DETERMINANTS OF STOCK MARKET PERFORMANCE IN MALAYSIA

BY

KWONG SEN MIN

TAN HAW SHYAN

TAN HENG SIANG

TAN XIN YING

TUNG MUN YEE

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DECLARATION

We hereby declare that:

(1) This undergraduate research project 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 research project 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 research project.

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Name of Student:	Student ID:	Signature:
1. KWONG SEN MIN	13ABB06066	_____
2. TAN HAW SHYAN	13ABB02061	_____
3. TAN HENG SIANG	14ABB04826	_____
4. TAN XIN YING	13ABB05663	_____
5. TUNG MUN YEE	14ABB04498	_____

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LIST OF ABBREVIATIONS

ABS	Australian Bureau Of Statistics
APT	Arbitrage Pricing Theory
ARCH	Autoregressive Conditional Heteroscedastic
ASEAN	The Association of Southeast Asian Nations
BLUE	Best Linear Unbiased Efficient
BNM	Bank Negara Malaysia
BRIC	Brazil, Russia, India and China
CAPM	Capital Asset Pricing Model
CLRM	Classical Linear Regression Model
CPI	Consumer Price Index
DCC	Dynamic Conditional Correlation
DJIA	Dow Jones Industrial Average
EUR	Euro
EXR	Exchange Rate
FTSE	Financial Times Stock Exchange
GDP	Gross Domestic Product

HAC	Heteroskedasticity And Autocorrelation Consistent
KLCI	Kuala Lumpur Composite Index
KLSE	Kuala Lumpur Stock Exchange
LOP	Law of One Price
MSE	Malayan Stock Exchange
OIL	Crude Oil Price
OLS	Ordinary Least Squares
PCA	Principle Components Analysis
PLS	Partial Squares Regression
PPP	Purchasing Power Parity
RESET	Ramsey's Regression Specification Error Test
RM	Ringgit Malaysia
SARS	Severe Acute Respiratory Syndrome
S&P500	Standard & Poor's 500 Index
SEM	Stock Exchange Of Malaysia
SPX	Standard & Poor's 500 Index
TOL	Tolerance
US	United Sates
USD	United States Dollar
VIF	Variance Inflation Factor
WLS	Weighted Least Squares
WTI	West Texas Intermediate

WWI	World War I

Abstract

For years, the study of determinants for stock market performance are well-documented. However, most of the studies are focus on the macroeconomic factors in the developed country context. In light of this, this research intends to bright the gap by examining the factors that affect the stock market performance in developing country namely Malaysia. More specifically, this research aims to extend the current literature reviews by including inflation rate, exchange rate, oil price and U.S. stock market performance in determining their relationships with the Malaysian stock market performance. By using Ordinary Least-Square regression method in E-views 7, multiple linear regression analysis is performed to examine the hypotheses and statistical relationships in a monthly basis from January 2009 to July 2016. The results conclude that U.S. stock market performance and inflation rate have a positive and negative relationship respectively with Malaysian stock market performance. On the other hand, this research also indicates that both the exchange rate and oil price have an insignificant relationship with Malaysian stock market performance.

Keywords: Malaysian stock market performance, multiple linear regression analysis, inflation rate, exchange rate, oil price, U.S. stock market performance

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

This chapter will give an overview of this research. Section 1.1 will discuss about the research background and then follow by the problem statement in section 1.2. Section 1.3 and Section 1.4 will present the research objectives and research questions respectively. In Section 1.5, hypotheses of the study will be formulated and continue by explaining the significance of the study in section 1.7. Then, this chapter will end with the chapter layout and conclusion.

1.1 Research Background

The study of stock market remains as one of the main interests for researches over the past decades. This is because the stock market is not only important for the investors who want to increase their wealth over times, but also important to the economy of a country since the stock market can act as one of the leading indicators for a country's current and future economy condition. This paper, therefore, is designed to investigate the factors affecting the stock market particularly in Malaysia.

1.1.1 Stock Market Crash in the History

Historically, the stock market crash in any of the country around the world had shown a detrimental impact to its own country and the world economy. The biggest economy depression in the 20th century, Great Depression, was one of the examples that according to Almunia, Bénétrix, Eichengreen, O'Rourke and Rua (2010), none of the financial crisis that happened after 1980s was similar to the deflationary environment facing like in 1930s. In fact, it was triggered by the stock market crash in 1929 (Shaikh, 2011). In general, the stock market crash was started on 24 October 1929 whereby the market opened at 305.85 but subsequently fell sharply to 272.32 (James, 2010). Before this, the United States (US) stock market index, Dow Jones Industrial Average (DJIA), indeed, was almost doubled in 1929 relative to 1926 with the highest point at 386.1 on September 1929 (James, 2010). Unfortunately, the DJIA fell to the lowest (40.56 points) in July 1932 by incurring more than $20bilion losses to the investors and reducing U.S. gross domestic product (GDP) from $103.1 billion to $58 billion (James, 2010). In addition, the study of Bordo and James (2010) revealed that the depression was spread to the other countries through the fixed exchange gold standard that exercised during that period.

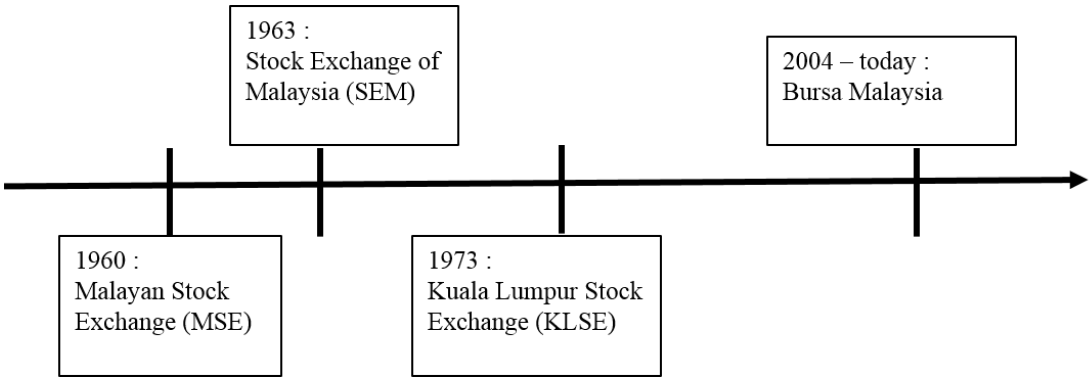
From the history of Great Depression which was initiated by the stock market crash in 1929, it had incurred huge losses to the investors and economy. Similarly, after 62 years, there was another case which had similar impacts as in Great Depression. It was Japan's asset bubble in 1991. In fact, US was able to recover from the Great Depression after acquiring an 8 percent growth of output in 1939 (Bordo & James, 2010). However, Japan was unfortunately beaten by the crisis and went through a long economic slump which was famously known as the lost decade (Shimizu, Karato & Asami, 2010; Kupchan, 2012). Currently, the long economy lost was still felt by Japanese. Ironically, before the crisis happened, Japan was experiencing a rapid growth either in its economy or its stock market. For example, the Nikkei 225 stock market index rose to 40,000 in 1989 relative to around 10,000 in mid-1980s (Allen & Carletti, 2010). Besides, referring to per capita GDP, Japan was the fourth in the world during 1989 relative to its ranking 24th by 2010 (Kupchan, 2012).

However, when the enormous burble in stock prices and property prices were burst, a large wealth that accumulated before this collapsed (Martin & Ventura, 2012). The most direct impact from this asset bubble was the loss of 201 trillion yen and 36.4 trillion yen respectively in stock holdings from nonfinancial firms and banks between 1989 and 1991 (Kupchan, 2012). As a result, the whole country, either by firms or citizens, were prudent in spending because of the pessimistic future expectation on Japan's economy.

1.1.2 Stock Market in Malaysia

1.1.2.1 History of Stock Exchange in Malaysia

Figure 1.1.2.1: Timeline for Formation of Bursa Malaysia



Adapted from: Arshad, M. N. & Yahya, M. H. (2016). Relationship between Stock Market Returns and Exchange rates In Emerging Stock Markets. *Journal of Islamic Economics and Business*, *1*(2), 131-143.

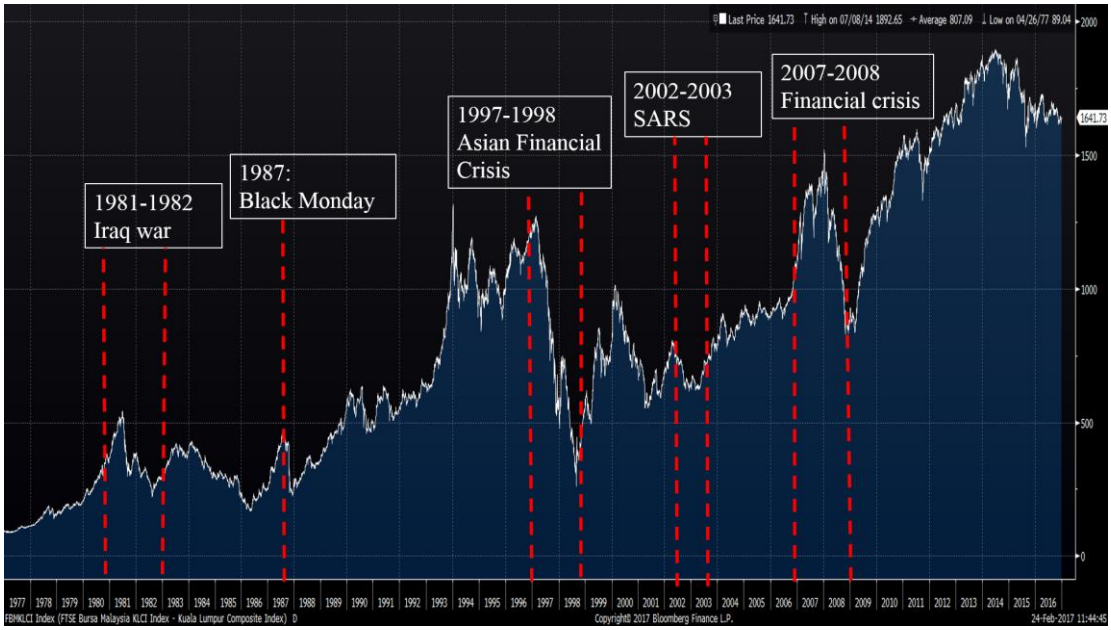
The history for formation of stock exchange in Malaysia was started as early as 1930s, but it was formerly formed and named as Malayan Stock Exchange (MSE) in 1960s

(Arshad & Yahya, 2016). After the formation of Malaysia in 1963, the stock exchange was again changed its name to Stock Exchange of Malaysia (SEM). Indeed, this stock exchange was the common trading floor for Malaysia and Singapore. Besides, the currency for Malaysia and Singapore was exchangeable at par (RM1=S$1) which was known as exchange rate interchangeability since they were interdependent in terms of economy prior to 1973 (Schenk, 2013). However, Malaysia was terminated the interchangeability in 1973. Subsequently, the Stock Exchange of Singapore and Malaysia were separated at the same year. Under the new change, Singapore stock exchange was named as Stock Exchange of Singapore whereas Malaysia stock exchange was named as Kuala Lumpur Stock Exchange (KLSE) (Ibrahim, 2006; Arshad & Yahya, 2016). However, KLSE was renamed as Bursa Malaysia in 2004. After that, based on Arshad and Yahya (2016), Bursa Malaysia had recorded a number of 1,145 listed companies with a combination of around $235.28 billion in their market capitals at the end of February 2014.

1.1.2.2 Volatility of Stock Market in Malaysia

The globalization of market among the countries was an inevitable trend in the late of 20th century. In fact, Malaysia is benefited from this globalization era due to the reduction of financial and trade barrier among countries. (Yeoh, Hooy and Arsad, 2010). By exporting resources such as tin, rubber and palm oil, Malaysia had achieved a significant growth in economy from 1970s to 1990s. Besides, Malaysian stock market was grown tremendously in view of the importance to attract foreign capitals for the economy growth (Yeoh et al., 2010). However, the integration of financial sector with the global market was not always beneficial to the country. This view was supported by James (2010) and Tuyon and Ahmad (2016). They agreed that the integration would lead to more volatility of the stock market.

Figure 1.1.2.2 Global Incidents and KLCI from 1977-2016



Adapted from: Bloomberg, L. P. (2017). *Historical Data for FBMKLCI Index 03/01/1977 to 12/31/2016*. Retrieved from Bloomberg database.

Indeed, Malaysian stock market was very sensitive towards the internal and external factors such as economic and financial crises (Tuyon & Ahmad, 2016). According to figure 1.1.2.2, over the past few decades, Malaysia could feel the impacts of financial or economic problem around the world which resulted in decline of stock market index. Those crises were Iraq war (1981-1982), Black Monday (1987), Asian Financial Crisis (1997-1998), the outbreak of Severe Acute Respiratory Syndrome (2002-2003) and 2008 Financial Crisis (2007-2008).

