockdown to increase investor confidence and reduce uncertainty on the market. It is because as a rational investor, they know that the stock price represents the potential future earnings of the company, so investors are worried about the uncertainty of the market, and the investor will tend to sell out the stock before the severity of the deterioration.

5.4 Limitation of the Study

There are not any research or study is perfect, every study or research have its limitation. However, many researchers choose to not discuss the limitations of their studies and research because it might decrease the value of the study for the audiences. In our opinion, discussion of the limitation of the study is important in order to help the audiences or researchers to develop more useful topic in future. Besides, every limitation can be a good recommendation for future study and research.

No doubt, this research also subject to several limitations. The first limitation of our research is lack of previous research on the topic. It is because there are fewer of COVID-19 related topic research and our topic is related to the effects of COVID-19 on the Malaysian stock market. It means that our research is consider a quite new study area or field that might have insufficient relevant theory foundation to support and justify. In addition, the second limitation is the data that we collected might not completed. It is because the outbreak of COVID-19 still happening in Malaysia which means the data is continuous. However, we have collected the latest data for our research. Last but not least, there are some variables that might affected the stock market Malaysia not included in this study. For instance, demographic variable. Due to the lack of data, we did not study this kind of variable such as age in our research.

5.5 Recommendations for the future study

The COVID-19 was affected almost every corner of the world and it was affected the global economy continuously. Nobody knows when the end of this pandemic is. The recommendation for further research of this topic, our group thinks that the researcher can use our research paper as a basal and have a further study. As the research presented above, our groups think that our independent variables are suitable for this topic and the result of the study was very satisfying, However, due to the shock of time and the need for our group to finish our research topic, our groups only use the data until 30/5/2021 only which is the total of 70 observations only. So, our groups recommend that, since the pandemic is still going on, other researchers use a longer period to collect more data and carry out more observation for example collect the data up until 31.12.2021 to make the topic become more latest and more convincing in the future.

Besides, our group think that for future research, maybe can add more factor that can show how the COVID-19 pandemic has affected the KLCI for example add Brent crude oil price (BRENT) as the other independent variable. It is because in this research, our group only use three independent variables only. The reason our group recommend adding BRENT as the other independent variable is, Malaysia is one of the oil exporters, if the oil price increase, then Malaysia's GDP will increase, this is also a good sign of the economy. If the economy is good, the stock index will tend to increase. According to Majuca (2020), the Brent crude oil and Malaysia's stock index had a positive relationship. So, our group was highly recommended to add BRENT as the other independence variable for the future.

In short, this study is not only highlighting the impact of this pandemic but also highlighted other factors for another researcher to refer.

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APPENDICES

Appendix 4.1

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for KLCI

Level:

Null Hypothesis: KLCI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.572606	0.4911
Test critical values:	1% level	-3.528515	
	5% level	-2.904198	
	10% level	-2.589562	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: KLCI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.603840	0.2801
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

*MacKinnon (1996) one-sided p-values.

First Difference:

Null Hypothesis: D(KLCI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.296801	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(KLCI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.247307	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.2

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for LNKLCI

Null Hypothesis: LNKLCI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.582384	0.4861
Test critical values:	1% level	-3.528515	
	5% level	-2.904198	
	10% level	-2.589562	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNKLCI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.615522	0.2750
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNKLCI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.310436	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNKLCI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.262127	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.3

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for GS

Null Hypothesis: GS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.153671	0.0273
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: GS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.321110	0.0715
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(GS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.704235	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(GS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.709103	0.0001
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.4

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for LNGS

Null Hypothesis: LNGS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.228786	0.0225
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.247447	0.0841
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.359326	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.400081	0.0002
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.5

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for CASES

Null Hypothesis: CASES has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.938114	0.9955
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CASES has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.680589	0.9703
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CASES) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.211494	0.2042
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CASES) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.655350	0.2582
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.6

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for LNCASES

Null Hypothesis: LNCASES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.833932	0.3614
Test critical values:	1% level	-3.528515	
	5% level	-2.904198	
	10% level	-2.589562	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCASES has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.654463	0.2585
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCASES) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.394813	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCASES) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.343379	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.7

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for VIX

Null Hypothesis: VIX has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.552976	0.1079
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: VIX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.797611	0.0225
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(VIX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.169484	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(VIX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.201117	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.8

Unit Root Test – Augmented Dickey–Fuller (ADF) Test for LNVIX

Null Hypothesis: LNVIX has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.647174	0.0887
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNVIX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.323895	0.0052
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNVIX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.771135	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNVIX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.906226	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

*MacKinnon (1996) one-sided p-values.

Appendix 4.9

Autoregressive Distributed Lag (ARDL) Bounds Test – F-Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.287022	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	68		Finite Sample: n=70	
		10%	2.482	3.31
		5%	2.924	3.86
		1%	3.916	5.088
			Finite Sample: n=65	
		10%	2.492	3.35
		5%	2.976	3.896
		1%	4.056	5.158

Appendix 4.10

Model Selection for ADRL Model – Akaike Information Criterion

Model Selection Criteria Table
Dependent Variable: LNKLSE
Date: 03/16/22 Time: 17:18
Sample: 2/02/2020 5/30/2021
Included observations: 68

Model	LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
465	179.683615	-5.172231	-4.873641	-5.054244	0.918456	ARDL(1, 1, 2, 0)
440	180.210288	-5.157888	-4.826122	-5.026791	0.918314	ARDL(1, 2, 2, 0)
490	178.149663	-5.156050	-4.890638	-5.051173	0.916049	ARDL(1, 0, 2, 0)
464	179.929312	-5.149373	-4.817607	-5.018277	0.917616	ARDL(1, 1, 2, 1)
495	176.791287	-5.145191	-4.912954	-5.053423	0.914004	ARDL(1, 0, 1, 0)
463	180.769151	-5.144520	-4.779577	-5.000314	0.918226	ARDL(1, 1, 2, 2)
340	179.716650	-5.142929	-4.811163	-5.011832	0.917083	ARDL(2, 1, 2, 0)
460	179.708972	-5.142696	-4.810930	-5.011600	0.917064	ARDL(1, 1, 3, 0)
439	180.703578	-5.142533	-4.777590	-4.998327	0.918063	ARDL(1, 2, 2, 1)
485	178.577825	-5.138722	-4.840133	-5.020735	0.915678	ARDL(1, 0, 3, 0)

Appendix 4.11

Estimation Results for the Selected ARDL Model

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGS	0.176888	0.066074	2.677135	0.0096
LNCASES	-0.028630	0.012421	-2.304971	0.0247
LNVIX	-0.153010	0.036080	-4.240831	0.0001
C	7.259855	0.231249	31.39414	0.0000

EC = LNKLSE - (0.1769*LNGS -0.0286*LNCASES -0.1530*LNVIX + 7.2599)

Appendix 4.12

ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNKLSE)
Selected Model: ARDL(1, 1, 2, 0)
Case 2: Restricted Constant and No Trend
Date: 03/16/22 Time: 17:23
Sample: 2/02/2020 5/30/2021
Included observations: 68

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.941356	0.481602	4.031035	0.0002
LNKLSE(-1)*	-0.267410	0.062330	-4.290251	0.0001
LNGS(-1)	0.047302	0.014181	3.335527	0.0015
LNCASES(-1)	-0.007656	0.003269	-2.341603	0.0226
LNVIX**	-0.040916	0.010935	-3.741648	0.0004
D(LNGS)	0.079898	0.023505	3.399174	0.0012
D(LNCASES)	-0.004353	0.002667	-1.632083	0.1080
D(LNCASES(-1))	-0.005581	0.002825	-1.975794	0.0529
DUMMY	0.027974	0.013417	2.084931	0.0414

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Appendix 4.13

ARDL Error Correction Regression

ARDL Error Correction Regression
Dependent Variable: D(LNKLSE)
Selected Model: ARDL(1, 1, 2, 0)
Case 2: Restricted Constant and No Trend
Date: 03/16/22 Time: 17:22
Sample: 2/02/2020 5/30/2021
Included observations: 68

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGS)	0.079898	0.018140	4.404457	0.0000
D(LNCASES)	-0.004353	0.002255	-1.930726	0.0583
D(LNCASES(-1))	-0.005581	0.002477	-2.253492	0.0280
DUMMY	0.027974	0.004692	5.962482	0.0000
CointEq(-1)*	-0.267410	0.040202	-6.651637	0.0000

R-squared	0.516214	Mean dependent var	0.000320
Adjusted R-squared	0.485498	S.D. dependent var	0.022828
S.E. of regression	0.016374	Akaike info criterion	-5.315537
Sum squared resid	0.016891	Schwarz criterion	-5.152338
Log likelihood	185.7283	Hannan-Quinn criter.	-5.250873
Durbin-Watson stat	1.879996		

* p-value incompatible with t-Bounds distribution.

Appendix 4.14

Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.188590	Prob. F(2,57)	0.8286
Obs*R-squared	0.447011	Prob. Chi-Square(2)	0.7997

Appendix 4.15

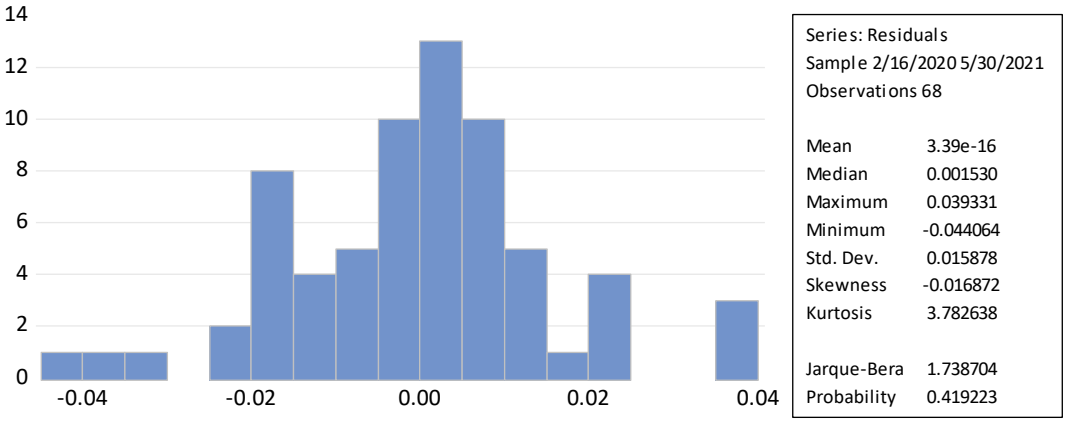
Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.107828	Prob. F(8,59)	0.3712
Obs*R-squared	8.880568	Prob. Chi-Square(8)	0.3525
Scaled explained SS	9.301513	Prob. Chi-Square(8)	0.3175

Appendix 4.16

Normality Test: Jarque-Bera



Appendix 4.17

Ramsey Reset Test

Ramsey RESET Test
Equation: UNTITLED
Omitted Variables: Squares of fitted values
Specification: LNKLSE LNKLSE(-1) LNGS LNGS(-1) LNCASES LNCASES(-1) LNCASES(-2) LNVIX DUMMY C

	Value	df	Probability
t-statistic	0.235596	58	0.8146
F-statistic	0.055505	(1, 58)	0.8146
Likelihood ratio	0.065044	1	0.7987

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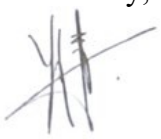

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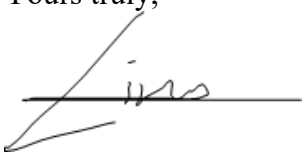

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Date : 7/4/2022

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CHAPTER 1: RESEARCH OVERVIEW

1.1 Research Background

Coronavirus 2019 (COVID-19), a highly infectious and dangerous disease caused by novel coronavirus, which was first detected in a respiratory disease outbreak in Wuhan City, Hubei Province, China. The outbreak was officially declared a global pandemic by the World Health Organization on 11 March 2020. The first COVID-19 case In Malaysia was detected on January 25, 2020 (Elengoe, 2020). However, due to the virus spread across states and local clusters of cases emerged, the number of confirmed cases increased dramatically in less than 2 months. The Sabah state elections held in September 2020 were responsible for the resurgence of COVID-19 infection, as people gathered despite Movement Control Order and returned home without quarantine measures (Hermesauto, 2020). Therefore, it is responsible for governments to strike a delicate balance between the mutually exclusive and competing objectives of protecting their citizens' health and promoting economic activity, which can have an unpredictable impact on stock market conditions. This situation has led the Malaysian government to implement different levels of Movement Control Order to effectively contain the current outbreak.