In addition, Salamudin, Bakar, Ibrahim and Hassan (2010) revealed that the real economy and stock market of Malaysia were contracted significantly after hitting by the Asian Financial crisis in 1997. In particular, Malaysian stock market was declined due to the continuous depreciation of Ringgit Malaysia although Malaysian authorities tried to defense the value by spending RM9 Billion (Uddin & Ahsan,

2014). Likewise, by looking to a more recent case which was 2008 Financial Crisis, Malaysia was also inevitably affected by this global crisis. Indeed, the number of companies listed in Bursa Malaysia and their market capitals were decreased after the financial crises (Yeoh et al., 2010).

Through the history of stock crash and the volatility that experienced by Malaysian stock market, it was clear that stock market would affect by either internal or external factors.

1.2 Problem Statement

As mentioned above, the stock market is a vital part for a country's economy. Undeniably, it plays a crucial role to support the economy growth of a country. Hence, many researchers have highlighted that the stock market of a country can work as an indicator to measure the economic development of that country. Many policymakers and investors believe that large decrease in stock index will lead to a future recession while dramatically boost of stock index is a reflection of a future economy growth. Recently, instability of Kuala Lumpur Composite Index (KLCI) has gained attentions from researches. This study will examine the determinants of the Malaysian stock market performance.

Indeed, investors invest their capitals in the stock market to protect themselves from the high anticipated inflation. Both Kaur (2015) and Subramanian (2015) explained that high inflation rate would significantly boost the stock market performance. Besides, the exchange rate is one of the determinants of Malaysian stock market performance as it might significantly affect the decision of the foreign investment in

Malaysia. More specifically, Mutuku and Ng'eny (2015) claimed that exchange rate is significantly related to the stock market performance in a positive manner.

On the other hand, US stands a significant position in the world economy. This might be due to the US dollar is a key currency for international trades. Most of the central bank and government in the world hold US dollar as their main international reserve currency (Lee, 2013). In light of this, investors around the world are concerned about any news that affecting US stock market. In fact, after the collapse of Lehman Brothers in 2008, the global economy was critically hit by the financial shock. Although KLCI is not as liquid as the foreign stock exchange market, decline of US stock market still rampage in the Malaysian stock market. The history showed that the KLCI was dropped from 1400 above to 850 below. This implies US Stock market might give a significant impact to the performance of Malaysian stock market.

Besides, Hadi, Yahya and Shaari (2009) stated that Malaysia is an oil production and exports country. As an oil production country, the high oil price in 2010-2014mid has driven the high economic growth in Malaysia. If the oil price continues to increase, Malaysia is expected to gain some economic benefits. Unfortunately, the price was lower in 2015 and gave critical impacts to the economy of Malaysia. This might indicate that crude oil price is one of the important variables to affect Malaysia's economy which will eventually affect the company's overall performance and stock market performance.

Nevertheless, most of the studies are carried out in developed countries and large economic nations instead of in developing markets such as Malaysia. There are lack of studies about the relationship between the selected determinants and the stock market. Besides, the data used are not the latest. Therefore, this study aims to extend the existing studies by examining the impact of US Stock Market, crude oil price,

inflation rate and exchange rate to the Malaysian stock market performance by using Ordinary Least Square (OLS) method.

1.3 Research Objectives

1.3.1 General Objective

This study intends to investigate the determinants of stock market performance in Malaysia. In brief, this study aims to identify how the selective factors influence the Malaysian stock market performance. Therefore, the primary goal of this study is to analyse the relationship between the selected variables and the Malaysian stock market performance.

1.3.2 Specific Objectives

1) To analyse the relationship between exchange rate and Malaysian stock market performance.
2) To analyse the relationship between inflation rate and Malaysian stock market performance.
3) To analyse the relationship between the U.S. stock market performance and Malaysian stock market performance.

4) To analyse the relationship between the crude oil price and Malaysian stock market performance.

5) To analyse the impact of the exchange rate, crude oil price, inflation rate and U.S. stock market performance on Malaysian stock market performance as a whole.

1.4 Research Questions

1) Are there any significant relationship between the exchange rate and Malaysian stock market performance?

2) Are there any significant relationship between the inflation rate and Malaysian stock market performance?

3) Are there any significant relationship between the U.S. stock market performance and Malaysian stock market performance?

4) Are there any significant relationship between the crude oil price and Malaysian stock market performance?

5) Can the Malaysian stock market performance be explained by the exchange rate, crude oil price, inflation rate and U.S. stock market performance as a whole?

1.5 Hypotheses of the Study

1.5.1 Exchange rate

H_0: There is no significant relationship between the exchange rate and Malaysian stock market performance.

H_1: There is a significant relationship between the exchange rate and Malaysian stock market performance.

1.5.2 Inflation Rate

H_0: There is no significant relationship between the inflation rate and Malaysian stock market performance.

H_1: There is a significant relationship between the inflation rate and Malaysian stock market performance.

1.5.3 U.S. Stock Market Performance

H_0: There is no significant relationship between U.S. stock market performance and Malaysian stock market performance.

H_1: There is a significant relationship between U.S. stock market performance and Malaysian stock market performance.

1.5.4 Crude Oil Price

H_0: There is no significant relationship between the crude oil price and Malaysian stock market performance.

H_1: There is a significant relationship between the crude oil price and Malaysian stock market performance.

1.6 Significance of the Study

This research intends to determine the relationship between explanatory variables (exchange rate, crude oil price, inflation rate and U.S. stock market performance) and the response variable (Malaysian stock market performance) with the monthly time series data from January 2009 to July 2016. By using a more recent data, this research might provide some updated indications to potential investors, government and policy makers, and future researchers in their relevant studies.

According to Murthy, Anthony and Vighneswaran (2017), the stock market is an open market where a firm's shares are being issued and traded. Investors will buy and sell those shares to pursue for greater returns and sustain their wealth. However, investors often fail to secure their desired returns from their investments. This is partly due to the uncertainty in the stock market as the market often reacts to changes in selective determinants and sometimes for some illogical reasons. Therefore, it is important for the investors to consider the selective factors in this research before investing in the stock market. In other words, the knowledge and deep understanding towards the selective variables are one of the key successes for the investors.

Besides, Janor, Halid and Rahman (2005) stated the researchers found that the stock market performance could reflect the expectation of the future economy of Malaysia. This shows that it is important for the government and policy makers to have a clearer picture by comprehending the relationship between the selective variables and the stock market performance since they play a vital role in regulating the economy policy of the country. Hence, they can increase the probability to predict the stock market behaviour correctly and this will assist them in drafting the policy.

Indeed, based on the previous researchers' empirical results, there is no consensus on how the selective variables can affect the stock market performance. However, this study will provide another prospective result by introducing the US stock market performance as one of the variables in the model. In other words, this study might further play as a guidance for the future researchers who investigate the determinants of the stock market performance in Malaysia.

1.7 Chapter Layout

The chapter layout of this study is organized as follow.

Chapter 1 discusses about the overview of the research by introducing the research background, objectives, questions, hypothesis and significance of this study.

Chapter 2 provides the details from the past researches such as literature reviews and theoretical frameworks behind this study.

Chapter 3 illustrates the sources of data collected, sample design, sample size, process of this study, research methods and tools involve in this study.

Chapter 4 explains the empirical result obtained by using the data collected and research methods that introduced in chapter 3.

Chapter 5 summarizes the result obtained in chapter 4 and discusses about the major findings, policy implications, limitations and recommendations of this study.

1.8 Conclusion

This chapter has provided the brief research background and the direction of this study. By having a brief understanding, the following chapter will review the past researches to provide an in depth understanding about this study.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In this chapter, the literature review that based on previous studies and related to this research topic will be carried out. By summarizing the literature review, it will provide a better understanding of the relationship between the dependent variable (Malaysian stock market performance) and each of the independent variable (exchange rate, inflation rate, U.S. stock market performance and crude oil price).

2.1 Review of the Literature

2.1.1 Stock Market Performance in Malaysia

A stock market is where the shares of public listed companies are issued and traded. Levine and Zervos (1998) stated that the stock market performance and development played a significant role in predicting the future economic growth.

In Malaysia, Kuala Lumpur Composite Index (KLCI) is the most widely used indicator for the stock market performance. KLCI consists of 30 top companies in Malaysia. In fact, the performances of these 30 companies have a significant effect on the Malaysia's economic growth. Policymakers such as government and the central bank will take the stock index into consideration when implementing fiscal policies or monetary policies to stabilize the country's economy.

There are many studies support that macroeconomic variable can be used to predict the movement of the stock index. Chen, Roll and Ross (1986) had started the research

on the relationship between economic forces and the stock performance in the early era. They found that inflation, industrial production and securities return had provided the basis for the long-term equilibrium through their impacts on current incomes and interest rates.

Besides, the study of Corradi, Distaso and Mele (2013) showed that Malaysian stock market was the fifth biggest market in Asia in terms of capitalisation before Asian financial crisis. In their study, almost 75% of the changes in the stock market variation could be explained by the macroeconomic factors.

On the other hand, Rahman, Sidek and Tafri (2009) stated that monetary policies' variables had a significant long-run effect on Malaysian stock market. In addition, Srinivasan (2011) also carried out the similar study in his research. The study showed that the share price index had a significant and positive relationship with the macroeconomic variables in the long run. Although both studies found the similar result, their selection of the variables were different. For Srinivasan (2011), inflation, money supply and industrial production were included in his study while Rahman et al.'s (2009) study selected the policies' variables such as the exchange rate, reserve rate, interest rate and money supply.

2.1.2 Exchange Rate

There are several studies in the past to study the relationship between the exchange rate and the stock market performance.

According to Kibria, Mehmood, Kamran, Arshad, Perveen and Sajid (2014), there was a positive and significant relationship between exchange rate and stock market performance. When the exchange rates increased, the stock prices would increase as well. This result is consistent with the study carried by Mutuku and Ng'eny (2015). Their study showed an evidence of the positive relationship between stock prices and

currency values with respect to the USD and the EUR, where the home currencies appreciated when stock prices moved up (Reboredo, Rivera & Ugolini, 2016).

In the study of Katechos (2011), the model explained a significant proportion of exchange rate returns which all results were statistically significant and all coefficients had the correct sign. Furthermore, the sign of the relationship depend on the characteristics of the currencies that examined. For instance, the value of higher yielding currencies was positively related to global stock market returns and vice versa.

However, Moore and Wang (2014) stated that by founding a significant time-varying correlation between the two times series, it implied that the DCC Approach might be an appropriate approximation for investigating the relationship and resulted a negative relationship between the stock and foreign exchange markets. Besides, Ouma and Muriu (2014) also found that the impact of exchange rate on stock returns was significant and negative. In addition, the coefficients that stood for the relationship between two stock price indexes and exchange rate were all significantly negative (Tsai, 2012).

On the other hand, Chkili and Nguyen (2014) claimed that exchange rate changes did not affect stock market returns. Inversely, the impact from stock market returns to exchange rates was significant. Nonetheless, by using a Nonparametric Causality Test Approach, there was no linear or nonlinear causality relation between the share price and the exchange rate before the recent financial crisis, but the exchange rate could linearly and nonlinearly influenced the share price after the crisis (Liu & Wan, 2012).

After all, Tudor and Popescu (2012) found out a significant bilateral causality between exchange rates and share prices at 1% significant level. In brief, there are no mutual agreements in term of the relationship between the exchange rate and the stock market performance. This might be due to the different methods were employed in various researches.

2.1.3 Inflation Rate

There is always an argument on the relationship between the inflation rate and the stock market performance.

Firstly, some researches argued that a negative relationship was existed between the stock market and the inflation rate. Asayesh and Gharavi (2015) performed the Limer test by using a set of panel data across 10 companies in 10 years period and found that there was a strong negative relationship between inflation rate and stock market performance. However, some researchers claimed that the negative relationship between inflation and stock market performance was only in a weak degree. According to Bai (2014), there was a limited negative relationship between Consumer Price Index (CPI) and stock market performance in China due to the government interference. This statement is supported by Uwubanmwen and Eghosa (2015) which claimed that inflation rate was negatively and weakly related to the stock price. In other words, the inflation rate was not a strong predictor of stock return in Nigeria. Also, in the long run, Chia and Lim (2015) stated that Malaysian companies' share price was positively influenced by the money supply and the interest rate while negatively affected by the inflation.