According to Dashveenjit (2020), the FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBM KLCI) fall 18% in the first quarter of 2020, heading for the biggest decline in a decade with March seeing the index fall 12%. The reason behind was that Malaysia's economy almost completely shut down between March and June 2020 due to the restriction of MCO regulations. As of May 1, 2020, 67.8% of 4,094 Malaysian companies had no sales during the MCO period. Malaysia's overall GDP contracted by 5.6% in 2020, as the second wave of the coronavirus caused by the Sabah election at the end of the year propelled the economy to its worst annual performance since the Asian financial crisis in 1998 (Anand, 2021). It also reflects the significant impact of government interventions on the Malaysian economy,

including the extended lockdown policy, strict social distancing measures and extensive travel restrictions. The effectiveness of these actions has created additional uncertainty, not only tightening domestic stock market conditions, but also a downward trend in private investment due to reduced household income and spending (Flanders, n.d.). However, some findings found that the number of new central depositary system (CDS) accounts opened between January and July 2020 jumped 125%, from about 97,000 a year earlier to about 218,000, as interest in equities became apparent among retail investors (The Edge Markets, 2020).

Besides that, negative news has the potential to derail the market's upward trajectory. According to Zhang (2020), the study showed a significantly increase trend in stock market volatility in February 2020 in the 10 countries with the highest number of COVID-19 confirmed cases: the United States., Italy, China, Spain Germany, France, United Kingdom, Switzerland, South Korea and the Netherlands. In Malaysia, four-digit cases have been recorded every day since the end of November 2020, which led the government to declare a state of emergency in January 2021, causing panic selling among investors. The participation in Bursa Malaysia by retail investors was also reported to be lower than expected (Shankar, 2021). However, there was also evidence that while government intervention could tip the economy into recession, aggressive policy measures could also help provide strong upward momentum for stocks once the economy responds, with lockdowns and social distancing being the classic examples.

According to Shazni (2020), the FBM KLCI has shown an upward trend since the introduction of the MCO. In an effort to shore up investor confidence and increase economic liquidity, the Bank Negara Malaysia cut interest rates twice by 25 basis points, taking its benchmark lending rate to 1.75% in March while the overnight policy rate (OPR) fell to its lowest level since 2010. According to Ee-Lin (2021), the FBM KLCI index has recorded the fastest V-shaped recovery in 2020 despite its poor performance earlier of the year. More than half of the listed companies have turned a profit and about 120 have seen their share prices more than double since the end of 2019. As of Dec 15, 2020, the market capitalization (cap) of listed

companies increased by RM121.08 billion compared to 2019, according to Bloomberg data. This showed that it will take time for the government and monetary authorities to fully recover from the stagnation of the real economy. In other words, the effectiveness of government interventions in economic activity, such as lockdown policies, workplace closures and social distancing measures may initially reduce stock prices, but its long-term impact remains to be seen.

To sum up, more studies have proved that the rapid spread of the epidemic has brought a big shock on global stock markets. The short-term economic impact was restricted economic activity due to strict quarantine policies, resulting in business bottlenecks for most small and medium-sized enterprises (SMEs), while the long-term economic impact was massive unemployment and business closures (Zhang, 2020). These adverse economic outcomes have the ability to influence an investor's psychological quality and investment decisions, which in turn may affect the performance and trends of the stock market. As more COVID-19 cases weigh on market sentiment, coupled with the impact of stringent government measures, these effects could eventually lead to unprecedented level of risk and volatility in Malaysian stock market condition, enabling investors to take these into account to make appropriate decisions.

1.2 Problem statement

In fact, it is undeniable that the dynamics and performance of global stock markets, including Malaysia, has been affected to some extent during the pandemic, either positively or negatively. Therefore, in this topic study, there are three independent variables that considered to have an impact on Malaysian stock market, including the number of COVID-19 confirmed cases, the Chicago Board of Options Exchange Volatility Index and the government stringency index. To sum up the key reasons for the importance of these three independent variables in this study, the number of diagnosed cases was definitely the focus of public attention during the COVID-19 outbreak. With the increase or decrease of the number, the government also adopted

measures of different severity to deal with and contain the rapid spread of the epidemic. In the end, these consequences increased unpredictable volatility in stock market performance, and panic gradually spread among investors. The main problem statement of this research is that although these variables seem to be negatively correlated with the stock market at first glance, the impact and significance of these variables over time remains to be observed.

1.2.1 Number of COVID-19 Confirmed Cases in Malaysia

The major concern of this research is on how the COVID-19 epidemic affects the stock market in Malaysia. In order to find the impact of COVID-19 on stock market, we have observed three independent variables during the COVID-19 pandemic. First of all, the problem statement we concern is the number of COVID-19 confirmed cases in Malaysia. As we mention in background of study, the first positive COVID-19 case is reported on 25, January 2020 in Malaysia. Initially, Malaysian government and citizens did not realize that how dangerous COVID-19 epidemic is. It can show by the Malaysia did not banned the traveler from China even there was a positive COVID-19 case reported on 25, January 2021. However, Shah et al. (2020) had found that Malaysian citizen started panic and government started take action to protect the health of citizen because of the number of COVID-19 positive cases keep increasing in Malaysia. Furthermore, Shah et al. (2020) had stated that the government of Malaysia was implement Movement Control Order (MCO) to encounter the spread of COVID-19 in Malaysia. No doubt, it makes a huge loss on the economy of Malaysia since there are many companies from different sector cannot operate as normal.

Since the Malaysian government worried about the economy of Malaysia cannot afford the losses, so the government have loosened the policy. In consequences, the COVID-19 positive cases keep increasing after the action taken by government, it forces government to lock down again and

implemented MCO 2.0. Currently, the government of Malaysia has implemented MCO 3.0 since the outbreak of COVID-19 is exposure again. It can show by there was a total 678,764 COVID-19 positive cases which reported by Ministry of Health Malaysia on 17, June 2021. According to Abdullah (2020), there was a total of 2766 COVID-19 positive cases had been reported by Ministry of Health Malaysia at March 31, 2020. As a comparison, the total cases nowadays are larger and more terrible. In short, the number of new COVID-19 positive cases will directly affect the actions taken by government while might indirectly affected the stock market through influence the revenue from each industry.

1.2.2 Chicago Board of Options Exchange Volatility Index (VIX)

First of all, we chose this index as our variable because the U.S. market is one of the largest stock markets in the world, so the index is considered to have the ability to influence stock markets around the world, including Malaysia. Secondly, as an indicator in the trading and finance sector, the index provides a quantitative measure of market risk and investor sentiment, which can help investors to use the index to measure the level of risk, fear or stress in the market when making investment decisions. It is worth noting that the Malaysian VIX is not used in this study, as the index only provides annual data, which cannot meet the requirements of weekly data that we need to use for data analysis. In fact, although the CBOE VIX is derived from the price of S&P 500 (SPX) index options, there is sufficient evidence from previous studies that this indicator can be adopted to investigate and validate the impact of the COVID-19 pandemic on the Malaysian stock market. According to Lee. et. al (2021), as Malaysia is an oil exporter, it is important for investors to consider external factors during the COVID-19 pandemic, and the CBOE VIX is one example. Their research proves that the Malaysian stock market is significantly influenced by the VIX. Specifically, the index has a significant negative correlation with all sector indices and KLCI except for the Real Estate Investment Fund (REIT) sector,

indicating that higher financial market volatility has negatively impacted Malaysian stock market performance.

Therefore, the problem statement is how the CBOE VIX affects Malaysia's stock index (KLCI) during the COVID-19 pandemic. As of mid-June 2020, the novel coronavirus has infected approximately 8.5 million people worldwide, resulting in more than 450,000 deaths. Most of the governments in different country has implemented a variety of lockdown-type tools during the pandemic to prevent the spread of COVID-19 (Just, 2020). As a result, this will affect the investor's emotion to do the decision-making. Besides, when the government keeps repeated announcements of new cases and deaths to the public and announces the rapid contamination and high death rates, this created a significant amount of uncertainty in the market. Hence, this will create panic in financial markets because there is a shock in supply and demand and at the end, it increased the severity of stock market volatility (Uddin et al., 2021). In short, the number of cases of COVID-19 is increasing, it will increase the public fear and the uncertainty in the market. Therefore, when the market is in uncertainty, our group think that the volatility index will be increased and affect KLCI negatively. Based on the previous research done by the researcher, they found that there is a negative relationship between VIX and the global stock market. It's because more volatility correlates, the larger possibility of a stock market downturn, whereas lower volatility correlates, a higher probability of a stock market rise (Easterling, 2021). The study's gaps include how the COVID-19 case influences volatility and how volatility indirectly affects the stock market.

1.2.3 Government Stringency Index

The third problem statement is how the government stringency index affects Malaysia's stock index (KLCI) during the COVID-19 pandemic. According to Ritchie et al. (2020), government stringency index is used to records the strictness of government policy based on nine metrics which includes school

and workplace closures, public event cancellations, public gathering limitations, public transportation closures, stay-at-home mandates, public information campaigns, internal mobility restrictions and foreign travel controls during COVID-19. Due to the outbreak of COVID-19, all of the government from different countries had implement the different level of social distancing measure on their country to prevent the spread of COVID-19. Although it can help to protect human health and reduce mortality rate, it also hurt most of the industry and bring a negative effect on economy. Then, stock market became volatile due to the uncertainty factor. According to Anh & Gan (2020), the research show that there is a positive relationship between lockdown and stock market return in Vietnam. It is because investors are confidence with Vietnam's government action and believe that the government can perform well in preventing virus outbreak. In the case of Malaysia, one of the factors supporting investor confidence is the government's efforts to reach out to existing investors to understand the needs of the industry during the implementation of MCO. As a result, investor sentiment towards Malaysia remains strong despite the pandemic (MIDA, 2021).

Furthermore, another study had shown that there is a direct negative relationship between government social distancing measure and stock market return because the measure has a negative influence on economy, however, there are also an indirect positive relationship between government social distancing measure and stock market return because the measure can help to reduce the cases of COVID-19 (Ashraf, 2020). In short, the index is updated with a frequency of each day and is based on a composite measure of nine response indicators in a country's response to the COVID-19 pandemic. It is recorded on a scale that reflects the extent of government action, adjusted from 0 to 100, where 100 is the most stringent response. Even in the case of weekly basis, the indicator has the ability to reflect the actual situation in the sampling period, as the data can help investors understand the government's response in a consistent way and aid the effort to combat the pandemic. It's important to note that the index only

records how strict government policies are. It does not measure or imply whether a country's response is appropriate or effective. A high score does not necessarily mean a country is "better" than a country with a lower index. Therefore, the result of our study can be positive or negative. The gap in this study is how the COVID-19 pandemic affect the level of government stringency and the level of government stringency affect the growth of COVID-19 confirm cases then affect the stock market.

1.3 Research Objectives

Our general objective of proposed this study is trying to identify the factors that might influenced Malaysian stock market during the COVID-19 pandemic. Next, the specific objective is trying to determine the relationship between the three independent variables proposed in this study and the condition of the stock market in Malaysia (Kuala Lumpur Composite Index) during the outbreak of the COVID-19 pandemic, whether their relationship is positive, negative or no relationship.