On the other hand, Kaur (2015) and Subramanian (2015) stated that there was a positive relationship between the inflation rate and stock market performance. The result is consistent with the finding of Arouri, Dar, Bhanja, Tiwari and Teulon (2015). They claimed that the inflation would not weaken the stock prices of Pakistan in the long run. This statement was applicable when the CPI was taken into consideration, and without anticipated by the producer price index. Moreover, there were researchers who examined the relationship between macroeconomic variables and the US stock market. According to Jareño and Negrut (2016), they found that by studying the CPI with the Dow Jones Index, inflation had a positive effect on the US stock market performance.

However, some researchers claimed that the relationship between the inflation and stock market performance was insignificant. In Plíhal's (2016) study, Granger Causality Test was performed to analyse the relationship between macroeconomic variables and the stock market in Germany. The result showed that no macroeconomic indicators could explain the stock market performance.

Interestingly, Mbulawa (2015) discovered the inflation was applicable on both Fisher hypothesis and Fama hypothesis, which supported the positive and negative relationship with the stock market performance respectively when carrying out the Impulse Response Function and Forecast Error Variance Decomposition tests.

In short, according to the studies carried out by prior researchers, the relationship between inflation rate and stock market performance could be significant (positive or negative) and insignificant.

2.1.4 US Stock Market Performance

Various studies have been carried out to investigate the co-movement, cointegration or relationship between the stock market of a country with US. Overall, the studies do not come to a consensus about the relationship of a country's stock market with U.S stock market. There are several viewpoints about this relationship.

Firstly, some studies agreed that Malaysian stock market was related to U.S. stock market. Azizan and Sulong (2011) found that only the stock price and exchange rate of other countries had a relationship with Malaysian stock price after investigating the macroeconomic variables of Asia countries and U.S with Malaysian stock market. In particular, the sensitivity of Malaysian stock market was higher towards the changes of China stock market instead of U.S. stock market. Besides, Teng, Yen and Chua (2013) had shown that ASEAN-5's stock market was highly integrated with the stock market in U.S. and Japan in terms of finance by using monthly data from January

1991 to June 2010. In fact, they noticed an upward moving trend of financial integration among ASEAN-5 with the emerging and developed countries. Their study is supported by Chan, Karim and Karim (2010). Nevertheless, by using daily data from 1 March 1991 to 31 December 2007, Chan et al. (2010) indicated U.S stock market had more influences to ASEAN-5's stock market than Japan. Furthermore, the study that based on Pearson Correlation found a significant relationship between the stock market in emerging Asian and U.S. at a significance level of 0.01 (Sharma, 2011).

In long run, the Malaysian stock market and U.S. stock market were found to be integrated. Using wavelet methodology, a long run relationship was found between these two stock markets (Loh, 2013; Graham, Kiviaho & Nikkinen, 2012). Interestingly, both studies found that the degree of integration was varied across time scales. Loh's (2013) study showed that the movement of Asia-Pacific market and U.S stock market were different during the two financial crisis periods which were US sub-prime crisis and European debt crisis. On the other hand, Graham et al. (2012) noticed a change in pattern for the movement of stock market after 2006 which implied a short-term fluctuation relationship during the global financial crisis. In other words, the relationship might be strong or weak during that period and varied upon country. Moreover, the long-run relationship is found to be in line with the study of Palamalai, Kalaivani and Devakumar (2013). They examined the integration of stock market among emerging Asia-Pacific countries and United States. The result implied the stock market had brought together by a common force such as arbitrage activity in the long run.

Conversely, some researchers found a limited or no relationship between the stock market of Malaysia and U.S. According to Lim and Sek (2014), they did found the relationship between these two markets, but there was a limited interaction between them. However, the volatility of Malaysian stock market was largely affected by the volatility in U.S stock market during the pre-crisis and crisis period when comparing the results across periods. In addition, Khan (2011) found no cointegration between

China, Malaysia, Korea, France, Spain and Austria and United States. In general, both studies did not have enough evidence for the relationship between the stock market in Malaysia and U.S. when using daily data.

2.1.5 Crude Oil Price

There are several studies have been carried out in order to examine the relationship between the crude oil price and the stock market performance. In the study of Siddiqui (2014), the result showed that there was a statistically positive relationship between the crude oil price and stock market index. This result was further supported by Boubaker and Sghaier (2014) where the oil price changes were positively correlated to the stock market returns. When there was an increment in oil price, the stock price would appreciate.

Besides, Aloui, Nguyen, and Njeh (2012) also stated that the stock market performance was positively correlated with the crude oil price movement, especially in emerging market. In the research, when the market was in a bull market condition, the global market beta would increase as the emerging stock market returns increased. Nonetheless, in the research of Nguyen (2010), the results showed that there were both positive and negative relationship being examined between the West Texas Intermediate (WTI) oil returns and the emerging stock market performance.

The markets were positively correlated to the oil returns when the data used was at a lower frequency such as weekly or monthly data. In contrast, the markets were showing a negative relationship with the oil returns when the data used was at a higher frequency such as daily data. Furthermore, the former result is supported by Puah, Tan, and Isa (2009). They found that the world oil spot price had positive impacts on the stock market performance in the long run.

However, there are also studies that support the latter result which is shown in the research of Nguyen (2010). In addition, Dhaoui and Khraief (2014) employed the oil price, oil production, industrial production and short-term interest rate to test their relationships with the stock market performance. Their results showed that there was a statistically negative relationship between the oil price and stock market return. When the oil price increased, the stock market return would decline. Also, this result is supported by Nandha and Hammoudeh (2007). The market was showing a significant negative relationship when the oil market was down where the oil price was expressed in local currency.

On the other hand, Nordin, Nordin and Ismail (2014) found that there was a statistically insignificant relationship between crude oil price and stock market performance in both long run and short run. This result is supported by Ono (2011) in the study of oil price shocks and stock markets in BRICs.

In brief, most of the studies showed that the crude oil price was influencing the stock market performance positively. When the crude oil price increased, the stock market return would also increase.

2.2 Review of Relevant Theoretical Models

2.2.1 Arbitrage pricing theory

Arbitrage pricing theory (APT) which developed by Ross (1976) is an idea that the asset or portfolio investment's return can be anticipated through the linear effect of macroeconomic variables on market's return. Arbitrage pricing theory is an alternative to forecast the stock returns besides using Capital Asset Pricing Model (CAPM) (Kuwornu & Owusu-Nantwi, 2011). Ramadan (2012) stated that APT can

show a linear multi-factor relationship and non-diversifiable risk factors that affect the stock performance. Additionally, APT allows researchers to choose the best available variables and explain without any restrictions. Arbitrage pricing theory formula is shown by the equation below:

$$E(rj) = rf + bj1RP1 + bj2RP2 + bj3RP3 + bj4RP4 + \ldots + bjnRPn$$

Where:

E (rj)	= the expected return of asset or portfolio investment
rf	= the risk-free rate
bj	= the sensitivity of the asset return to the particular factor
RP	= the risk premium associated with the particular factor

2.2.2 Fisher Effect (Inflation vs Stock Return)

Fisher Effect is the earliest western theory that discussed on the relationship between the inflation rate and the interest rate. This theory was first proposed by Irving Fisher in 1930. The Fisher effect can also be known as Fisher hypothesis. The formula of the Fisher effect is $r=i-\pi^e$, where r is the real interest rate, i stands for nominal interest rate and π^e is the inflation rate. Through the formula, the nominal interest rate and the inflation rate should have a direct positive relationship under the assumption that the real interest rate is fixed and move independently from inflation. Hence Fisher (1930) concluded that when the nominal interest rate increased, the future value of money would drop.

In fact, Fisher effect is used to explain the relationship between the inflation rate and the stock return nowadays. This is because the stock is claimed as the real asset and its return is influenced by the expected and unexpected changes in the future inflation (Oprea, 2014). According to Bai (2014), there is a significant positive relationship between the inflation rate and stock return in 2011, especially the agriculture sector

where Fisher effect is applicable. The researcher concluded that when the inflation occurred, the stock price would increase. However, Umar and Spierdijk (2015) claimed that the Fisher effect was only happened in the long run when the inflation hedging was absent. In the view of Kimani and Mutuku (2013), the Fisher effect showed that when inflation rate increased, the interest rate would increase. This situation would cause the borrowing cost to become higher. As a result, the borrower would tend to not involve in the stock market due to the higher cost of debt. While for the investors, the increase of interest rate would attract them to enter the stock market to earn a higher return.

$$S_{(t)} = \lambda_1 + \lambda_2 〖CPI〗_t + \varepsilon_t$$

$S_{(t)}$ = return on the stock portfolio

λ_1 = constant

$\lambda_{(2)}$ = slope of coefficient

$〖CPI〗_t$ = Inflation rate

ε_t = the stochastic term which assumes the properties $\sim N(0, \delta 2)$.

Indeed, there are some adjustments from the original formula due to the researchers apply the stock market performance instead of the interest rate in the Fisher effect. The formula had been generalized above (Omotor, 2010).

2.2.3 Purchasing Power Parity Theory

Purchasing Power Parity (PPP) Theory was developed by Gustav Cassel in 1918 after the First World War (WWI). According to Kadochnikov (2013), there were serious economic problems after WWI. For instance, those problems were the burden of mutual war debts, major imbalances in the world trade and capital flows, high

inflation and unstable national currencies. In order to solve those problems, Cassel had formulated his version of PPP doctrine.

PPP is an economics theory that approximates the total adjustment that must be made on the currency exchange rate between countries. This allows the exchange to be equal to the purchasing power of each country's currency. In fact, this concept of PPP is often termed as absolute PPP. Relative PPP is said to hold when the rate of depreciation of one currency relative to another matches the difference in aggregate price inflation between the two countries concerned. If the nominal exchange rate is simply defined as the price of one currency, then the real exchange rate is the nominal exchange rate adjusted for relative national price level differences. When PPP holds, the real exchange rate is a constant, so that movements in the real exchange rate represent deviations from PPP (Sarno & Taylor, 2002).

The relative version of PPP is calculated as:

$$S = \frac{P1}{P2}$$

Where:

"S" = Exchange rate of currency 1 to currency 2

"P1" = Cost of good "x" in currency 1

"P2" = Cost of good "x" in currency 2

However, instead of looking at the aggregate price levels, the Law of One Price (LOP) applies to an individual commodity. LOP is another way of stating the concept of purchasing power parity. LOP is the economic theory that the price of a given security, commodity or asset has the same price when exchange rates are taken into consideration. LOP exists due to arbitrage opportunities. As stated in Lamont and Thaler (2003), LOP holds exactly in competitive markets with no transactions costs and no barriers of trade. In other words, LOP holds if the same asset is selling for two

different prices simultaneously which then attracts arbitrageurs to step in, correct the situation and make themselves a tidy profit at the same time. For instance, good X in country A is cheaper than country B, then a citizen of country B will buy in country A. The demands of good X in country A increase and lead to the price of good X in country A increases. Inversely, the demands of good X in country B decrease and its price tends to decrease. Hence, the prices of good X in both countries will move toward the equilibrium. In conclusion, there are no price differentials between two countries in the long run since market forces will equalize the prices between two countries and adjust the exchange rates.

2.2.4 Hotelling's Theory (Variable: Crude Oil Price)

Hotelling's theory is proposed by Harold Hotelling in 1931. This theory is used to predict the prices of non-renewable resources such as oil which based on the prevailing interest rate. Hotelling's theory assumes that the markets are efficient, at the same time, the owners of the non-renewable resources are motivated by profits. Hotelling (1931) states that the owners of the non-renewable resources can choose to keep the oil as a physical asset or turn it into a financial asset which depends on the prevailing interest rate in the market. For example, the owners will only provide a limited supply of oil if its yield is more than the interest-bearing instruments. If the owners predict the future oil prices will not keep going up with the prevailing interest rate, they will be better off by selling the oil for cash and purchasing the bonds (Chari & Christiano, 2014). On the contrary, if the owners expect the future oil prices will increase at a higher rate than the prevailing interest rate, they will choose to keep the oil underground, reduce current oil supplies, and thus increase the current oil prices in the market eventually (Hamilton, 2008).

However, the principle holds in the study of Hotelling (1931) is that the oil prices should increase at the prevailing interest rate year after year. In other words, the prices of the oil must grow at the market rate of interest which is known as the

"Hotelling r-percent rule". Therefore, the Hotelling holds that the oil prices should increase equivalent to the market rate of interest and the oil extraction rate should be constant in the market with its prices are rising (Minnitt, 2007).

The "Hotelling r-percent rule" can be written in an equation as below:

$$P_t = P_0 e^{rt}$$

Where:

P_t = Price in the period t

P_0 = Price in the initial period

r = Market interest rate

2.2.5 Law of Supply and Demand Theory

Generally, the concept of demand and supply is defined as below in term of its simplest form (Gale, 1955):

i. If the demand of a good is more than its supply [as shown in Figure 2.2.5(a)], the price of the good will increase.
ii. If the supply of a good is more than its demand [as shown in Figure 2.2.5(a)], the price of the good will decrease.
iii. The price will regulate by itself to the value at which the supply and demand are at the same point. This is known as economic equilibrium [as shown in Figure 2.2.5(b)].

Figure 2.2.5(a) Supply and demand curve

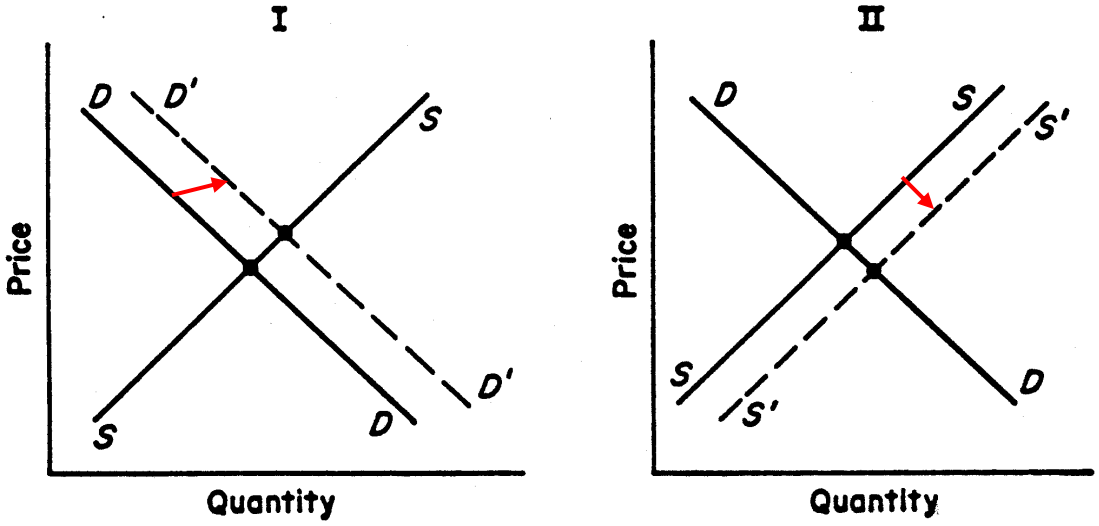
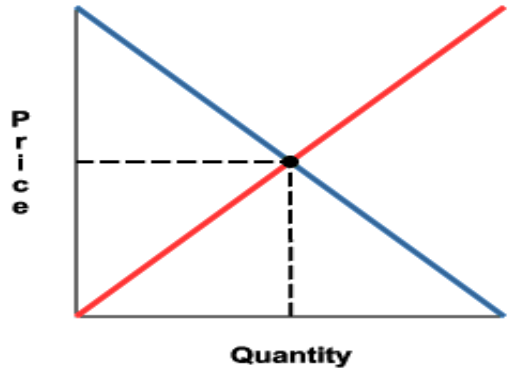


Figure 2.2.5(b) Equilibrium point of supply and demand curve



The section below will link the law of supply and demand to the exchange rate, oil price and inflation rate which subsequently affect the stock market.

2.2.5.1 Exchange Rate

According to Kandil, Berument and Dincer (2007), the exchange rate fluctuation is affected by its supply and demand. For instance, when the supply of the currency increases, its value will drop given that the demands of the currency remain unchanged. There are several ways that the currency can affect the stock price.

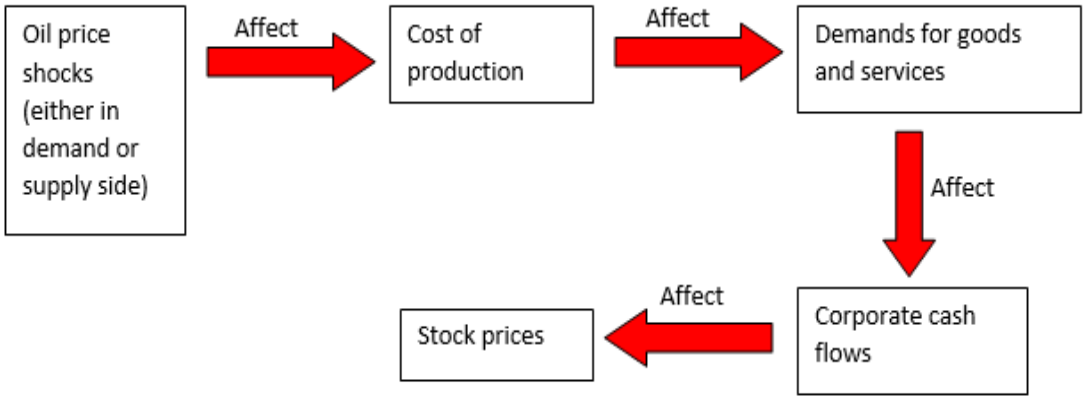
- ✓ When the value of the currency decreases, the foreign investors will deny to hold the assets of that decline currency because they earn lesser on their investment return (Dimitrova, 2005). Therefore, the pull out investment from the foreign investors might imply the company perform weakly and its share price decreases.
- ✓ Secondly, the import company might suffer by bearing more costs when the currency is weak. This is because the company's costs are higher which subsequently reduce its revenue. Furthermore, weak revenue might indicate the poor performance of the company and the share price will drop.
- ✓ From the perspective of macroeconomic level, a depreciated currency will improve export industry (Dimitrova, 2005). When the output of the economy increases, this indicates the economy is booming and the investors will invest in the stock market.

2.2.5.2 Oil Price

Previously, a number of researchers had studied the impact of oil price which caused by changes from demand side or supply side to the stock market. According to Kang, Ratti and Vespignani (2016), the long-term variation in US real stock return is contributed by the demand and supply shocks in oil market. In other words, the stock market in U.S. was affected by the supply and demand of the oil. Particularly, Kang et al. (2016) stated that the positive supply shock would affect the US real stock return positively and vice versa. Moreover, the study of Apergis and Miller (2009) added that structural changes in oil market (oil-supply shocks, global aggregate-

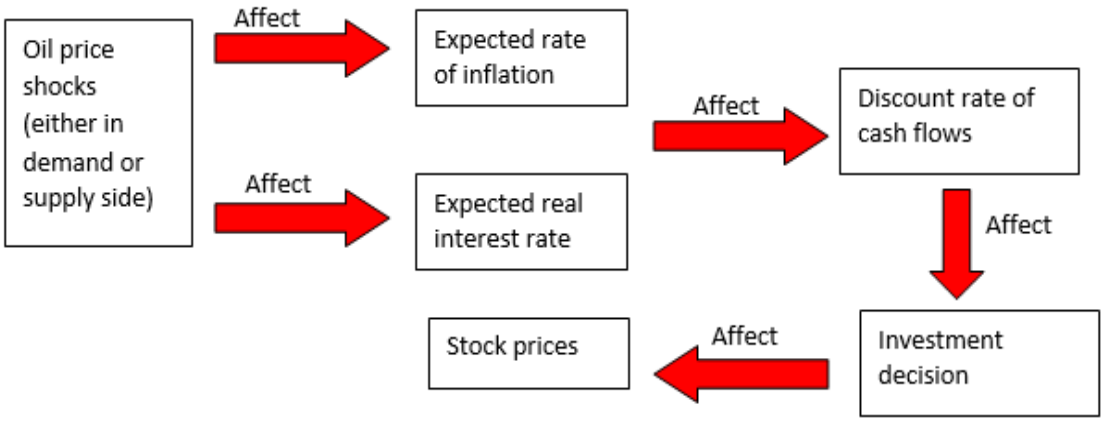
demand shocks, and global oil-demand shocks) would affect the stock market but in a small magnitude only.

Figure 2.2.5.2(a) Impact of oil price to the stock price



More specifically, Miller and Ratti (2009) identified the ways of oil price shocks influenced the stock prices through expected cash flows and the discount rate. The Figures below illustrate the ways of oil price shock affecting the stock prices:

Figure 2.2.5.2(b) Impact of oil price to the stock price



2.2.5.3 Inflation Rate

In general, inflation indicates the increasing of general prices for the products. Indeed, inflation can be further divided into demand pull inflation and cost push inflation. Both types of inflations can affect the economy and subsequently influence the stock market performance. For demand pull inflation, it usually occurs due to higher aggregate demand than aggregate supply during economy expansion (when real GDP increases). According to Zhang (2013), investors act positively towards low levels of demand pull inflation; however, when high levels of demand pull inflation occur, the economy will become inefficiency which results in an adverse stock value.

Cost push inflation, on the other hand, occurs when the output of economy drops. The rationale behind this situation is because of the increase costs for any four factors of production which are labour, capital, entrepreneurship or land. When production costs cannot be maintained due to reaching maximum productions, the company will pass the costs to consumers. As a result, people spend lesser and might ultimately drive the economy into recession. This was in line with the study of Zhang (2013) whereby the study stated expectation of recession in the future would cause the decline of stock value.

2.3 Proposed Theoretical/ Conceptual Framework

Figure 2.3 Proposed Theoretical Framework

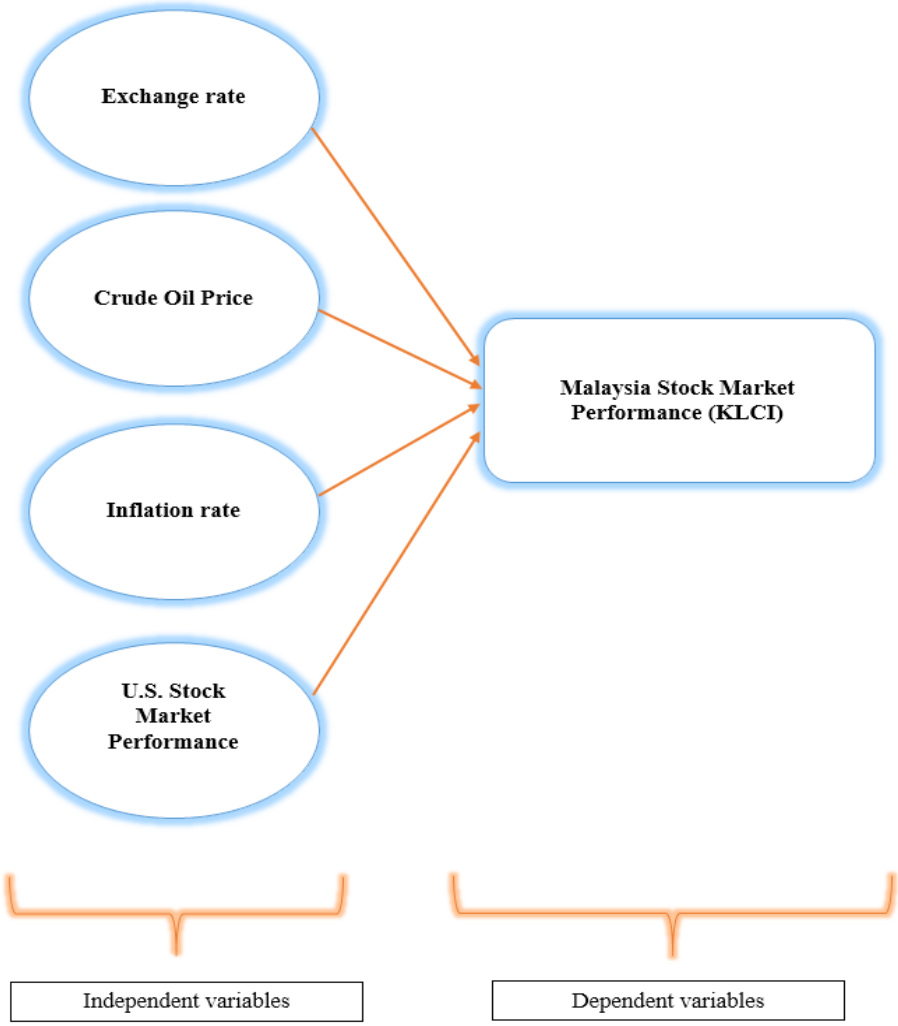


Figure 2.3 illustrates the relationship between the Malaysian stock market performance and the selected explanatory variables. The explanatory variables that are being investigated in this research include exchange rate, crude oil price, inflation rate and U.S. stock market performance. The study period for this research is on monthly basis, between January 2009 and July 2016.

2.4 Hypothesis Development

2.4.1 Exchange Rate

H_0: There is no significant relationship between exchange rate and Malaysian stock market performance.

H_1: There is a significant relationship between exchange rate and Malaysian stock market performance.

2.4.2 Inflation Rate

H_0: There is no significant relationship between inflation rate and Malaysian stock market performance.

H_1: There is a significant relationship between inflation rate and Malaysian stock market performance.

2.4.3 US Stock Market Performance

H_0: There is no significant relationship between U.S. stock market performance and Malaysian stock market performance.