1.3.1 To examine the relationship between the condition of Malaysian stock market and the number of COVID-19 confirmed cases in Malaysia

First of all, the reason this study intends to investigate is that the large number of COVID-19 diagnosed cases in Malaysia indicates that the epidemic is spreading rapidly in the country. Furthermore, COVID-19 as one of the dangerous and new epidemics will affect the people afraid of it since it is the new uncertainty the people never face before. In logically, the businessman who also the investors will keep more funds and cash to support their own business. It means that the investors might less concern and invest in stock market and at the end there are less liquidity in the stock market Malaysia.

1.3.2 To investigate the relationship between the condition of Malaysian stock market and the Chicago Board Options Exchange Volatility Index

Next, this study intends to investigate this variable because the Chicago Board Option Exchange Volatility represents the volatility and fear of investors when investing in the US market. As we know, United Stated America as a strong country which have strong influencing power toward many countries in the worldwide. There are several index of USA might affect other countries' economy which included S&P 500, Gross Domestic Product and exchange rate of US dollar. According to Arora & Vamvakidis (2001), the economy growth of America has significant impact on the countries in the worldwide.

1.3.3 To identify the relationship between the condition of Malaysian stock market and the Malaysian government stringency index

Thirdly, government as a policy maker of a country, it was playing an important key role in the economy. The stock market and bond market are quickly response to the government's actions. For example, the government adjusted the interest rate by using the monetary policy and the bond price will be affected by the interest rate. In this case, the government Malaysia have implemented the social distancing policy, and travel restriction in order to prevent and control the spread of COVID-19. Thus, we would like to identity the relationship whether is positive or negative.

1.4 Research Questions

1. Will the number of COVID-19 confirmed cases in Malaysia affect the condition of stock market in Malaysia?

2. Will the condition of Malaysian stock market affected by the changes of Chicago Board Options Exchange Volatility Index?

3. Will the Malaysian government stringency level toward COVID-19 influence the condition of stock market Malaysia?

1.5 Significance of Study

In general, we conduct the research to help us identified and provided the investigation of factors that may affected the stock market Malaysia during the COVID-19 pandemic. We believe that it can be useful for academic and researchers to develop further research topics. As we mention in the background of study, we found that there was some evidence and studies had proved that the pandemic is caused by the occurrence of COVID-19 in Malaysia, and it have hit heavily on the Malaysian economy. During the COVID-19 pandemic, we have found that there were some factors that might influence the Malaysian stock market as well as we mention in problem statements.

In this research paper, we have explored some new factors and gather them together to run the test in order to explore more details and information related to our topic. The combination of the factors in this research paper is different compared with previous studies. It can help the researchers uncover and explore new fields that they have not explore before. Besides, this study is useful for the market

practitioners such as investors and speculators. It is because our research mainly focuses on the relationship between the factors and stock market Malaysia, the investors as well as the speculators can take this research as their consideration when they trade during the COVID-19 pandemic. Furthermore, the policy maker and government of Malaysia can understand how the government regulation affected the stock market Malaysia since one of the factors is government stringency.

CHAPTER 2: LITERATURE REVIEW

2.1 Relevant Theories/Concepts/Models

Risk perception will be the first theory to be applied in this research proposal. According to Wachinger et al. (2012), risk perception refers to the process of gathering, adopting, and interpreting signals about the unpredictable outcomes of events, activities, or technologies. Such signals can be categorized to direct experience (for example, witnessing a landslide) and indirect experience (for example, external information such as hearing about a disease outbreak from TV news).

While Ning et al. (2020) described risk perception as a personal intuitive risk assessment which reflects public attitudes or beliefs regarding potential harm. It is commonly acknowledged that perceived risk is the basis for triggering changes in behavior. Those who underestimate the potential harm of a risk occurrence, on the other hand, are less likely to adopt targeted measures in order to prevent it from happening. The outbreaks of H1N1 influenza and Ebola in the past few years have demonstrated the importance of risk perception in predicting behavioral changes. Knowledge typically shapes a person's risk perception, and it facilitates adequate self-assessment of the risk of an occurrence and its associated repercussions. Behavioral decisions may deviate from rationality as a result of biased risk perception, leading to severe social and economic implications eventually.

There are two exclusive forms of risk perceptions, which are affective and cognitive responses. Both of these forms may exhibit unusual patterns of modifications and adaptations over the course of public health crises. According to Slovic and Peters (2006), affective responses are defined as emotional reactions to risk, whereas cognitive elements comprise the perceived level of the threat and estimated coping efficacy of a person. While Cameron and Leventhal (2003) proposed that the affective responses are experiential, immediate, and intuitive; the cognitive

responses are deliberate, slow, and rule based. However, Brug et al. (2004) suggested that increased perceptions of risk or danger may only predict defensive behaviors, especially when the public believes that effective responses and defensive measures are easy to come by (response efficacy), and when they have high level of confidence in their abilities to interact and engage in such defensive measures (self-efficacy).

The other theories imposed in this research is **aggregate demand and supply.** According to Krishna & Skott (2006), this theory explains how the aggregate demand and aggregate supply interact at the macroeconomic level. Aggregate supply refers to the total quantity of production produced by enterprises in a nation, whereas aggregate demand refers to the total amount of money spent in a country on domestic goods and services. When aggregate demand equals aggregate supply and the prices of goods and services remain stable, the economy is said to be in equilibrium.

In this theory, when the price level of product rises, the firms are more likely to produce more product because they can earn more profit, while the consumers are less likely to consume the products because it is more expensive, hence supply rises and demand falls. According to Corporate Finance Institution (2021), aggregate demand would be affected by several factor which includes changes in consumer preferences, changes in interest rate, changes in inflation rate, changes in household wealth's level and foreign currency risk.

Following that, aggregate supply is elastic in the short run but inelastic in the long run. In the short run, the aggregate supply will be affected by the price level. In the long run, the aggregate supply will only be affected by technology, capital and labour. The aggregate demand also called real GDP which consist of four components includes consumer consumption, investments, government spending and net export.

Lastly, the theory that we will apply in this research is government intervention during the COVID-19 pandemic. **Government intervention** is defined as any action implemented by the government with the direct objective of influencing the

economy of a country on contract regulation and public goods and services (Gallego, n.d.). As in most imperfect competitive markets, a corporation may engage in abusive behavior especially monopolistic ones, which may result in a loss of welfare. In such instances, government intervention may be praised by consumers and businesses seeking cheaper prices and a profitable business portion. So, the government can implement some regulations such as price-fixing, taxation, and subsidies that may be used to restore and enhance the initial efficiency of natural monopoly. However, the government must exercise prudence while implementing and enforcing these rules and regulations. A misconception of market structure might result in a higher societal cost than the predicted benefit (Gallego, n.d.).

Government interventionists argue for the implementation of a variety of economic policies to address the flaws in the financial system that cause severe economic imbalances. They believe that the Law of Demand and Supply is inadequate to preserve equilibrium of the economy, so the government intervention is required to guarantee that the economy functions properly. It is because the extremely infectious COVID-19 pandemic struck without warning, producing unprecedented uncertainty regarding the disease's severity and whether a vaccine would be available worldwide. So, the emergency measures such as travel restrictions, lockdown, quarantining and testing, and economic packages were pushed in by governments throughout the globe to guarantee the country's economy and citizen health could be balanced (Ashraf, 2020).

2.2 Literature Review

Author	Model/ Methodology	Findings
Lee et al. (2020)	• Ordinary least squares regression analysis	• The number of COVID-19 confirmed cases has a significant impact on nearly all sectors in the Malaysian stock market.

	• Multicollinearity • Autocorrelation • Heteroscedasticity problem	• CBOE VIX have negative correlation with all sector indices Malaysia and KLCI but excluded REit fund sector.
Ashraf (2020)	• Pooled panel ordinary least squares regression model • Fixed-effects dummy variables	• The stock market reacts negatively to the number of COVID-19 confirmed cases. • A strong negative market reaction is observed, especially between 40 and 60 days after the initial reported cases. • Social distancing policies have both direct negative and indirect positive effects on stock market results.
Chia et al. (2020)	• Ordinary least squares (OLS) • Dummy variable	• The number of daily deaths has no significant relationship with the stock market returns. • The number of daily new COVID-19 cases would affect the returns on the indices significantly. • Malaysian stock market are response negatively toward movement control order announce by government.
Tissaoui & Zaghdoudi (2020)	• Spatial regression models • Benchmark OLS regression	• A significant positive geographical spillover effect between the financial markets of the United States and Europe and Asia.
Bahrini & Filfilan (2020)	• Panel data regression analysis	• Suggested that investors in the GCC stock markets are more concerned with reports of COVID-19 related deaths

		than the number of daily COVID-19 confirmed cases.
Wang et al. (2021)	• OLS method • LARS method	• The USD and the VIX are both negatively influence the returns on the S&P 500 stock index.
Hoshikawa & Yoshimi (2021)	• VAR estimation • GARCH estimation	• When the number of COVID-19 confirmed cases increases, the South Korean stock market is expected to become more volatile. • Lead to depreciation of the KRW against the USD.
Zaremba et al. (2021)	• Panel data regression analysis • Two-way fixed effects cluster-robust standard errors	• government policies have a small and limited impact on the stock market liquidity. • closure of workplaces or schools may reduce stock market liquidity, whereas public information campaigns promote additional trading.
Keh & Tan (2021)	• Ordinary least squares model	• The increment in COVID-19 confirmed cases has a negative relationship with the stock prices in Malaysia. • Government Stringency Index had reduced the risk of infection and the negative stock market reaction to the pandemic, having a positive and significant impact on share prices.
Yang & Deng (2021)	• Panel regression model with robust standard errors	• A gradual increase in the number of COVID-19 confirmed would still result in a negative effect on stock market returns.

		• government interventions can negatively affect stock market returns.
Topcu & Gulal (2020)	• Pooled ordinary least squares regression model • Unit root test	• The first two sub-samples were found to be experiencing negative impact caused by the COVID-19 pandemic. • When the period is extended to April 17, 2020, the impact of COVID-19 falls gradually and begins to taper off.
KHAN et al. (2020)	• Pooled ordinary least squares regression model • T-test • Mann-Whitney test	• The weekly growth rate of new infections will significantly reduce weekly stock market returns.
Grima et al. (2021)	• Unit root test • Fully Modified Ordinary Least-Square (FMOLS) • Co-integration Test • VAR model	• The CBOE VIX index are negatively influence the stock market indices which included the DJIA, DAX, FTSE100, SSEC and Nikkei225 significantly.
Anh & Gan (2020)	• Panel-data regression model with random-effects estimation	• The daily increase in the number of COVID-19 confirmed cases will adversely affect stock market returns in Vietnam. • a negative influence on Vietnam's stock return before to the COVID-19 lockout period.
O'Donnell et al.	• multiple linear regression analyses.	• Volatility was more essential compared to growth of Covid-19 cases in order to

(2021)	• linear regression model	explain the stock price. • early government intervention in China and the government intervention can affect the investor's sentiment.

2.2.1 The Impact of the Number of COVID-19 Confirmed Cases on the Stock Market

The number of COVID-19 confirmed cases is on the rise all across the world. The study by Lee et al. (2020) found evidence that increased COVID-19 confirmed cases may result in a significant impact on nearly all sectors in the Malaysian stock market. Before entering the Malaysian stock market, investors are encouraged to pay close attention to changes in the number of COVID-19 confirmed cases. Ashraf (2020) examined the stock market's response to the COVID-19 pandemic. Daily data of COVID-19 confirmed cases and stock market returns data from 64 countries were gathered, the findings showed that stock market returns decline when there is an increase in the number of COVID-19 confirmed cases in a country. Also, the author observed a strong negative market reaction in the early stages of reported cases, especially between 40 and 60 days after the initial reported cases.

The next study by Chia et al. (2020) argued that the number of daily deaths had no significant effect, but the number of daily new COVID-19 cases would affect the returns on the indices severely, specifically FTSE Bursa Malaysia KLCI Index, FTSE Bursa Malaysia Top 100 Index (T100), FTSE Bursa Malaysia Mid 70 Index (M70), EMAS Index (EMAS), EMAS Shariah Index (ESH) and Hijrah Shariah Index (HSH). Bahrini and Filfilan (2020) attempted to study the impact of COVID-19 by focusing on the stock markets in the Gulf Cooperation Council (GCC) countries. Unlike previous study by Chia et al. (2020), it was found that the number of COVID-19 confirmed deaths has a negative relationship with the GCC stock markets; nevertheless, no significant response is found between the number of daily

COVID-19 confirmed cases and GCC stock markets.

While Hoshikawa and Yoshimi (2021) revealed that an increase in the number of COVID-19 confirmed cases would cause sharp volatility in the South Korean stock market, resulting in rapid capital flight from foreign investors. This will further cause the South Korean won (SKW) to depreciate against the USD. However, the authors believed that the value of KRW will rise again as investors are likely to buy back the KRW seven days after an increase in new cases. The next findings contributed by Keh and Tan (2021) showed that the increment in COVID-19 confirmed cases would lead to a drop in Malaysian stock prices. Since the pandemic had created widespread uncertainty across the stock market, investors were apprehensive and pessimistic about future returns.

Yang and Deng (2021) tried to analyze the relationship between the COVID-19 pandemic and stock market returns. Data from 20 OECD countries, including the number of COVID-19 confirmed cases and stock market returns, were used in their study. They proved that stock market returns would be affected despite a gradual increase in number of COVID-19 confirmed cases. This results in in line with the findings by Ashraf (2020) and Chia et al. (2020). Topcu and Gulal (2020) divided sample periods into three sub-samples (i) March 10 – 31, 2020, (ii) March 10 - April 10, 2020, and (iii) March 10 - April 17, 2020, to investigate the impact of COVID-19 on emerging stock markets. The main results indicated that the pandemic has a significant negative impact on the emerging stock markets for the sub-samples of (i) and (ii), yet the impact of COVID-19 becomes insignificant when the time period extends to April 17, 2020. This is because the local governments took prompt action in time and announced larger stimulus packages in response to the rising number of COVID-19 confirmed cases.

The study conducted by KHAN et al. (2020) evidenced that the growth rate in weekly new cases has a considerable impact on weekly stock market returns. The COVID-19 pandemic wreaked havoc on the main stock indices of the following countries: the United States, China, Japan, South Korea,

Spain, Italy, Germany, France, the United Kingdom, Canada, Belgium, Denmark, Netherland, Norway, Sweden and Switzerland. According to Anh and Gan (2020), the daily increase in the number of infections would cause a detrimental effect on stock returns in Vietnam. In conclusion, most studies discovered a significant negative relationship between the number of COVID-19 confirmed cases and stock market returns.

2.2.2 The impact of Chicago Board of Options Exchange Volatility Index on the Stock Market

As we mention in part 1.2.1, we will select and review Chicago Board of Options Exchange Volatility Index as independent variable of our research due to the lack of daily Malaysia VIX data. In fact, we had found that there were previous researchers agreed that the Chicago Board of Options Exchange Volatility Index (CBOE)VIX will affect the worldwide stock market which include Malaysia stock market. According to Lee et al. (2020), since Malaysia is an oil-exporting country, the are many external factors which include CBOE VIX are required investors to consider when the Covid-19 pandemic. In addition, Lee et al. (2020) had found that CBOE VIX as one of the financial market volatility indices has a significant impact on Malaysian stock market. It is important to point out that the researchers have proved that CBOE VIX might be a factor that affecting the stock market in Malaysia. It can be showed by Lee et al. (2020) had found that there was a negative correlation between CBOE VIX with many sector indices in Malaysia which included Kuala Lumpur Composite Index (KLCI) significantly. However, the result show that only Real Estate Investment Fund (REIT) sector is the exception indices in Malaysia.

Subsequently, we have found that the study conducted by Grima et al. (2021) which stated that the CBOE VIX index are negatively influence the stock market indices which included the DJIA, DAX, FTSE100, SSEC and Nikkei225 significantly. However, the researchers have stated that the impact of VIX index on the China stock market indices is the weakest

among the stock market indices. Besides, the fear in the market which caused by the COVID-19 pandemic have indirect effect on the market. According to Wang et al (2021), the USD index and VIX index are both negatively associated to the returns on the S&P 500 stock index. Nevertheless, the S&P 500 stock index returns are positively related to the newspaper-based infectious illness "equity market volatility tracker". However, Wang et al (2021) had mentioned that the findings were limited to daily-frequency data, which cannot further provide additional information about the financial market effects of COVID-19-related uncertainty.

On the other hands, Tissaoui & Zaghdoudi (2020) had found that the relationship of fear index from US financial market to European financial markets for the European case is positive. It indicates that fluctuations in the fear index in Europe and Asia have a geographical influence on the changes of fear index in US, and vice versa. In simple words, when the fear index from US financial market increase, the fear index in Europe and Asia will also increase, vice versa. Besides, Tissaoui & Zaghdoudi (2020) had mentioned that the amount of fear in the American market (VIX) can be utilized to forecast the level of worry in the Euro-Asian markets. This implies that investors and asset managers with implied volatility positions may gain from the increased emphasis on implied volatility in the US and Euro-Asian indices. It is not hard to see O'Donnell et al. agree with the researchers, they had stated that volatility, which is commonly used to measure investor mood, was more important in explaining stock price than growth of COVID-19 cases. In short, most of the studies we found show the result of CBOE VIX have negative impact on the stock market.

2.2.3 The Impact of the Government Stringency Index on the Stock Market

As shown in previous study, government intervention had an impact on its stock market. Ashraf (2020) examine the stock market's response to government intervention. Over the period from January 22, 2020, to April

17, 2020, the daily data of Covid-19 confirmed cases, stock market return and government stringency index from 77 countries were gather, the finding showed that government announcements about the execution of social distancing policies have both direct negative and indirect positive effects on stock market results. Investors are pessimistic toward stock market because they predicted that these policies will lead an unfavourable impact on the economy. In other hand, investors are optimism toward stock market when they found that these policies had effective on reduction on Covid-19 confirm cases. It also found that public awareness programs, swab testing and quarantine policies, and salary assist plan have positively affected the stock market return in general.

The next study by Chia et al. (2020) found that the Malaysian stock market are response negatively toward movement control order announce by government due to the negative impact on business financial earning. However, the study argues that the positive impact to the favourable market sentiment resulted from the government's efforts to prevent the spread of COVID-19. The next study by Zaremba et al. (2021) examine the response of government policy toward stock market liquidity. The daily data were gathered from 49 countries over the period from January 2020 to April 2020. The finding showed that government policies such as closure of school and office and internal mobility restriction have a small and limited impact on the stock market liquidity. Some closure of workplaces or schools may reduce stock market liquidity, whereas public information campaigns promote additional trading. It is because closure of workplace and schools may cause a reduce on household income as it lower investors motivation to invest in hazardous investment. Nonetheless, all these effects are solely driven by emerging markets and literally play no role in modern countries.

Moreover, Keh & Tan (2021) had found that Government Stringency Index includes International Travel Control and Stay at Home Requirements policies had reduced the risk of infection and the negative stock market reaction to the pandemic, having a positive and significant impact on share prices. By banning individuals from other countries from entering the

country through strict travel restrictions, it is decreasing the number of COVID-19 cases from foreign country, not only helps reduce sentiment of uncertainty, but also increases investor confidence, a positive sentiment that will help stock prices rise. By staying at home, the stock market's negative reaction to COVID-19 was reduced, as it would reduce the risk of mortality, and instead investors developed a liking for "stay at home" stocks, such as technology stock, leading to a rise in stock prices. By deterring economic actors from conducting business and making investors gloomy about the stock market, other social distancing measures, such as the restriction of gatherings and the workplace closure policies, have negatively impacted stock prices.

Furthermore, Yang & Deng (2021) had found that government interventions such as social distancing and containment measures, can negatively impact stock market returns. However, the study only reflects market reactions in the short term. Since the time span covered is longer, it better reflects the counterproductive impact of government intervention on stock market returns. Besides, Yang & Deng (2021) had also stated that the stringency index, government response index, and containment and health index all had a substantial positive influence on stock market returns but the economic support index did not. According to Anh & Gan (2020), there is a negative influence on Vietnam's stock return before to the COVID-19 lockout period. The COVID-19 lockout, on the other hand, had a beneficial influence on Vietnam's stock performance. The reason for this is that investors trust the Vietnam government's reactions to Covid-19, and the undervalued stock price has enticed investors to invest. According to O'Donnell et al. (2021), the impact of COVID-19 on stock market indices in Italy, Spain, the United Kingdom, and the United States was enormous. However, the rise in COVID-19 has had no discernible impact on the prices of the Chinese SSE 180 index and the MSCI World index. It is because of the early government intervention in China and the government intervention can affect the investor's sentiment. It showed us the impact on stock market index will be different when there was different level of government intervention toward Covid-19.

2.3 The Study's Theoretical Framework

Risk perception has a significant relationship with the behavior of investors during the COVID-19 pandemic. Nearly all countries today are experiencing unprecedented economic impact as a result of the novel coronavirus. According to Wang et al. (2021), the outbreak of COVID-19 has increased the awareness of investors, the public, and policymakers that external uncertainties may result in tremendous economic damage, with unforeseeable repercussions. Whereas the pandemic has caused an aggregate impact on the stock market all over the world, and there is a shift in the spending behavior of households as well since they become more defensive and resistant to making investments.

Meanwhile, government interventions such as lockdown and the temporary closure of institutes and offices have rapidly disrupted people's daily lives, limiting the earnings of most individuals as well as investors. As a result, the investment behavior of investors in the financial market is heavily affected. The adverse impact of this global uncertainty has brought more instability for the investors. Wang et al. (2021) also stated that increased uncertainty may result in higher risk over various financial securities anticipated by financial investors. Since the functioning of financial markets is severely disrupted as a result of widespread uncertainty in general, risk perception in the financial market causes volatility in their decision-making process. Consequently, many financial investors are less likely to make investments in order to secure their cash or to reduce the risk of a financial return failure.

According to Samudra & Burghate (2012), individual decision making related to investing is heavily influenced by cognitive characteristics. Such psychological attributes include the capability to take risk, mental calculation, willingness to embrace financial risk and degree of risk aversion. Major events such as the financial crisis of 2007-2009 had caused a substantial influence on individual investors. The decline in investor wealth, along with market volatility, resulted in a shift in the individual investor perception and attitude (Hudomiet et al., 2010). Even Bucher-Koenen & Ziegelmeyer (2011) highlighted that investor might have been

driven to become over cautious when it came to investing in stocks. Investor attitude and behavior are expected to change especially during pandemic, with the priority shifting from return expectations to risk-aversion.

The **aggregate demand and supply theory has an indirect relationship with Malaysian stock market.** When the COVID-19 epidemic struck, most countries, including Malaysia, imposed a lockdown strategy to prevent the spread of COVID-19. This strategy forced practically all businesses to shut down their operations in a specific period, affecting the overall supply chain and economy. When the firm stopped and employees were unable to go to work, the manufacturing line was forced to stop, causing the aggregate supply to fall significantly.

According to The World Bank (n.d.), Malaysia's GDP decreased by 5.647 percent in 2020 compared to 2019. Due to the decline in aggregate supply, most businesses' profit margins have decreased, and they are facing financial struggles. The majority of businesses then proceeded to lay off people, causing the unemployment rate to rise. According to O'Neill (2022), the unemployment rate in year 2020 had risen to 4.55%, compare with the preceding 20 years' unemployment rate hovering around 3%. Moreover, the increase in unemployment rate had affected the household wealth's level. It causes a drop in consumer spending since customers cannot afford to spend much money. As a result, aggregate demand falls.