H_1: There is a significant relationship between U.S. stock market performance and Malaysian stock market performance.

2.4.4 Crude Oil Price

H_0: There is no significant relationship between crude oil price and Malaysian stock market performance.

H_1: There is a significant relationship between crude oil price and Malaysian stock market performance.

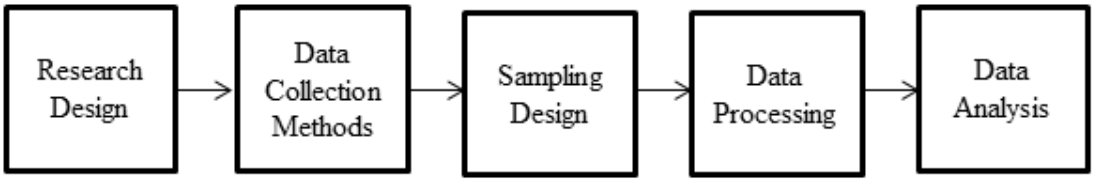
2.5 Conclusion

The relationships between the Malaysian stock market performance and each of the independent variable had been examined in this chapter by summarizing the methodologies employed by previous researchers. Besides, some of the theoretical models that have been used in previous studies were discussed in this chapter and followed by the theoretical framework to demonstrate the relationship between the dependent variable and independent variables. The methodology used in this study will be discussed in the following chapter.

CHAPTER 3: METHODOLOGY

3.0 Introduction

The main purpose of this chapter is to cover the explanations of methodologies that are chosen to complete this research project in details. In this chapter, data collection method, data processing procedures, econometric model and methods applied are discussed. In general, this chapter consists of the following part:



3.1 Research Design

According to Conrad and Serlin (2011), research design is reflecting the overall research process. The first step of the process is forming an idea with a problem, then the second step is analysing the literature review. Next, the third step is collecting the relevant data and the last step is drawing a conclusion. The research design is vital because it is a method to combine all the information regarding the key features of the research. Actually, it can be categorised into three types which are quantitative, qualitative and mixed methods. In this research project, the method applied is quantitative research design which is a type of research design that involves the

numerical and statistical approach. It is specifically based on the existing theories, then conduct the surveys and carry out experiments to answer the research question. By collecting and processing the data, it provides the result which is more applicable in the reality.

3.2 Data Collection Methods

The data collected for this study are a monthly time series data from January 2009 to July 2016. Initially, daily data is planned to use because Palamalai et al. (2013) stated that by using weekly or monthly data, it will unable to capture the impact of some responses which last for only a few days. However, CPI does not have daily data. Thus, monthly data is used instead of yearly data because it enables the sample size to become larger relative to yearly data.

3.2.1 Secondary Data

Secondary data is chosen for this study. It is a set of data that is collected and readily available from other sources. This type of data is time saving and inexpensive for data collection. The table below shows the various sources that accessed for data collection:

Table 3.2.1 Sources of data

Variables	**Proxy**	**Units**	**Explanation**	**Data sources**
Stock Market Performance in Malaysia	KLCI	Point	Kuala Lumpur Composite Index (monthly closing price) in Bursa Malaysia	Bloomberg
Inflation rate	CPI	Index point	Consumer price index by taking the year 2010 as the base year	Bank Negara Malaysia
Crude Oil Price	Brent Crude Oil Price	$ per barrel	Oil price in dollar per barrel	World Bank Commodity Price
Exchange rate	Exchange rate	RM/ USD	Direct quote in Malaysia (Ringgit Malaysia for one unit of US dollar)	Bank Negara Malaysia
Stock market performance in United States	S&P 500	Point	Standard & Poor's 500 Index (monthly closing price) in United States	Bloomberg

3.3 Sampling Design

3.3.1 Target Population

In this research, Malaysian stock market is set as the target population. In other words, this research is aimed to determine the relationship of the Kuala Lumpur Composite Index (KLCI) and the selective variables such as inflation rate (CPI), exchange rate (RM/USD), crude oil price ($/barrel) and stock market in United State (S&P500) along the period from January 2009 until July 2016. The reason that KLCI is being selected as the indicator is due to its high accuracy to represent the Malaysian stock market performance as it comprises of thirty largest companies from the main market in Bursa Malaysia. There are two main eligibility requirements stated in the FTSE Bursa Malaysia Index Ground Rules which are minimum free float of 15% and liquidity requirements.

3.3.2 Sample Size

The data of this research is collected in a monthly basis which is from January 2009 to July 2016. A total of 91 observations of data is collected for the dependent variable Malaysian stock market performance (KLCI) and independent variables such as inflation rate (CPI), exchange rate, oil price and stock market in US (S&P500). The sample size of the data in this research is enlarged in order to obtain a more accurate result and to minimize the data omission problem because the missing data can significantly affect the conclusions that can be drawn from the data.

3.3.3 Modification of Original Data for KLCI, S&P 500 and CPI

3.3.3.1 Reasons to log KLCI and S&P500

The reasons to log the proxy of stock market in Malaysia and United States which are KLCI and S&P500 are as follow:

i. Without transforming the stock market proxy to log form, the model of this study will meet the problem of wrong functional form. In other words, the model in this paper is not suitable to study the linear relationship between the variables and the stock market performance in Malaysia. This is not in line with the research objective for this study.

ii. Generally, previous studies for stock market had converted the stock market index into stock market return by using first log difference method (Graham et al., 2012; Loh, 2013). Although some researchers were using daily or weekly data of stock indices, the formula for converting the data into the first difference log was still the same (Chan et al., 2010; Graham et al., 2012; Loh, 2013; Palamalai et al., 2013; Lim & Sek, 2014). Thus, the formula to convert the stock market index into the stock market return is shown as below:

$$R_t = Ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where R_t = Return of stock market index at time t

P_t = Stock index at time t

P_{t-1} = Stock index one day before day t

3.3.3.2 Re-referencing or Rebasing for CPI

It is important to note that there are several terms refer to the changing of the current base year to another base year. Australian Bureau of Statistics (ABS) defined re-referencing as "the process which sets a new index reference period for a price index" (ABS, 2012b, para. 1).

On the other hand, the United States Census Bureau (2012, para. 4) uses rebasing instead of re-referencing. They defined rebasing as "a simple method that shifts the base year from one year to another without changing the base weights for the constant quality house". However, both definitions carry the same meaning since ABS (2012a, para. 6) further mentioning "re-referencing does not change the relative movements between periods". In other words, the weightage of a group of basket for measuring CPI is fixed. Thus, re-referencing and rebasing in this study are referring to changing the base year of the CPI without revising its weight.

3.3.3.3 Reasons to re-referencing or rebasing CPI

One of the advantages of re-referencing is it allows consistency to exist for a time series that change over time (Ralph, O'Neill & Winton, 2015). This is important to ensure the accuracy of the final result for this study. Besides, the United States Census Bureau (2012, para. 5) stated that "this method assumes that the period-to-period change (inflation) associated with an old series fairly represents the new series when new series did not exist". In other words, re-referencing enables the data to reflect the current changes of CPI by referring to the latest base year.

Moreover, the index value after re-referencing will still reflect the change of series between base period and current period, but the initial base year is no longer equal to 100 (Ralph et al., 2015). This indicates the modified data still can reflect the same impact as the original data.

Lastly, the large sample size is obtained by applying re-referencing. As a result, it enables the variables become normally distributed (Gujarati & Porter, 2009). This is important as the tests perform in the chapter 4 are based on normal distribution. Violation of this normality assumption will result in biased result.

3.3.3.4 Methods of re-referencing CPI

Initially, the data of CPI for this study involve two base years which are 2005 and 2010. It is then re-reference the data to base year of 2010. To get the re-referencing value, the old series values are multiply with the conversion factor. In this study, the old series values refer to the values from January 2009 to December 2009 which have the base year of 2005. The formula for the conversion factor is based on the suggestion from ABS (2012a) which rounds off the figure to four decimal places. Besides, the figures of annual index for 2010 (as shown in the formula below) which based in 2010 and 2005 are collected from BNM website.

$$Conversion\ factor = \frac{2010\ based\ index\ in\ 2010\ (annual)}{2010\ based\ index\ in\ 2005\ (annual)}$$

$$= \frac{100}{114}$$

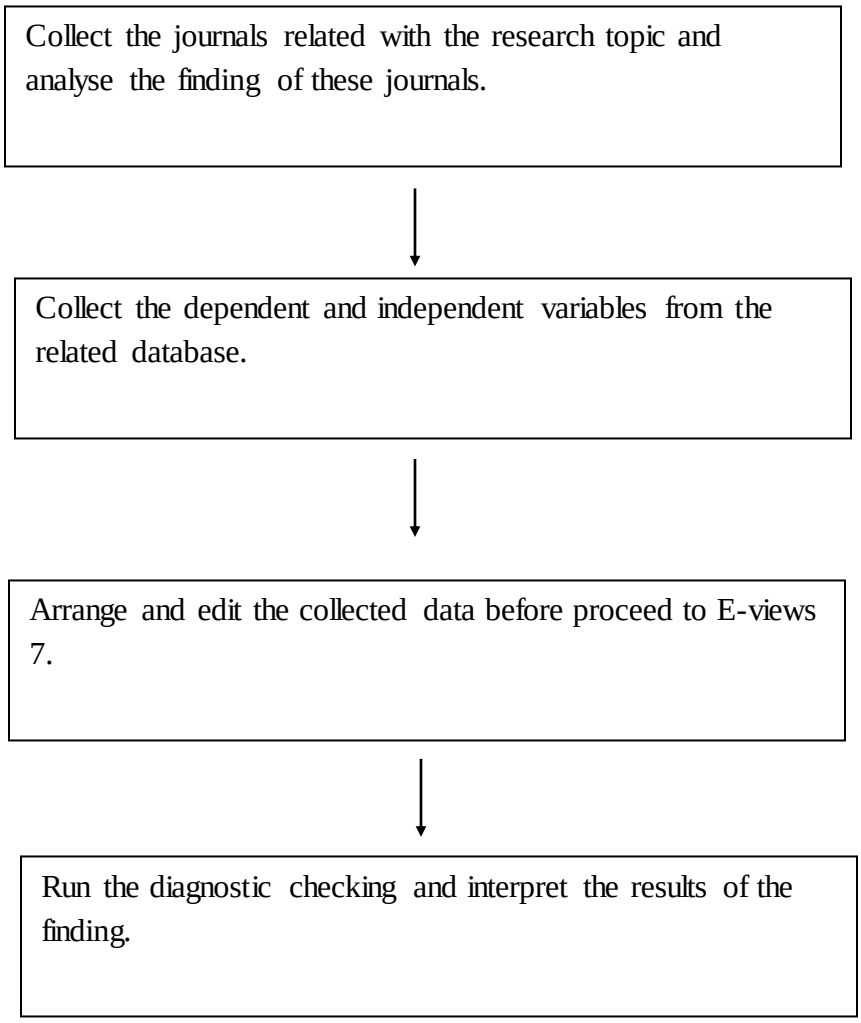
$$= 0.8772$$

3.4 Data Processing

By referring and analysing at least 40 journals from the latest 5 year, the findings that related to this study are recorded. On the other hand, all the data of this

study are obtained from different sources such as Bloomberg, Bank Negara Malaysia and World Bank. In order to obtain a larger sample size, the base year for inflation rate (CPI) in 2009 has been re-referencing by using the available formula supported by Australian Bureau of Statistic. After that, all the data are arranged in the Microsoft-Excel, then proceed to diagnostic checking (using E-views 7) and interpretation of results. The figure below shows the summary of the sequences for the data processing.

Figure 3.4 The flow of Data Processing.



3.5 Data Analysis

3.5.1 Multiple Linear Regression Model

According to Cohen, Cohen, West and Aiken (2003), Multiple Linear Regression Model is a model that contains two or more independent variables to predict the determinants' impact on the dependent variable. Gujarati and Porter (2009) showed that there are few assumptions that the model has to follow in order to get Best Linear Unbiased Efficient Estimator (BLUE) results. BLUE can be explained as all the estimators must be in linear form with a minimum error of estimation. Besides, the expected value of coefficients are equal or near to the true value and the model consists of minimum variance.

In some studies, some of the variables will be transformed into logarithm form. Indeed, log transformation of variables can decrease the variation of the data (Imarhiagbe, 2010). Besides, Wooldridge (2005) shows that the independent variable in logarithm is approximately to the assumptions of classical linear regression model.

The model in this study is as follow:

lnKLCI = f [Exchange Rate (EXR), Consumer Price Index (CPI), S&P 500 Index (SPX), Crude Oil Price (OIL)]

Economic Function:

$$\ln Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_t + \beta_3 \ln X_t + \beta_4 X_t + \varepsilon_t$$

$$\ln KLCI_t = B_0 + B_1 EXR_t + B_2 CPI_t + B_3 \ln SPX_t + B_4 OIL_t + \varepsilon_t$$

Where:

$\ln KLCI_t$ = The natural logarithm form of Kuala Lumpur Composite Index (KLCI) at year t. (%)

EXR_t = Exchange Rate (EXR) at year t. (RM/USD)

CPI_t = Consumer Price Index (CPI) at year t. (Index point)

$\ln SPX_t$ = The natural logarithm of S&P 500 Index (SPX) at year t. (%)

OIL_t = Oil Price (OIL) at year t. ($ per barrel)

ε_t = Error term

3.5.2 Ordinary Least-Square

Ordinary Least-Square (OLS) regression is a generalized linear modelling technique which is used to estimate the figures of the parameters in order to fit a function to a set of data. OLS regression is widely used and can be easily adapted to include a number of explanatory variables, including dummy variables (Hutcheson & Moutinho, 2011). In other words, OLS regression is applicable to a single explanatory variable, multiple explanatory variables, and categorical explanatory variables.

According to Hutcheson and Sofroniou (1999), the OLS regression is powerful as it can trace the model assumptions in its linearity, constant variance and the effect of outliers by using simple graphical methods. However, the Gauss-Markov theorem stated that there are five conditions to be fulfilled in order to obtain the smallest variance (Wooldridge, 2013). The five conditions of Gauss-Markov theorem are listed as below:

1. The regression model is linear in parameters.
2. The observations are random sampling.
3. There are no exact linear relationships among the independent variables.
4. The error term has a zero mean value.
5. The error term is homoscedasticity.

In other words, once the OLS estimates are fulfilling the stated five Gauss-Markov conditions, the OLS estimators are the best linear unbiased estimators.

3.5.3 E-Views 7

E-Views is a spreadsheet software that used for various types of data analysis. It has some similarity to the commonly used Microsoft Excel and does support this type of files. In fact, it is a sophisticated software for analysing data, forming regression line, and forecasting in computers operating in Microsoft Windows. It will not be possible if researchers intend to conduct analysis without using E-Views. Since E-Views is a tool which designed for economic purposes, it is useful for analysing economic time series and even for handling a quite large cross-section projects. Besides, E-Views is designed to provide convenient visual ways to enter data series from disk files, to create new series from existing ones, to display and print series, and to carry out statistical analysis of the relationships among series.

In this research, E-Views 7 is used to run all the hypothesis testing and diagnostic checking. For instance, T-statistics Hypothesis Test (T-Test), F-statistics Overall Fitness Test (F-Test), Ordinary Least Square Method, Multicollinearity Correlation Table, Heteroscedasticity (Autoregressive Conditional Heteroskedasticity Test), Autocorrelation (Breusch-Godfrey Serial Correlation LM Test), Ramsey-RESET Test and Jarque-Bera Normality Test (JB Test) have been tested by using E-Views 7. Besides, remedial test will be used appropriately in order to handle those particular econometric problems.

3.5.4 Diagnostic Checking

3.5.4.1 Normality Test - Jarque-Bera Test

Jarque-Bera test is a type of goodness-of-fit test which plays a vital role in statistical application, especially for testing on the normality of the model. It is proposed by Jarque and Bera (1987) and gained a huge acceptance among the econometricians. The test is based on the sample of skewness (S) and kurtosis (K) of the OLS model. The test statistic formula is shown as below:

$$JB = [\frac{S^2}{6} + \frac{(K-3)^2}{24}]$$

Besides, the Jarque-Bera Test is a type of chi-square test and the degree of freedom is 2. By comparing the result with the specific critical value, a large test statistic result (Jarque-Bera value) or a small p-value for Jarque Bera test might tell the researcher that the error term does not normally distributed (Andale, 2016).

3.5.4.2 Model Specification

According to Gujarati and Porter (2009), model specification error is an econometric problem where the model consists of any one or combination of the situations below:

i) Omitting important or relevant variables.

ii) Including irrelevant variables.

iii) Existing of wrong functional in the model.

Model specification errors will cause the outcome of the studies to become inconsistent with the theoretical expectation (Jarvis, Mackenzie & Podsakoff, 2003). Hence, having this problem will disobey the assumption of CLRM.

In order to detect the model specification errors, performing Ramsey Reset Test is one of the methods to compute the stability of specification error. RESET stands for Regression Specification Error Test, and it tests whether the non-linear combinations of the fitted values help to explain the response variable (Wooldridge, 2005). RESET test will be used in this study.

The hypotheses for RESET test are stated as below:

H_0: The model is correctly specified.

H_1: The model does not correctly specified.

The level of significant, α is 0.01. The decision rule is to reject H_0 if the probability value is lower than α. Otherwise, do not reject the H_0.

3.5.4.3 Multicollinearity

Multicollinearity problem occurs when there are two or more explanatory variables are highly correlated with each other in a multiple regression model (Adeboye, Fagoyinbo & Olatayo, 2014). According to Vatcheva, Lee, McCormick and Rahbar (2016), the reason that multicollinearity problem occurs in the model is due to the population unrepresentative sample or insufficient information in the sample.

In the presence of multicollinearity, the regression model has difficulty in determining which explanatory variables are influencing the dependent variable. There are few consequences of multicollinearity problem in a regression model. Firstly, the variances of ordinary least square (OLS) estimators will become larger which result in less precise in the estimation. Secondly, the confident intervals become much wider and this results in more easily to accept the null hypothesis. Thirdly, the t-ratios of the coefficients are more likely to be insignificant due to the wider confidence interval while the R-square for the model with multicollinearity could still be relatively high which results in invalid hypothesis testing. Nonetheless, the model with multicollinearity does not violate OLS assumptions; the OLS estimates are still Best Linear Unbiased Estimators.

There are several ways to detect the presence of multicollinearity problem in a model. Firstly, the multicollinearity problem is suspected if there are few significant t-ratios for the individual coefficients with the overall significant F-statistic. Secondly, a high pair-wise correlation coefficient also indicates that the model is suspected to have a multicollinearity problem. Indeed, Yu, Jiang and Land (2015) suggest that when the pair-wise correlation coefficient is equal to 0.7 or higher, the model is suspected to have a multicollinearity problem.

Besides, Paul (2014) claims that multicollinearity is a matter of degree; thus, the seriousness of multicollinearity problem could be detected through Variance Inflation Factor (VIF) and Tolerance (TOL). VIF quantifies how much the variance of the estimated regression coefficients increases when the predictor variables are not linearly related. While for the TOL, it is the inverse of VIF. Akinwande, Dikko and Samson (2015) states that it is not good for a regression model to have a VIF above 10 because it might render other significant variables redundant. Therefore, when VIF exceeds 10 or TOL close to 0, both indicates that the model is having a serious multicollinearity problem. The formula of VIF and TOL are as followed:

$$VIF_j = \frac{1}{1 - R_j^2} \qquad TOL_j = \frac{1}{VIF_j}$$

There are two ways to deal with multicollinearity problem according to Vatcheva et al. (2016). Firstly, collecting more variables or increasing the sample size. Theoretically, this will reduce the standard errors of the slopes in the model. Secondly, using Partial Squares Regression (PLS) or Principle Components Analysis (PCA). By using these regression methods, the number of predictors is cut to a smaller set of uncorrelated components. Thus, this will reduce the correlated relationship between the explanatory variables in the model.

3.5.4.4 Heteroscedasticity/Heteroskedasticity

Heteroscedasticity refers to the inconsistent variance of the error terms in a regression model. The conditional variance depends on the observation, including variability depends on the mean of the data, or variability depends on one or more explanatory variables (Payne, 2014). There are few possible reasons that heteroscedasticity might

be occurred in the model. Firstly, there is a measurement error where there might be a possibility that the respondents are giving less accurate responses than others during data collection. Secondly, a model misspecification is detected where the model is not correctly specified due to omitted variables or includes non-related variables in the model.

The present of heteroscedasticity in the model will lead to several consequences. Firstly, the Ordinary Least Square (OLS) estimates are no longer Best Linear Unbiased Estimators. The OLS method is inefficient because it violates the assumption of minimum variance of the error terms. Secondly, the variances and standard errors of a model are underestimated. Inaccurate standard errors will tend to increase the value of t-statistic and f-statistic; thus, the hypothesis testing of T-statistic and F-statistic are no longer valid. However, the OLS estimators for the coefficients are still unbiased and consistent since the explanatory variables are uncorrelated to the error terms (Gujarati & Porter, 2009).

According to Gujarati and Porter (2009), there are two ways to detect the presence of heteroscedasticity in general which are the informal way and the formal way. The informal way could be carried out through the graphical method, while the formal way could be carried out through several formal tests such as the Breusch-Pagan LM test, Glesjer LM test, Harvey-Godfrey LM test, Park LM test, Goldfeld-Quandt test, ARCH test and White's test. However, Wong (2014) specifies that Autoregressive Conditional Heteroskedasticity (ARCH) model is used in order to detect the heteroskedasticity problem for time-series data.

There are three ways to deal with heteroscedasticity problem according to Williams (2015) which are transforming the variables, using Robust Standard Errors and Weighted Least Squares (WLS) method. WLS method is the most suitable solution

for heteroscedasticity problem providing that the pattern of the error variances are known (Gujarati & Porter, 2009).

In this study, ARCH Test is applied to test the time series data. The hypotheses for this test are stated as below:

H_0: There is no heteroscedasticity problem.

H_1: There is heteroscedasticity problem.

The level of significant, α is 0.01. The decision rule is to reject H_0 if p-value is less than the significant level, $\alpha = 0.01$. Otherwise, do not reject H_0.

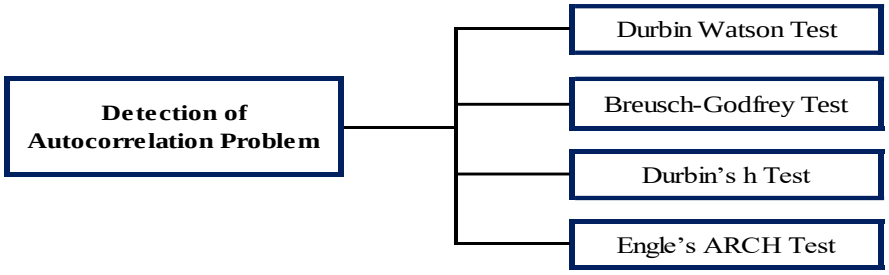
3.5.4.5 Autocorrelation

According to Gujarati and Porter (2009), autocorrelation problem is defined as a problem exists when the random variable which ordered over time shows nonzero covariance. It can be explained as there is a relationship among error terms. Having autocorrelation problem is the violation of CLRM's assumption. There are several consequences for the existing of autocorrelation problem (Greene, 2003).

a) OLS estimators are still unbiased and linear. However, minimum variance property is not satisfied.
b) Confidence intervals and hypothesis test based on t and F distributions are unreliable. There is a possibility of drawing a wrong conclusion on hypothesis tests.
c) If the disturbance terms, u_i are correlated, then the OLS estimates are non-asymptotic. The variance of random term might be seriously underestimated.

In fact, autocorrelation can be categorised into pure serial correlation and impure serial correlation. The pure autocorrelation is occurred due to the underlying distribution of the error term for the true specification of an equation (passed Model Specification Ramsey Reset Test). In contrast, the impure autocorrelation is caused by the specification bias such as an incorrect functional form and omitted variables. (Gujarati & Porter, 2009).

Figure 3.5.4.5: Detection of Autocorrelation Problem



According to Gujarati and Porter (2009), there are a few ways to detect auto correlation problem in the model. These tests are shown in figure 3.5.4.5.

Breusch-Godfrey Test is applied in this study. The hypotheses for this test are stated as below:

H_0: There is no autocorrelation problem.

H_1: There is autocorrelation problem.

The level of significant, α is 0.01. The decision rule is to reject H_0 if the probability value is lower than α value. Otherwise, do not reject the H_0.

3.5.5 F-statistic test

F-statistic test was created by George W. Snedecor and developed by Sir Ronald A. Fisher in 1920 (Jeffrey, James, Michael, Jeffrey & David, 2015). An F-test is any statistical test in which the test statistic has an F-distribution under the null hypothesis. It is most often used when comparing statistical models that have been fitted to a data set in order to identify the model that best fits the population from which the data are sampled. In other words, it is used to test the overall fitness of the model. Furthermore, F-statistic test can be conducted by using E-Views 7 and the value can be generated from the equation window and the P-value of F-statistic test can be generated from the output (Gujarati & Porter, 2009).

The null hypothesis and alternative hypothesis for this test are stated as below:

H_0: $\beta_2=\beta_3=\beta_4=\beta_5 = 0$
(Model is not significant.)