Next, the bad economy and the massive decline in revenue of most companies influenced investor behavior as they are less likely to invest their money in the stock market in this uncertainty period. In short, consumers and investors are more likely to save their money rather to spend it. According to Investopedia (2021), the economic data, interest rate and corporate result are the main factors affecting the demand of stock. Aggregate demand and supply can be used to measure a country's economic performance. As a result, when aggregate demand and supply decrease, the economy will suffer, and investors' attention will shift from return expectations to risk-aversion as mentioned in previous theory.

The **government's intervention** would have an impact on Malaysian stock market results, **either directly or indirectly**. The extremely infectious COVID-19 pandemic occurred unexpectedly, causing unparalleled uncertainty regarding the disease's severity and if a vaccine would be available. In response to the COVID-19 pandemic, governments throughout the world have implemented unprecedented steps. According to Duan et al. (2020), they mentioned that government intervention will directly affect the market. If health responses and containment, as well as economic assistance packages, have a beneficial influence on market growth, the future negative economic consequences will be reduced, and the market will expand as a result (Bo et al., 2021).

However, the result of long-term government interventions has a considerable detrimental influence on general economic and social well-being, including higher unemployment and company failures, there is an unavoidable trade-off between sickness management and economic repercussions (Coibion et al., 2020). Governments everywhere across the world immediately implemented emergency legislation to limit the spread and minimize risk exposures. Three primary kinds of government activities are economic assistance packages, immediate steps such as lockdown, and containment strategies. Surprisingly, these efforts heightened public concern, as many worried about the consequences of the abrupt shifts. Although the policies' long-term impacts are still being investigated, the trickle-down effect has resulted in fewer new diseases, job losses, and cost-cutting (Bo et al., 2021).

2.4 Hypotheses Development

In this study, we test hypotheses on the impact of proposed variables on Malaysian stock market conditions. Since the level of information efficiency in the market is the key to the profiteering by strategic participants, investors will use all the information they have when making investment decisions (Okorie & Lin, 2021). However, it is difficult to predict the trend of stock prices, especially during the epidemic. The main reason behind is that the stock market is constantly changing due to unpredictable events and unstable information. Taking previous empirical

studies as reference, the following are the three variables that this study considers having the power to affect the Malaysian stock market throughout the pandemic.

2.4.1 Number of COVID-19 Confirmed Case in Malaysia

H_0: A significant relationship does not exist between the condition of Malaysian stock market and the number of COVID-19 confirmed case in the country.

H_1: A significant relationship exists between the condition of Malaysian stock market and the number of COVID-19 confirmed case in the country.

As long as the coronavirus is contagious and immigrants exist, this virus has the ability to simultaneously affect the performance of enterprises in many of the world's economies and the dynamics of their stock markets. According to Okorie and Lin (2021), the study shows that the spread of COVID-19 pandemic has a substantial fractal contagion effect on the stock market. At the initial stage of COVID-19 pandemic, there was no effective vaccine developed to control its spread. As the result, the rapid spread of the epidemic announced a large number of deaths and positive results of diagnosis. In particular, due to the wake of the COVID-19 outbreak, citizens in economies with large numbers of confirmed Coronavirus cases are panicked, while businesses are temporarily shutting down or even exits the market. For investors, the fear of future stock market performance and the fear of possible global recession make it difficult for them to make decisions and take actions easily in the current market. Most investors liquidate their positions in order to have sufficient resources to resume normal business or make ends meet if necessary. This trend gradually spread among investors and affected the stock market. As many previous studies have pointed out, stock markets reacted negatively as the rise in diagnosed cases. However, Ashraf (2020) suggests that with the improvement of healthcare measures and policies, especially the successful development of vaccines, and the

gradual improvement of the government's ability to control the epidemic, investors' confidence and trust in them will gradually be restored and strengthened. Suppose, for example, that people are relatively less likely to contract and die from the Coronavirus once they have been vaccinated completely. Along with this phenomenon, businesses in many of the world's economies will be allowed to resume operations by local governments, and economic activity between countries will gradually resume after a temporary suspension. In other words, based on these predictions, it cannot be ruled out that the number of cases diagnosed in a country will not have much impact on its stock market in the future.

2.4.2 Chicago Board of Options Exchange (CBOE) Volatility Index

H_0: A significant relationship does not exist between the condition of Malaysian stock market and the CBOE Volatility Index.

H_1: A significant relationship exists between the condition of Malaysian stock market and the CBOE Volatility Index.

While the first wave of the epidemic in early 2020 caused economies in almost every country into a panic, the second wave of the COVID-19 pandemic in early 2021 led to similar actions, but at the city level. Not only did the rapid outbreak of COVID-19 create great uncertainty for the global economy, but the fear that this uncertainty caused spread among investors, ultimately contributing to the volatility of the stock market. As a measure of investor fear, the Chicago Board of Options Exchange (CBOE) Volatility Index, also known simply as the VIX or "Fear Index", can be factored into investors' decisions to help gauge expected volatility and future stock performance. For example, investors can use the volatility index to determine whether the market as a whole will rise or fall in the future. In general, a strong negative correlation exists between the VIX and stock

market conditions. As Grima et al. (2021) pointed out, the stock market has a significantly negative reaction to the VIX. An increase in the VIX could be a sign of market volatility or growing investor concern, pointing to future declines in stock prices. That is why the CBOE volatility index can be a way to help investors profit from such forecasts. However, it should not be ignored that the VIX, while historically moving in the opposite direction of the stock market, has also moved in tandem with the stock market. Therefore, this also means that investors should not use this variable as an absolute indicator of their investment decisions.

2.4.3 Malaysian Government Stringency Index

H_0: A significant relationship does not exist between the condition of Malaysian stock market and the government stringency index in the country.

H_1: A significant relationship exists between the condition of Malaysian stock market and the government stringency index in the country.

In response to the COVID-19 pandemic, governments in almost all economies have implemented emergency measures to effectively contain the outbreak, including lockdowns, travel restrictions, social distancing, and more. According to Ashraf (2020), the effectiveness of these measures is expected to generate additional uncertainty on the stock markets. In terms of immediate impact, the implementation of lockdown and stay-at-home policies strategically separates the population into infected and non-infected groups, thus allowing the rest of the population to resume normal life and saving lives. However, the fact is that it can impose huge costs on society in terms of reduced economic activity. Ultimately, these adverse valuation effects can be factored in or priced in by investors, leading to lower stock returns. Conversely, the study also suggests that stock markets may respond positively to government measures related to containment by reducing the risk of new infections and deaths, despite the direct negative impact on

economic activity of strict measures imposed by the government. According to Yang and Deng (2021), the stock market has reacted negatively to the number of diagnosed cases and the opposite to various government interventions. As suggested by Greenstone and Nigam (2020), government interventions related to containment could in turn bring significant economic benefits to the country by reducing new infections and deaths. In other words, the implementation of these measures may not only mitigate the negative impact on the stock market caused by the rise in diagnosed cases but may even improve it. The main reason is that people are more likely to carry out these actions efficiently in countries with strict government practices, especially social distancing policies.

CHAPTER 3: METHODOLOGY

3.1 Research design

The approach we used in our topic research is quantitative approach since we have collected secondary data on variables, namely Malaysian stock market indices, Malaysian government stringency index, the number of COVID-19 confirmed cases in Malaysia and Chicago Board of Options Exchange Volatility Index (VIX). We will explain the ways we collected the data in part 3.2. After that, we analytic all collected data through Autoregressive Distributed Lag (ARDL) model. It had fulfilled the idea that mention by Bhandari (2020) which quantitative approach is acquiring the data then analytic the data. According to Bhandari (2020), there are three approaches under quantitative approach which are descriptive research, experimental research, correlation research. Specifically, the correlation research will be conduct for this research paper. It is because correlation research is design for investigate the correlation between the independent and dependent variables.

3.2 Data Collection Method

Table 3.2:

Data collection method

Variable	**Proxy**	**Unit measurement**	**Source**
Kuala Lumpur Composite Index (Malaysian Stock Market Index)	$KLCI_t$ / Y_t	Index	Yahoo Finance
Malaysian Government Response Stringency Index	GS_t	Ordinal scale (Range: 0 to 100)	Oxford Coronavirus Government Response Tracker (OxCGRT)

The Number of COVID-19 Confirmed Cases in Malaysia	$CASES_t$	Case	World Health Organization (WHO)
Chicago Board of Options Exchange Volatility Index	VIX_t	Index	Yahoo Finance

In this study, secondary data will be collected to understand and identify the relationships between proposed variables, as well as the changes of dependent variable in different periods. We selected the time period based on an independent variable in our proposed model, which is the number of COVID-19 confirmed cases. Since most of the confirmed cases occurred after the election in Sabah (26 September 2020), this study intends to use October as the dividing line to see the time effect. We decided to use the weekly data instead of daily non-stop data. In order to compare the results of the different periods and solve the problem of data imbalance, we will select the weekly data with the same amount of observation in the two periods. In other words, the first period observation will be the same as the second period we chose. The first phase is from February 2, 2020 to September 27, 2020, and the second phase is from October 4, 2020 to May 30, 2021. There are 35 observations in each period, amounting to total of 70 observations.

In terms of the sources of data collection, the dependent variable, Kuala Lumpur Composite Index, was downloaded from finance.yahoo.com. For independent variables, data on the number of COVID-19 confirmed cases in Malaysia were obtained from the database on the website of the World Health Organization (WHO). The Malaysian government stringency index, a composite measure of the government's nine response indicators, was extracted from the Oxford Coronavirus Government Response Tracker (OxCGRT), the global panel database of pandemic policies. Historical data from the CBOE Volatility Index will be sampled using the same principles and resources as our dependent variable (Yt). In addition, the impact of COVID-19 on Malaysian stock market conditions can be seen by comparing weekly data from two different periods before and after the Sabah election. Since each independent variable is obtained from a trusted source, it can

be considered that the data collected is very reliable and the possibility of inaccurate data is very small.

3.3 Model Specification

The econometric model for our research can be expressed as follow (Equation 1):

$$\boldsymbol{LnY_t = \beta_0 + \beta_1 LnX_{1t} + \beta_2 LnX_{2t} + \beta_3 LnX_{3t} + D_t + \varepsilon_t} \quad (1)$$

Where,

LnY_t =Natural Logarithm of Kuala Lumpur Composite Index (KLCI)

LnX_{1t} =Natural Logarithm of Malaysian government stringency index

LnX_{2t} =Natural Logarithm of Number of COVID-19 weekly accumulated confirmed cases in Malaysia

LnX_{3t} =Natural Logarithm of Chicago Board of Options Exchange Volatility Index (VIX)

D_t =1 if after Sabah election, otherwise, =0

β_k =Parameter, where k= 0,1,2,3

ε_t =Error term

Our research will be conducted time series data analysis and the model equation 1 will be our econometric model. According to Shrestha and Bhatta (2018), there are three most basis model selection for time series data which are Ordinary Least Square model (OLS), Vector autoregressive model (VAR) and Autoregressive Distributed Lag (ARDL) model. In this case, we think that Autoregressive Distributed Lag (ARDL) model will be the most suitable for our econometric model among these three basis models. It is because the ARDL model allow us to take a substantial numbers of lag terms to describe the data generating process. Furthermore, we do not choose the VAR model or SVAR model is due to it have limitation on the length of lag terms (Shrestha & Bhatta, 2018). Although Ordinary Least Square model (OLS) is more easier to run for the research but it only applicable when the variable is stationary. However, ARDL model is an OLS based

model, but it can applicable when there have mixed variables of stationary and non-stationary variable. Besides, we can access the long-term connection between the independent and dependent variables without suffer in loss of the long run information based on ARDL model concept (Engle and Granger, 1987). It is not hard to see how Shrestha and Bhatta agree with Engle and Granger, they have mention that there was an error correction model which able easily derived from ARDL model to avoid the problem.

3.4 Estimation procedure

3.4.1 Unit Root Test

Since all variables proposed in our model belong to time series data, unit root testing is the first and essential test to be carried out in our research. In statistics, the unit root test is used to check the stationarity of a variable in a given time series, as it is essential for researchers to understand the characteristic of variables correctly. According to Shrestha and Bhatta (2018), while graphs are a preliminary tool that can give us a rough idea of stationary, the final decision basically requires statistical tests. In this study, we decided to use Augmented Dickey–Fuller (ADF) test because it is the most common method for testing unit root. The null hypotheses (H_0) is defined as the existence of unit roots, while the alternative hypotheses (H_1) is defined as the time series is trend stationary. In other words, if a time series is trend non-stationary, which indicates that the unit root process contains stochastic components. However, it is worth noting that non-stationary time series can be transformed into stationary time series by de-trending process. When a time series becomes stationary after a first-order difference, it is called a first-order integral, denoted as I(1). In this study, the main purpose of ADF test on level data and first-order difference to detect logarithmic and non-logarithmic series is to determine the integration

order of the four variables proposed and select an appropriate framework for analyzing time series data.

3.4.2 Autoregressive Distributed Lag (ARDL) Bounds Test

In general, methods for analyzing time series data are selected based on the results of unit root test. The reason is that if the proposed model is described incorrectly or using the wrong methods, it may provide biased results and unreliable estimates. There is a simple method to analyze the relationship by differentiating the non-stationary time series and making all variables stationary, namely the Ordinary Least Squares (OLS) method. However, its differences only represent short-term changes in time series and completely ignore long run information. Therefore, the Autoregressive Distributed Lag (ARDL) Bounds testing is the second test to be carried out in this study. The main purpose of this test is to determine whether there is a long-term relationship between the proposed variables by performing an F-test on the joint significance of the lag level coefficient of each variable (Peseran et al., 2001). In the case of small sample size, it is more effective to adopt the ARDL test for identity co-integration verification. Regression variables can tolerate different optimal lags, which allows researchers to obtain realistic and valid long run model estimates (Thao, 2016). The decision rule is to reject H_0 if the F-statistic is greater than the value of upper critical bound, I(1). Conversely, H_0 cannot be rejected if the F-statistic is less than the lower critical bound, I(0). However, it is worth nothing that the test is inconclusive if the F-statistic falls within the critical range, which is worthless. The hypotheses testing of the ARDL Bounds test is as follows:

H_0: A co-integration relationship does not exist between the proposed variables.

H_1: A co-integration relationship exists between the proposed variables.

The error correction version of the normal ARDL bound co-integration test model of Equation (1) can be framed as:

$$\triangle LnKLSE_t = \beta_0 + \beta_1 LnKLSE_{t-1} + \beta_2 LnGS_{t-1} + \beta_3 LnCASES_{t-1} + \beta_4 LnVIX_{t-1} + D_t + \sum_{i=0}^{P} \alpha_1 \triangle LnKLSE_{t-i} + \sum_{i=0}^{P} \alpha_2 \triangle LnGS_{t-i} + \sum_{i=0}^{P} \alpha_3 \triangle LnCASES_{t-i} + \sum_{i=0}^{P} \alpha_4 \triangle LnVIX_{t-i} + u_t$$

3.5 Diagnostic Checking

3.5.1 Serial Autocorrelation Test

Serial correlation, also known as temporal correlation, is a special case of correlation that describes the relationship between the values of the same variables over successive time intervals. Rather than dealing with variables X and Y, serial correlation focuses on lagged values of the same variables. However, most linear regression models assume error terms to be identically and independently distributed which means that there is no correlation between consecutive error terms. The violation of this assumption in the context of time-series research designs would result in serial correlation, where the errors are said to be autocorrelated or dependent (Abdulhafedh, 2017). There are several ways to detect the presence of serial correlation such as the residual scatter plots, the Durbin-Watson test, the Durbin h test and the Breusch-Godfrey LM test. Among the available tests, we are going to use the Breusch-Godfrey LM test to check for serial correlation problems in our research model. In addition to testing for serial correlation of any order, the LM test can also be applied to models with or without lagged dependent variables, making it one of the most commonly used tests (Uyanto, 2020). The decision rule is to reject H_0 if the P-value is less than the significance level. Otherwise, do not reject H_0. The hypothesis testing of the Breusch-Godfrey LM test is as follows:

H_0: Autocorrelation problem does not exist in the model.

H_1: Autocorrelation problem exists in the model.

3.5.2 Heteroscedasticity Test

Heteroscedasticity refers to the data with unequal variability (scatter) across the range of values of a second variable that predicts it. A significant part of the inference theory for the linear regression model is based on the assumption that the error terms are independently identically distributed. In particular, the errors terms are said to be homoscedastic when they are independently identically distributed. Nonetheless, this assumption may not always be guaranteed in practice, and it is well-known that heteroscedasticity can arise from misspecification as a result of overlooked nonlinear predictor terms or unobserved predictors that are not included in the model (Li & Yao, 2019).The introduction of the Breusch-Pagan test by Breusch and Pagan (1979) was found to be the first and perhaps most classic test that helps to determine whether there is heteroscedasticity existing in the regression model. Other than the Breusch-Pagan test, there are still many tests which can provide the same outcome such as the White test, the Park's test, the Glejser Test and the Speaeman's rank correlation test. For this paper, we use the Breusch-Pagan test to check for the problem of heteroscedasticity in our research model. The decision rule is to reject H_0 if the P-value is less than the significance level. Otherwise, do not reject H_0. The hypothesis testing of the Breusch-Pagan test is as follows:

H_0: Heteroscedasticity problem does not exist in the model.

H_1: Heteroscedasticity problem exists in the model.

3.5.3 Normality Test (Jarque-Bera Test)

Normality test is used to determine whether or not a data set follow the normal distribution (Jarque, 2014). The research result will be less reliability if the data set are not normal distributed. Next, the type of normality test includes Shapiro–Wilk test, Kolmogorov–Smirnov test, Lilliefors test, Cramer–von Mises test, Anderson–Darling test, D'Agostino–Pearson test, Jarque-Bera test and chi-squared test (Yap & Sim, 2011). Among the

available tests, we are going to use the Jarque-Bera test to determine the normality of our research data. According to Thadewald & Buning (2004), Jarque-Bera test calculate the Skewness and Kurtosis from a data set to determine the normality. Next, Skewness indicates the degree to which the distribution of a data set is symmetrical while Kurtosis indicate the degree to which the distribution of data set is peak. According to Stephanie (2021), the skew of a normal distribution is zero, whereas the kurtosis is three. Moreover, if Kurtosis are more than 3 means that the distribution is narrow while it less than three means that the distribution are flat. The decision rule is Reject H0 if the P-value is less than the significance level. Otherwise, do not reject H0. The hypotheses testing of the Jarque-Bera test is as follows:

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

3.5.4 Ramsey's RESET Test

It's a broad misspecification test that looks for missing variables as well as an incorrect functional form published by Ramsey in 1969. This test is based on the Lagrange Multiplier principle, and this usually performed using the values of the F-critical distribution. (Shukur & Mantalos, 2004) According to Thursby and Schmidt (1977), they used Monte Carlo methods to investigate the properties of eight different variants of the Rest test in systems with one to ten equations. When using the critical values of the F-distribution, they find that the Rao's F-test has the best performance in terms of the correct size. However, when they use the critical values of the x^2 -distribution, they find that the commonly used LRT (uncorrected for degrees-of-freedom), as well as the LM and Wald tests (both corrected and uncorrected), behave badly even in a single equation situation, and as the RESET proxies get smaller and resulting in the power of test decreases. (Shukur & Mantalos, 2004) As the result, the researcher will prefer to use the F test for functional form. The null hypothesis is that the correct specification is linear. The alternative hypothesis is the correct specification is non-linear (Boyd, n.d.). In short, misspecification tests such as the

Ramsey RESET test is a misspecification tests that have to pass because it may show that there is some sort of misspecification, but it does not specify what the right specification should be (Boyd, n.d.).

3.5.5 /3.5.6 Cumulative Sum (CUSUM) and CUSUM of Squares (CUSUMSQ) Test

There are two most commonly used parameter constancy tests are Cumulative Sum and Cumulative Sum of Squares (CUSUMSQ) tests, which were introduced by Brown et al. (1975). They are widely used because they are intended to test the null hypothesis of parameter stability against numerous alternatives (Caporale & Pittis, 2004). The CUSUM test is one of the methods for researchers to diagnostic the stability of the regression relationship over time when the regression model is under time series analysis. Cumulative sum test refers to the cumulative sum of the recursive residuals while the recursive residuals need to have constants variance and uncorrelated with zero means. We can determine that the stability of parameter of our research model by observe the present of cumulative sum is outside or inside the two critical lines. The cumulative sum will be presented outside the two 5% significance line when the parameter of the equation is instability. Otherwise, the parameter of the equation is stable if the cumulative sum inside between the two significance lines. If a researcher wants to detect random movement (those that do not necessarily come from structural changes in the coefficients), the CUSUMSQ test is suggested. As with CUSUM tests, moves outside the critical boundary imply parameter or variance instability. The cumulative sum of squares is usually within the 5% significance line, indicating that whether the residual is relatively stable or unstable. Therefore, we choose Ccumulative Sum and Cumulative Sum of Square tests as stability diagnostic tests for our research model.

CHAPTER 4: DATA ANALYSIS

4.1 Estimation Procedure

In order to fulfil the requirement for the boundary testing procedure, all the four proposed variables in our research model, whether taking log or not, must become stationary at the level data, I(0) or at the first difference, I(1).

Table 4.1:

Unit Root Test – Augmented Dickey–Fuller (ADF) Test Result

Series	**Intercept**		**Trend and Intercept**	
	T-stat	P-value	T-stat	P-value
Level				
KLCI	-1.5726	0.4911	-2.6038	0.2801
LNKLCI	-1.5824	0.4861	-2.6155	0.2750
GS	-3.1537**	0.0273	-3.3211*	0.0715
LNGS	-3.2288**	0.0225	-3.2474*	0.0841
CASES	0.9381	0.9955	-0.6806	0.9703
LNCASES	-1.8339	0.3614	-2.6545	0.2585
VIX	-2.5530	0.1079	-3.7976**	0.0225
LNVIX	-2.6472*	0.0887	-4.3239***	0.0052
First Difference				
ΔKLCI	-7.2968***	0.0000	-7.2473	0.0000***

ΔLNKLCI	-7.3104***	0.0000	-7.2621	0.0000***
ΔGS	-5.7042***	0.0000	-5.7091	0.0001***
ΔLNGS	-5.3593***	0.0000	-5.4001	0.0002***
ΔCASES	-2.2115	0.2042	-2.6554	0.2582
ΔLNCASES	-8.3948***	0.0000	-8.3434	0.0000***
ΔVIX	-8.1695***	0.0000	-8.2011	0.0000***
ΔLNVIX	-8.7711***	0.0000	-8.9062	0.0000***

Note. The selection of lag length for ADF test is based on Schwarz Criterion (SC), with a maximum allowable lag length of 10. ***, **, * represents null rejection at 1%, 5% and 10% level of significance (α), respectively.

As shown in Table 4.1, the ADF test for stationary summarizes that if the test equation contains trend or trend and intercept, whether the series is logarithmic or not, some of them are not trend stationary at the level data, as the p-values are not lesser than or equal to the 5% level of significance, indicating the existence of a unit roots. However, it is worth noting that, except for the series of CASES that does not take logarithms, the other series are trend stationary at the first difference with or without logarithms. As the result, we decide to use the logarithmic series as the underlying variables in the research model.