H_1: At least one of the $\beta_i \neq 0$ where i= 2, 3, 4, 5
(Model is significant.)

- Reject H_0 if the F-statistic value is lower than critical value at significant level (assume = 0.01). Otherwise, do not reject H_0.
- Reject H_0 if the P-value is smaller than the significant level (assume = 0.01). Otherwise, do not reject H_0.

3.5.6 T-statistic test

T-statistic test was developed and introduced by William Sealy Gosset in 1908 and was published under the pseudonym of "Student". A t-statistic test is any statistical hypothesis test in which the test statistic follows a Student's t-distribution under the null hypothesis. It can be used to determine if two sets of data are significantly different from each other.

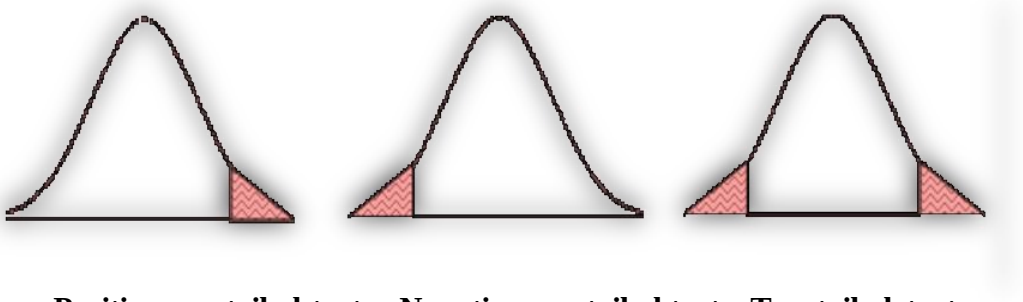
In this research, T-statistic test is used to examine whether the independent variables [Consumer Price Index (CPI), Exchange Rate (ER), Crude Oil Price (OIL), S&P 500 Index (SPX)] are individually significant to the dependent variable [Kuala Lumpur Composite Index (KLCI)].

This research is using the E-Views 7 to generate the result for each parameter from the equation window and the P-value of each parameter can be generated from the output (Gujarati & Porter, 2009). The hypotheses for T-test are stated as below:

H_0: There is no significant relationship between the independent and dependent variable.

H_1: There is a significant relationship between the independent and dependent variable.

Figure 3.5.6: Normal Distribution Curve



Positive one-tailed test **Negative one-tailed test** **Two-tailed test**

- Reject H_0 if F-statistic value is larger than the critical value at a specific α (significance level assume = 0.01). Otherwise, do not reject H_0.
- Reject H_0 if F-statistic value is lower than the critical value at a specific α (significance level assume = 0.01). Otherwise, do not reject H_0.
- For two-tailed test, reject H_0 if t-statistic value is larger than the upper critical value, or less than lower critical value at a specific significance level (assume = 0.01). Otherwise, do not reject H_0.
- Reject H_0 if the probability value is smaller than the significance level, α =0.01. Otherwise, do not reject H_0.

3.6 Conclusion

In conclusion, Chapter 3 has included detail explanations on research design, data collection methods, sampling design, data processing and data analysis. This chapter clearly stated out the econometric model that will be applied in this research. Last but not least, this chapter also covered and provided explanations for all econometric methods and statistical tests applied in this research. The empirical result of these tests will be conducted in the following chapter.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter focuses on interpreting the empirical results generating from Eview software. The involved tests are Ordinary Least Squares (OLS) method, T-Test, F-Test, Normality Test, and four diagnostic checking including Multicollinearity, Heteroscedasticity, Autocorrelation and Model Specification. All the results will be expressed in a table form and followed by the respective interpretations.

4.1 Diagnostic Checking

4.1.1 Normality Test

Jarque-Bera test is a type of goodness-of-fit test which plays a vital role in statistical application, especially for testing on the normality of the model.

Hypothesis

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

Significant Level

α=0.01

Decision Rule

Reject H_0 if the p-value smaller than the significant level. Otherwise do not reject H_0.

P-value

P-value = 0.236301

Decision Making

Do not reject H_0 since the p-value 0.236301 is greater than the significant level 0.01.

Conclusion

The model meets the normality assumption on the error term.

4.1.2 Model Specification

Ramsey Reset Test is one of the methods to compute the stability of specification error. Having model specification problem will make the result of the study become inconsistent with the theoretical expectation.

Hypothesis

H_0: The model is correctly specified.

H_1: The model does not correctly specified.

Significance level

$\alpha = 0.01$

Decision Rule

Reject H_0 if the P-value is smaller than the significance level, $\alpha = 0.01$. Otherwise, do not reject H_0.

Decision Making

	Value	df	Probability
t-statistic	0.480284	85	0.6323
F-statistic	0.230673	(1, 85)	0.6323
Likelihood ratio	0.246621	1	0.6195

Since the P-value, 0.6323 is greater than the significance level, $\alpha = 0.01$, do not reject H_0.

Conclusion

The model is correctly specified.

4.1.3 Multicollinearity

Multicollinearity is the problem that the explanatory variables are highly correlated with each other in the regression model. The multicollinearity problem could be examined through the following methods.

Firstly, when there is a high R-squared but few significant t-ratios, the model is suspected to having a multicollinearity problem. Based on Appendix 5, the model is having a low R-squared, which is 0.3523. This implies that only 35.23% of the variation in dependent variable can be explained by the variation in independent variables. Besides, the result in Appendix 5 also shows that the p-value of both CPI and INSPX are lower than the significant level, $\alpha = 0.01$, which are 0.0011 and 0.0001 respectively. In other words, both CPI and INSPX are significant at the significant level of 0.01. Therefore, the model is having a low R-squared with few significant t-ratios. Hence, there is no multicollinearity problem suspected in the model.

Table 4.1.3(a) Pair-wise Correlation Coefficients

	OIL_PRICE	LNSPX	CPI	EXR
OIL_PRICE	1.000000	0.077614	-0.014828	-0.872677
LNSPX	0.077614	1.000000	-0.068876	-0.112400
CPI	-0.014828	-0.068876	1.000000	0.311700
EXR	-0.872677	-0.112400	0.311700	1.000000

Secondly, when there is a high pair-wise correlation coefficients, the model is suspected to having the multicollinearity problem. Based on Table 4.1.3(a), there is a high correlation coefficients between OIL_PRICE and EXR, which is 0.872677. Therefore, the problem of multicollinearity is suspected in the model.

Table 4.1.3(b) Results of VIF and TOL

	R-squared	VIF = $\frac{1}{1-R_j^2}$	TOL = $\frac{1}{VIF_j}$
OIL_PRICE	0.834948	6.0587	0.1651
CPI	0.374710	1.5993	0.6253
EXR	0.851446	6.7316	0.1486
LNSPX	0.014613	1.0148	0.9854

Thirdly, when VIF exceeds 10 or TOL close to 0, the model is considered having a serious multicollinearity problem. However, based on Table 4.1.3(b), the VIFs obtained are lower than 10, while the TOLs obtained are far from 0. Therefore, the results indicate that the model is not having a serious multicollinearity problem.

In conclusion, although the model is suspected to have the multicollinearity problem when using pair-wise correlation coefficients method, both the VIF and TOL imply that the multicollinearity problem is not serious in the model. Thus, there is no serious multicollinearity problem in the model.

4.1.4 Heteroscedasticity

Heteroskedasticity is the problem where inconsistent variances of the error terms exist in the model. The presence of heteroskedasticity in the model could be detected by using Autoregressive Conditional Heteroskedasticity (ARCH) model.

Hypothesis

H_0: There is no heteroskedasticity problem.

H_1: There is heteroskedasticity problem.

Significance level

$\alpha = 0.01$

Decision Rule

Reject H_0 if the P-value is smaller than the significance level, $\alpha = 0.01$. Otherwise, do not reject H_0.

Decision Making

Heteroskedasticity Test: ARCH:

F-statistic	0.847209	Prob. F (4,82)	0.4994
Obs*R-squared	3.452777	Prob. Chi-Square (4)	0.4851

Since the P-value 0.4851 is greater than the significance level, $\alpha = 0.01$, do not reject H_0.

Conclusion

There is insufficient evidence to conclude that there is heteroskedasticity problem in the model.

4.1.5 Autocorrelation

Autocorrelation problem is defined as a problem exists when the random variable which ordered over time shows nonzero covariance. It can be explained as there is a relationship among error terms. Autocorrelation is detected through Breusch-Godfrey Serial Correlation LM Test.

Hypothesis

H0: There is no autocorrelation problem.

H1: There is autocorrelation problem.

Significance level

$\alpha = 0.01$

Decision Rule

Reject H0 if the p-value is less than the significance level, $\alpha = 0.01$. Otherwise, do not reject H0.

Decision Making

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.203573	Prob. F (4,82)	0.0038
Obs*R-squared	15.48461	Prob. Chi-Square (4)	0.0038

Since the P-value, 0.0038 is smaller than the significance level, $\alpha = 0.01$, do not reject H0.

Conclusion

There is sufficient evidence to conclude that there is autocorrelation problem in the model.

4.1.5.1 Solution for Autocorrelation Problem

Gujarati and Porter (2009) state that the research can still use Ordinary Least Squares (OLS) regression even if there is an autocorrelation problem in the model. However, if the autocorrelation problem exists, OLS will normally underestimate the true standard error. Thus, in this study, the result which affected by the autocorrelation problem can be solved by using Newey-West Standard Error.

Newey-West Standard Error, also known as Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors, can be used when the residuals are autocorrelated.

Table 4.1.5.1 Comparison of Ordinary Least Squares (OLS) and Newey-West Standard Error (HAC)

Variables	Coefficient		Standard Error		P-value	
	OLS	HAC	OLS	HAC	OLS	HAC
EXR	-0.00161	-0.00161	0.01806	0.01473	0.92920	0.91320
CPI	-0.00125	-0.00125	0.00042	0.00037	0.00380	0.00110
LNSPX	0.33477	0.33477	0.06237	0.08148	0.00000	0.00010
OIL_PRICE	-0.00011	-0.00011	0.00023	0.00017	0.65260	0.53290

As shown in table 4.1.5.1, after applying the Newey-West Standard Error, the standard errors have changed while the coefficient of the variables remain unchanged. Meanwhile, the result of t-statistic test and F-statistic test become more reliable since the P-values do not affected by autocorrelation after applying HAC. In short, after applying the HAC, the autocorrelation problem is solved.

4.2 Hypothesis Testing

4.2.1 F-Test

Hypothesis

H_0: $\beta_2=\beta_3=\beta_4=\beta_5 = 0$ (Model is not significant)

H_1: At least one of the $\beta i \neq 0$ (Model is significant)

Where i= 2, 3, 4, 5

Significance level

$\alpha = 0.01$

Decision Rule

Reject H_0 if the p-value smaller than the significant level. Otherwise do not reject H_0.

P-value

P-value = 0.0000

Decision Making

Reject H_0 since the p-value is 0.0000 which smaller than the significant level α= 0.01

Conclusion

The model is significant to explain the Malaysia stock performance.

4.2.2 T-test

This research uses t-test with p-value approach at significant level of 0.01 to examine whether each independent variable is significant or not. Below are the general hypotheses and decision rules for the t-test:

Hypothesis

H_0 = There is no significant relationship between independent variable and dependent variable.

H_1 = There is significant relationship between independent variable and dependent variable.

Decision rule

Reject H_0 if the p-value is lesser than the significant level, otherwise do not reject H_0.

4.2.2.1 Exchange Rate (EXR)

Hypothesis

H_0: $\beta_1 = 0$

H_1: $\beta_1 \neq 0$

Decision rule

Reject H_0 if the p-value is lesser than the significant level, otherwise do not reject H_0.

P-value

P-value = 0.9132

Decision making

Do not reject H_o since the p-value (0.9132) is greater than the significant level (0.01).

Conclusion

There is insufficient evidence to conclude that $\beta_1 \neq 0$. This result shows that there is no significant relationship between EXR and KLCI.

4.2.2.2 Consumer Price Index (CPI)

Hypothesis

H_0: $\beta_2 = 0$

H_1: $\beta_2 \neq 0$

Decision rule

Reject H_0 if the p-value is lesser than the significant level, otherwise do not reject H_0.

P-value

P-value = 0.0011

Decision making

Reject H_o since the p-value (0.0011) is lesser than the significant level (0.01).

Conclusion

There is sufficient evidence to conclude that $\beta_2 \neq 0$. This result shows that there is significant relationship between CPI and KLCI.

4.2.2.3 S&P 500 Index (SPX)

Hypothesis

H_0: $\beta_3 = 0$

H_1: $\beta_3 \neq 0$

Decision rule

Reject H_0 if the p-value is lesser than the significant level, otherwise do not reject H_0.