In this case, the logarithmic series may be co-integrated, but without validation, it may provide biased results and unreliable estimates. Therefore, the weekly series of LNKLCI, LNGS, LNCASES and LNVIX are adopted for the F-bound test. In order to proceed the ARDL modelling approach, the long-run model can be expressed as below:

$$\boldsymbol{LnKLCI_t = c_0 + c_1 LnGS_t + c_2 LnCASES_t + c_3 LnVIX_t + D_t + \varepsilon_t} \quad (1)$$

Table 4.2:

Autoregressive Distributed Lag (ARDL) Bounds Test – F-Bound Test Result

k = 3, Finite Sample: n = 70	**Wald F-statistics**	**8.287022**
Significance Level	**Critical Value**	
	Lower Bound – I(0)	**Upper Bound – I(1)**
10%	2.482	3.31
5%	2.924	3.86
1%	3.916	5.088

Note. Given 70 observations, critical values for bound test (Case II) are obtained from Narayan (2005) assuming restricted intercept and no trend.

From Table 4.2, the ARDL Bounds test for co-integration shows that the Wald F-statistic of the proposed variables (8.287022) is jointly greater than the value of the upper critical bound, I(1), indicating a long run relationship between the Malaysian stock market conditions and its determinants, namely the Malaysian Government Stringency Index (GS), the number of COVID-19 diagnosed cases in Malaysia (CASES) and the Chicago Board of Options Exchange Volatility Index (VIX).

Once the co-integration relationship between variables is determined, the next step is to model the short-run dynamic relationship by establishing error correction mechanism. Error correction model (ECM), which combines short-run dynamic and long-term equalization without losing long-run information. Therefore, the error correction term (ECT) must be included in the model as a regression, because its value represents the residuals from the ARDL co-integration model and the rate at which the previously unbalanced state is adjusted to the long-term equilibrium state (Engle and Granger, 1987). We take the coefficient value of the normalized co-integration equation as the error correction mechanism of the short-run disequilibrium to see whether the long-run relationship is significant. All the estimation results for the selected ARDL model are shown in Table 4.3.

Table 4.3:

Estimation Results for the Selected ARDL Model

Dependent Variable: LNKLCI		
Automatic selection of 4 lags dependent variable and 4 lags for regressors		
Variable	**Estimate / Coefficient**	**Prob. / P-value**
Long-run Relations		
LNGS	0.176888***	0.0096
LNCASES	-0.028630**	0.0247
LNVIX	-0.153010***	0.0001
Dummy	0.027974**	0.0414
Constant	7.259855***	0.0000
Short-run Dynamics		
Δ LNKLCI	1.941356***	0.0002
Δ LNGS	0.079898***	0.0012
Δ LNCASES	-0.004353	0.1080
Δ LNVIX	-0.040916***	0.0004
ECT	-0.267410***	0.0000

Note. Above model is estimated by using EViews. The ARDL (1,1,2,0) model selection method is based on Akaike Information Criterion. ***, **, * represents null rejection at 1%, 5% and 10% level of significance (α), respectively.

As shown in Table 4.3, the estimates of proposed variables in the long-run relationship are significant and robust. Based on the above results, Malaysian government stringency index (GS) and the Chicago Board of Options Exchange Volatility Index (VIX) have a significant long-term impact on Malaysian stock market (KLCI) at the 1% level, while the number of COVID-19 confirmed cases in

Malaysia (CASES) is at the 5% level. Among the variables, the long-run estimates show that the stock market have responded positively to GS, while negatively to CASES and VIX. Specifically, the elasticity of KLCI with respect to GS is about 0.1769, suggesting that if government stringency index increases by 1%, on average, stock prices increase by 0.18% in the long run, ceteris paribus. However, all else being equal, for every additional 1% increases in the number of COVID-19 diagnosed cases in Malaysia and the CBOE Volatility Index, stock prices will decrease on average by 0.03% and 0.15%, respectively.

As for the dummy variable (D), the purpose of this study to place it in the independent variable side of the model is to determine the impact of COVID-19 pandemic on the Malaysian stock market in two different periods, especially the rapid increase in COVID-19 confirmed cases after the Sabah elections held on September 26, 2020. As previous studies have shown, an increase in the number of diagnosed cases leads to a decline in stock market performance, while lockdown policies imposed by governments in the initial stages of an outbreak disrupt economic activity and sectors, ultimately leading to a severe global recession. These negative economic consequences had a ripple effect on the stock market, causing investor sentiment to panic because of the unpredictable volatility of the stock market. In short, the dummy variable of this study takes into account not only the impact of the number of diagnosed cases and investors' sentiment on the Malaysian stock market at different times of epidemic severity, but also the series of strict measures implemented by the local government after the outbreak.

By comparing the weekly data with two periods of the same amount of observations, the dummy variable of this study is to express the joint influence of these three determinants on the Malaysian stock market before and after the Sabah election, and the results show that there is a significant positive effect at the 5% level. The coefficient of the dummy variable is 0.02797, which reflects the 2.8% rise in the Malaysian stock market after the Sabah election. The results show that the measures taken and implemented by the Malaysian government in response to the COVID-19 outbreak have been effective over time. In other words, by reducing

the number of new infections and deaths, these measures not only helped mitigate the negative impact of the number of confirmed cases on the Malaysian stock market, but also helped restore investor confidence and trust in the local government and stock market with the successful development of the vaccine in the later stage. Therefore, the long-run equation can be written as below:

$$LnKLSE_t = 7.2599 + 0.1769LnGS_t - 0.0286LnCASES_t - 0.1530LnVIX_t + 0.02797D_t$$

Considering the short-run dynamics, the estimate suggests that GS has a significant and positive short term impact at the 1% level, while VIX is the opposite example with a significant and negative short term effect at the 1% level. No significant short-run effect on stock price is found in CASES. For the coefficient of error correction term (ECT), it is only allowed to be significant and within the range of -1 to 0, indicating the existence of long-term causality. If the coefficient is out of range or not significant, the model is considered inappropriate, and the model specification needs to be modified. If the value is equal to zero, there is no adjustment process, claiming that the long-term relationship is no longer meaningful (Anwar et al., 2020). The results showed that ECT with a value of -0.267410 was significant at the 1% level, suggesting that long-term relationship was a valid error correction mechanism in all specifications. In other words, any short-term deviation in stock prices will be corrected back to equilibrium. Since there is a co-integration, the error correction model (ECM) representation is specified as:

$$\Delta LnKLSE_t = \beta_0 + \beta_1 LnKLSE_{t-1} + \beta_2 LnGS_{t-1} + \beta_3 LnCASES_{t-1} + \beta_4 LnVIX_{t-1} + \beta_5 D_t + \sum_{i=0}^{P} \alpha_1 \Delta LnKLSE_{t-i} + \sum_{i=0}^{P} \alpha_2 \Delta LnGS_{t-i} + \sum_{i=0}^{P} \alpha_3 \Delta LnCASES_{t-i} + \sum_{i=0}^{P} \alpha_4 \Delta LnVIX_{t-i} + \varphi ECT_{t-1} + u_t$$

After using EViews to calculate and analyze the data, the results of all variables are consistent with most previous research results. According to Lee et al. (2020), their

research mentioned that investors will always depend on the change of confirmed cases before they make any investment decision. Most researchers claim that a rise in the number of COVID-19 diagnosed cases has a negative impact on the stock market, mainly because investors were worried and pessimistic about the future performance and returns of companies. Besides, the research done by the previous researchers said that the CBOE VIX has a negative relationship to the stock market. According to Grima et al. (2021), this research noted that the COVID-19 pandemic was caused fear in the market and indirectly affected the stock market since there is uncertainty in the market. According to Yang & Deng (2021), they argue that the longer the time span, the better the response of the government intervention indicators to the stock market, with a country's government stringency index being one example that has a significant impact on the country's stock market.

4.2 Diagnosis Checking

In addition to carrying out the above test, most importantly, evaluating the adequacy of the model's dynamic specifications against the various diagnostic tests is a step that must not be overlooked before making further inference. A total of six diagnostic tests will be adopted, namely the Breusch-Godfrey LM test, Breusch-Pagan test, Jarque-Bera test, Ramsey's RESET test, as well as Cumulative Sum (CUSUM) and CUSUM of Squares (CUSUMSQ) tests (95% bound). All the results of the diagnostic tests are shown in Table 4.4.

Table 4.4:

Results of Diagnosis Tests

Breusch-Godfrey Serial Correlation LM Test			
	Value		**Probability**
F-statistic	0.18859	Prob. F (2, 57)	0.8286

Obs *R-squared	0.447011	Prob. Chi-Square (2)	0.7997

Heteroscedasticity Test: Breusch-Pagan-Godfrey			
	Value		**Probability**
F-statistic	1.107828	Prob. F (8, 59)	0.3712
Obs *R-squared	8.880568	Prob. Chi-Square (8)	0.3525

Normality Test: Jarque-Bera			
	Value		**Probability**
Skewness	-0.016872	Prob.	0.4192
Kurtosis	3.782638		

Ramsey Reset Test			
	Value		**Probability**
t-statistic	0.235596	Prob. T (58)	0.8146
F-statistic	0.055551	Prob. F (1, 58)	0.8146
Likelihood ratio	0.065044	Prob. (1)	0.7987

CUSUM and CUSUM Square Test	
Empirical model: LnKLCI = f (LnGS, LnCASES, LnVIX)	**Remarks**
CUSUM (Figure 4.4.1)	*S*
CUSUM SQUARE (Figure 4.4.2)	*S*

Note. *S* indicates Stable.

For the Breusch-Godfrey serial correlation LM test, it is necessary that the p-value must be greater than the significance level in order to get rid of the autocorrelation problem. Based on the results given, the estimation model passes the serial correlation test with a P-value of 0.8286, which is greater than the significance levels of 1%, 5% and 10%. Therefore, the estimation result of the serial correlation is not rejected at these three levels. In other words, this test does not reject the null hypothesis. In short, the estimated model does not encounter the problem of serial correlation.

For the Breusch-Pagan-Godfrey test for heteroscedasticity, it is essential that the significance level must be less than the p-value in order to get rid of the heteroscedasticity problem. Based on the results given, the estimation model passes the heteroscedasticity test with a P-value of 0.3525. Therefore, the estimation result of the heteroscedasticity is not rejected at these three levels. As with the LM test above, this test does not reject the null hypothesis. In summary, the estimated model does not encounter the problem of heteroscedasticity, or the model is said to be homoscedasticity. Besides that, the results obtained from Jarque-Bera Test show that its P-value is more than the significance level of 1%, 5% and 10%, which is 0.4192. Therefore, it can be judged that the error term is normally distributed. Its skewness is -0.0168, close to zero, and its kurtosis is 3.7826, close to 3, which also indicates that the sample data we obtained are symmetric and moderate. Therefore, the research findings are reliable.

This Ramsey Rest test is supposed to discover both incorrect functional form and omitted parameters. This is the test we have to pass because it may show that there is some sort of misspecification. In other words, means that it indicates that the model is no misspecification of incorrect functional forms, omitted variables, and the relationship between the independent variables and also the error terms. In this case, our group decided to use F-statistic and does not consider the t-statistic values because our model is more than one independent variable since t-test is only applicable for the model that only has one variable. As Table 4.4 shows above, we can see that, since the P-value of F-statistic more than 0.1, our group conclude that we do not reject the null hypothesis since our model does not face misspecification with result 0.8146, which is more than 0.1.

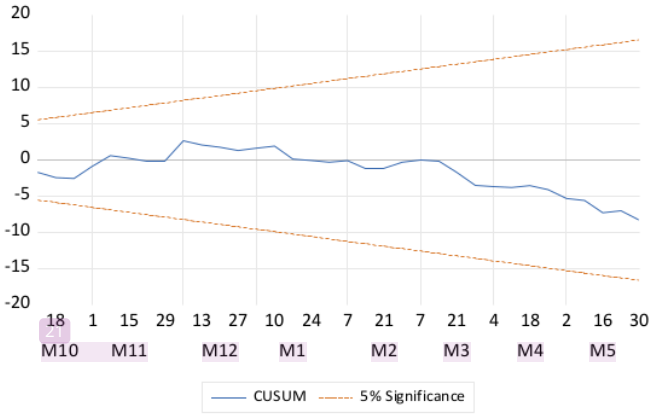

Figure 4.4.1. Result of CUSUM Test

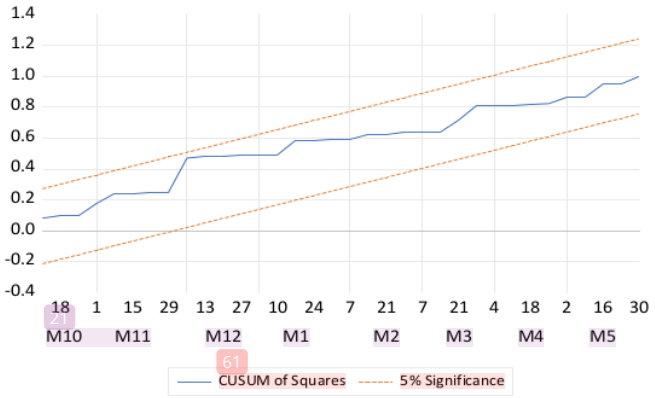

Figure 4.4.2. Result of CUSUM SQUARE Test

From Figure 4.4.1, it can be found that the cumulative sum for the empirical model is within the critical area at the significance level of 5%. It means that the parameter of the research model is stable during the sample period. Next, the cumulative sum of square test we run shown that it inside the two critical lines at 5% significance level (refer to Figure 4.4.2). This result implies that the residual of the model proposed in this study is stable during the sample period.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.1 Conclusion

Table 5.1:

Summary of ARDL

Hypotheses	Statement	Coefficient	P-value	Result
H_1	There is a significant relationship between the KLCI and the number of COVID-19 confirmed cases in Malaysia.	−0.0286	0.0247 < 0.05, Reject H_0	Accept H_1, Negative
H_2	There is a significant relationship between the KLCI and the Chicago Board of Options Exchange Volatility Index.	−0.1530	0.0001 < 0.05, Reject H_0	Accept H_1, Negative
H_3	There is a significant relationship between the KLCI and the Malaysian government stringency index.	0.1769	0.0096 < 0.05, Reject H_0	Accept H_1, Positive

Note. Collated by researchers.

As shown in Table 5.1, all p-value of independent variables in this proposed model, including the number of COVID-19 confirmed case in Malaysia, the CBOE Volatility Index and the Malaysian government stringency index, are below 0.05, showing that there is a significant relationship between the dependent variables, KLCI and the associated independent variables. In other words, this study rejects all the null hypotheses proposed in the previous section. Moreover, since the proposed model is estimated by using ADRL technique, it also proves that there is a co-integration relation between the dependent variable and underlying independent variables. In addition, the model has passed all the proposed diagnostic tests, so it can be judged that this study is worthy of further discussion and consideration by scholars and researchers, especially investors who are active in the stock market.

Based on the empirical results, this research paper suggests that investors who are interested to invest in Malaysia should pay attention to the number of confirmed cases before investor decide any investment involving in Malaysian stock market. In addition, investors should also be aware of the CBOE Volatility Index because it has a higher effect on the security market than the case, as demonstrated in Chapter 4. The most interesting is the Malaysian government stringency index. When the government imposes measures, such as a lockdown, investors assume that this will prevent the spread of the virus and accelerate the country's economy, thus making the Malaysian stock market return (KLCI Index) rise. These are external factors that investors should consider before making any investment decisions, especially during the pandemic.

5.1.1 Number of COVID-19 Confirmed Cases in Malaysia (H1)

According to data obtained by EViews, the data indicate it is a significant relationship between the KLCI and the number of COVID-19 confirmed case in Malaysia, as its P-value is less than 0.05, which is 0.0247. This study thus rejects the null hypothesis and accepts the alternative hypothesis. A coefficient of -0.0286 indicates that Malaysia's stock market returns are negatively correlated with the number of confirmed cases Malaysia. In other words, this research suggests that the increase in the number of confirmed cases in Malaysia has contributed to the decline in the country's stock market returns. This result is consistent with several previous studies mentioned in Chapter 2 (Lee et al.,2020; Keh & Tan, 2021; Ashraf, 2020; KHAN et al., 2020)

5.1.2 Chicago Board of Options Exchange (CBOE) Volatility Index (H2)

The results collected by using EViews show the relationship between KLCI and the CBOE Volatility Index is significant since the P-value is lower than 0.05, which is 0.0001. Therefore, this study rejects the null hypothesis and accepts the alternative hypothesis. The coefficient of -0.1530 is indicating a negative relation of KLCI to the CBOE Volatility Index. Which means, when the rise in the CBOE Volatility Index will caused the decline in Malaysian stock market returns, and this finding is consistent to previous research stated in Chapter 2 (Tissaoui & Zaghdoudi, 2020; Wang et al., 2021; Grima et al. 2021; O'Donnell et al. 2021).

5.1.3 Malaysian Government Stringency Index (H3)

Based on the results provided by EViews, it indicates a significant relationship between KLCI and the government's stringency index, as its p-value is less than 0.05, which is 0.0096. As a consequence, this study accepts the alternative hypothesis. Its coefficient of 0.1769 represents a positive

reaction of Malaysian stock market returns to the government's stringency index. Therefore, this study shows that the rise in the Malaysian government's stringency index due to an increase in the KLCI. This result is consistent with several previous studies mentioned in Chapter 2 (Ashraf, 2020; Chia et al., 2020; Zaremba et al., 2021; Yang & Deng, 2021).

5.2 Contribution to the Literature

The study contributes to the existing literature in several important ways. Due to the lack of adequate studies that investigate the influence of pandemics on Malaysian economic activity, the study is intended to contribute to the understanding of this issue by looking at the impact of the COVID-19 pandemic on the Malaysian stock market. We analyze the relationship between Kuala Lumpur Composite Index (FBM KLCI), the number of COVID-19 cases, Chicago Board of Options Exchange Volatility Index (VIX), government stringency index (GS), using the weekly observations from February 2, 2020 until May 30, 2021 (a total of 70 weekly observations); we applied the autoregressive distributed lag (ARDL) model to identify the relationship between variables. The next contribution of this study is that it not only considers the effects of the domestic spread pattern of COVID-19 on the Malaysian stock market, but also the impacts on the Malaysian stock market before and after the Sabah election. To the best of our knowledge, our study is the one that includes pre-Sabah election and post-Sabah election as a dummy variable in our research model, which helps to provide explicit empirical evidence about whether and how it affects the Malaysian stock market. Thus, this sets our study different from others since this variable has not yet been considered by the previous authors. In addition, this study adds values to the empirical literature on the COVID-19 pandemic that has caused a severe impact on global economies, including that of Malaysia, and contributes to the science of pandemic economies. This would be a fruitful research study which provides a reference for academics, governments and investors in dealing with future unexpected circumstances or pandemics.

5.3 Policy Contribution

In this study, our group focused on analysing how the COVID-19 pandemic affected on KLCI Our group thinks that our study contributes to the existence of knowledge by investigating the unanticipated effect of a COVID-19 onset on KLCI. From the investor perspective, the finding of our study result illustrates (1) number of COVID-19 confirmed cases (CASES) have significant long-term negative effect on the KLCI. (2) The Chicago Board of Options Exchange Volatility Index (VIX) have a significant long-term negative effect on the KLCI. (3) The Malaysian Government Stringency Index (GS) have a significant long-term positive effect on the KLCI. Since the COVID-19 cases keep increasing, our group believe that there is a butterfly effect in number of confirmed cases. So, this research not only considers the future public health problem but also public financial status as well.

First, our study contributed how CASES, VIX, GS affect to KLCI due to the increases in the cases, the fears of the COVID-19 pandemic were resulted in the global supply shock, especially for the manufacturing sector who needs labour intensive. Secondly, our study contributed the definition and the function of the ARDL model, which is the model most suitable for the applications that have mixed variables of the stationary and non-stationary variables. Thirdly, our study may as a guideline to Malaysian policymakers to implement a suitable strategy and at the same time ensure the country's health care system. For example, the Malaysian government implemented the Movement Control Order (MCO) that required the factories and offices to reduce the activities such as decrease labour force and productivity, it was ultimately negatively affected the profitability of companies. However, it was soothed investor sentiment and made the market become more confident. Lastly, our research may help the government in mitigating the effects of COVID-19 in the future since our research included dummy variable to represents the joint influence of the three independent variable before and after Sabah election on the Malaysian stock price. It is because if the authority does not handle it

correctly, it will cause companies to shut down entirely and that is why the financial market in global was in panic mode.

In short, our study has a significant policy implication to the policymakers. The government institution and investment bank regulation should be collaborated to tackle this challenge by implementing several actions to manage the effect carried by the COVID-19 such as lockdown to increase investor confidence and reduce uncertainty on the market. It is because as a rational investor, they know that the stock price represents the potential future earnings of the company, so investors are worried about the uncertainty of the market, and the investor will tend to sell out the stock before the severity of the deterioration.

5.4 Limitation of the Study

There are not any research or study is perfect, every study or research have its limitation. However, many researchers choose to not discuss the limitations of their studies and research because it might decrease the value of the study for the audiences. In our opinion, discussion of the limitation of the study is important in order to help the audiences or researchers to develop more useful topic in future. Besides, every limitation can be a good recommendation for future study and research.

No doubt, this research also subject to several limitations. The first limitation of our research is lack of previous research on the topic. It is because there are fewer of COVID-19 related topic research and our topic is related to the effects of COVID-19 on the Malaysian stock market. It means that our research is consider a quite new study area or field that might have insufficient relevant theory foundation to support and justify. In addition, the second limitation is the data that we collected might not completed. It is because the outbreak of COVID-19 still happening in Malaysia which means the data is continuous. However, we have collected the latest data for our research. Last but not least, there are some variables that might affected the stock market Malaysia not included in this study. For instance, demographic variable. Due to the lack of data, we did not study this kind of variable such as age in our research.

5.5 Recommendations for the future study

The COVID-19 was affected almost every corner of the world and it was affected the global economy continuously. Nobody knows when the end of this pandemic is. The recommendation for further research of this topic, our group thinks that the researcher can use our research paper as a basal and have a further study. As the research presented above, our groups think that our independent variables are suitable for this topic and the result of the study was very satisfying, However, due to the shock of time and the need for our group to finish our research topic, our groups only use the data until 30/5/2021 only which is the total of 70 observations only. So, our groups recommend that, since the pandemic is still going on, other researchers use a longer period to collect more data and carry out more observation for example collect the data up until 31.12.2021 to make the topic become more latest and more convincing in the future.

Besides, our group think that for future research, maybe can add more factor that can show how the COVID-19 pandemic has affected the KLCI for example add Brent crude oil price (BRENT) as the other independent variable. It is because in this research, our group only use three independent variables only. The reason our group recommend adding BRENT as the other independent variable is, Malaysia is one of the oil exporters, if the oil price increase, then Malaysia's GDP will increase, this is also a good sign of the economy. If the economy is good, the stock index will tend to increase. According to Majuca (2020), the Brent crude oil and Malaysia's stock index had a positive relationship. So, our group was highly recommended to add BRENT as the other independence variable for the future.

In short, this study is not only highlighting the impact of this pandemic but also highlighted other factors for another researcher to refer.

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