P-value

P-value = 0.0001

Decision making

Reject H_o since the p-value (0.0001) is lesser than the significant level (0.01).

Conclusion

There is sufficient evidence to conclude that $\beta_3 \neq 0$. This result shows that there is significant relationship between SPX and KLCI.

4.2.2.4 Crude Oil Price (OIL)

Hypothesis

H_0: $\beta_4 = 0$

H_1: $\beta_4 \neq 0$

Decision rule

Reject H_0 if the p-value is lesser than the significant level, otherwise do not reject H_0.

P-value

P-value = 0.5461

Decision making

Do not reject H_o since the p-value (0.5461) is greater than the significant level (0.01).

Conclusion

There is insufficient evidence to conclude that $\beta_4 \neq 0$. This result shows that there is no significant relationship between OIL and KLCI.

Table 4.2.2: Summary of T-test

Independent Variable	Significant Level, α	P-value	Decision Making	Conclusion
EXR	0.01	0.9132	Do not reject H_0	Insignificant
CPI	0.01	0.0011	Reject H_0	Significant
LNSPX	0.01	0.0001	Reject H_0	Significant
OIL	0.01	0.5329	Do not reject H_0	Insignificant

4.3 Interpretation

4.3.1 Ordinary Least Square Model

$$\ln KLCI_t = 0.149515 - 0.001610\, EXR_t - 0.001254\, CPI_t + 0.334770\, \ln SPX_t - 0.000106\, OIL_t$$

Where:

$\ln KLCI_t$ = The natural logarithm form of Kuala Lumpur Composite Index (KLCI) at year t. (%)

EXR_t = Exchange Rate (EXR) at year t. (RM/USD)

CPI_t = Consumer Price Index (CPI) at year t. (Index point)

$\ln SPX_t$ = The natural logarithm of S&P 500 Index (SPX) at year t. (%)

OIL_t = Oil Price (OIL) at year t. ($ per barrel)

4.3.2 Parameters

$\hat{\beta}_1 = -0.001610$

When Exchange Rate (EXR) increases by one USD to MYR, on average, KLCI stock index decreases by 0.1610 %, holding other variables constant.

$\hat{\beta}_2$ = -0.001254

When Consumer Price Index (CPI) increases by 1 index point, on average, KLCI stock index decreases by 0.1254 %, holding other variables constant.

$\hat{\beta}_3$= 0.334770

When S&P 500 Index (SPX) increases by 1%, on average, KLCI stock index increases by 0.334770 %, holding other variables constant.

$\hat{\beta}_4$ = -0.000106

When Oil Price (OIL) increases by $ 1 per barrel, on average, KLCI stock index decreases by 0.0106%, holding other variables constant.

4.3.3 Goodness of fit

Goodness of fit is shown by the R^2 in the eview result.

R^2 = 0.352294: There is 35.23% of the variation in log of KLCI can be explained by the exchange rate, oil price, CPI and log of SPX.

Adjusted R^2 = 0.322168: There is 32.22% of the variation in log of KLCI can be explained by the exchange rate, oil price, CPI and log of SPX, after taking into account the degrees of freedom (the sample size and the number of independent variable, n-k-1).

4.4 Conclusion

In this chapter, the relationships between Malaysian stock market performance and four determinants are examined. Several diagnostic checking tests such as Jarque-Bera test (Normality), Ramsey Reset (Model Misspecification) test, Multicollinearity Test, Autoregressive Conditional Heteroskedasticity (ARCH) test and Breusch-Godfrey Serial Correlation LM Test (Autocorrelation) have been conducted in this study. The autocorrelation problem has been overcome by using the Newey-West Standard Error. In the next chapter, the summary for the whole research will be discussed.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.0 Introduction

Results from Chapter 4 had showed the relationship between the Malaysian stock market performance and the four independent variables which are inflation rate (CPI), exchange rate, crude oil price and the US stock market performance (S&P500 index). The first section of this chapter is the summary of the result from the diagnostic checking computed in the previous chapter. The second section is the summary and the discussion on the relationship of the major findings in this study. The third section of this chapter will suggest the policy implication for different sectors. The fourth section will discuss about the limitation faces in this study, then follows by the related recommendation for the future study. Lastly, this chapter ends with a conclusion which summaries the contents in this chapter.

5.1 Summary of Statistical Analyses

Table 5.1 Summary of the diagnostic checking result

Diagnostic Checking	P-value	Result
Jarque Bera Normality Test	0.236301	The error term is normally distributed
Ramsey Reset Test	0.6323	The model is correctly specified
Variance Inflation Factor (VIF)	Highest VIF= 6.7316	No serious multicollinearity problem
Tolerance Factor (TOL)	Lowest TOL= 0.1486	No serious multicollinearity problem
Heteroskedasticity test: ARCH	0.4851	No heteroscedasticity problem
Breusch-Godfrey Serial Correlation LM test	0.0038	The autocorrelation problem is occurred

Table 5.1 shows the brief summary for diagnostic checking result. From the table above, it can be concluded that the model is free from normality, multicollinearity, model specification and heteroscedasticity problem. Unfortunately, the autocorrelation problem does exist in this regression model. In other words, the variance of the error term will be affected and becomes no longer minimum which might affect the accuracy of the hypothesis testing. However, as mentioned in chapter 4, Newey-West Standard Error method had been performed to solve the autocorrelation problem in the regression model. Therefore, the model in this study does provide a valid and accurate result.

5.2 Discussion of Major Findings

Table 5.2 Summary of Major Findings

Variables	P-value	Result	Relationship
Exchange Rate	0.9132	There is no significant relationship between the exchange rate and Malaysian stock market performance.	Negative
Inflation (CPI)	0.0011	There is a significant relationship between the inflation rate and Malaysian stock market performance.	Negative
US stock market (ln SPX)	0.0001	There is a significant relationship between the US stock market performance and Malaysian stock market performance.	Positive
Crude Oil Price	0.5329	There is no significant relationship between the crude oil price and Malaysian stock market performance.	Negative

Based on the summary in table 5.2, there are two significant independent variables and two insignificant variables in this study.

5.2.1 Significant Variables

5.2.1.1 Inflation Rate

Table 5.2 shows that the inflation rate has a significant negative relationship with the Malaysian stock market performance. Based on previous studies, it was a rare situation to obtain a negative relationship between the inflation rate and stock market performance. However, the result is consistent with the study of Chia and Lim (2015). They found that the negative relationship was due to the unexpected changes in the price level during inflation. The researchers claim that the announcement of the occurrence unanticipated of inflation helps in forecasting the future inflation level and leads to decrease of the share price immediately. In theoretical basis, an unanticipated inflation might cause the company facing liquidity problem due to high production costs while the selling price of the product remains unchanged. In other words, it leads to a shortage of fund in the operation of the company. Since the performances and profits of the company are affected, a significant drop in the share price of those companies will happen because investors expect the companies will unable to perform well in the future.

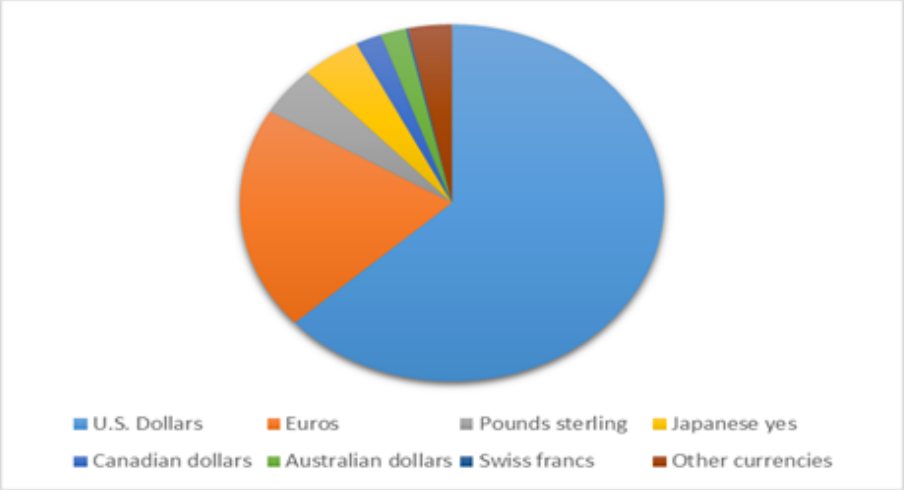
Besides, Rahman et al. (2009) also stated that a negative relationship between the inflation rate and stock market performance might be caused by the implementation of the monetary policy. It could be supported by an article in Bloomberg which stated that the government had focused on the implementation of the monetary policy that highly related to inflation control in the past few years. Therefore, when the government sold off the shares and bonds in a sudden during the year 2015, this had directly affected the stock market performance in Malaysia

5.2.1.2 US Stock Market Performance

This study shows that there is a significant relationship between US stock market performance and Malaysian stock market performance which is consistent with the study of Graham et al. (2012) and Teng et al. (2013). In fact, as found by the study of Sharma (2011), Loh (2013) and Chan et al. (2014), they showed that there was a positive relationship between US stock market and Malaysian stock market which was similar to this research. This significant and positive relationship can be explained by the reasons below.

Firstly, as the global superpower, US has the dominating position in many issues around the world which includes the world economy. It has strong influences on world economy because of:

Figure 5.2.1: World Allocated Reserves by Currency for 2016Q3



Adapted from: International Monetary Fund (2016). *Currency Composition of Official Foreign Exchange Reserves (COFER)*. Retrieved from http://data.imf.org/?sk=E6A5F467-C14B-4AA8-9F6D-5A09EC4E62A4

- US dollar is a key currency for international trade (Lee, 2013).
- Most of the central bank and government in the world hold US dollar as their main reserve currency (Lee, 2013). According to the Figure 5.2.1, more than 50% of U.S. dollar was allocated by the world as their reserves in 2016 Q3.
- According to World Bank (2017), US contributed 24.32% which is the most in world GDP during year 2015.

Since US is important to the world economy as shown by the facts above, any news, either positive or negative that affecting US economy and its stock market, will definitely weigh on the mind of the investors in other countries including Malaysia. Therefore, when this kind of mindset and overreaction in stock market which proposed by De Bondt and Thaler (1985) rooted in the investors, they could explain the positive and significant relationship between Malaysian stock market and US stock market.

In general, overreaction hypothesis stated that the stock price which acted like a human behavior, would overreact to the good and bad news on stock market (Ali, Nassir, Hassan and Abidin, 2010). The rationale behind this overreaction of stock price is due to investors tend to overreact to new information released to them and make decisions based on the latest information instead of the previous information (De Bondt & Thaler, 1985).

In other words, investors might trade the stocks based on misconceptions derived from the new information. Indeed, most of them are probably forgetting about the share price of a company should price according to the company performance instead of the new information received by them. This phenomena can be shown by the reactions of investors towards the good news and bad news. The stock price will more

than its fair value or true value when good news are released to the market. Conversely, the stock price will below its fair value when investors receive the bad news of a company.

However, the stock price would ultimately adjust to its fair value in long run, 3 to 5 years, because investors would take corrective actions after realizing their overreaction behavior (De Bondt & Thaler, 1985). This situation was supported by some more recent studies which was based on Malaysian context. According to Ali, Ahmad and Anusakumar (2011), they found that stock overreaction had occurred in Malaysian stock market for stock holdings more than 5 years. Interestingly, Ali, Nassir, Hassan and Abidin (2011) discovered that economic events would trigger the stock overreaction in Malaysian stock market. Therefore, using overreaction hypothesis, as investors are concerned about US stock market due to its dominate position in world economy, they tend to overreact and make harsh decisions when any news that affect US disseminate to them. In other words, Malaysian investors might react according to the trend of US stock market. If US stock market improves, they will overreact by expecting Malaysian stock market will in an upward trend too. In short, both stock markets have a positive relationship.

5.2.2 Insignificant Variables

5.2.2.1 Exchange Rate

Some researchers found out that there was no significant relationship between exchange rate and stock prices which was similar to the empirical result of this study. For instance, those researchers are Solnik (1987), Chow, Lee and Solt (1997), Nieh and Lee (2001), and Nguyen, Bui and Nguyen (2016).

According to Ooi, Wafa, Lajuni and Ghazali (2009), the asset market approach, at other extreme, indicated there was no relationship at all between exchange rate and stock prices. This was because the exchange rate was considered as one of the important parts of an asset's price in terms of foreign currency. Besides, the researchers claimed that the main factors for the changes of current exchange rate and the future exchange rate were not the same. For instance, the movement of exchange rate might be affected by a country's international trade performance. However, the future exchange rate might be affected by major political and economic events such as election, recession, war and change of government policy. Hence, no causal relationship was existed between these two variables.

In addition, the result of Ooi et al. (2009) is aligned with Abidin, Walters, Lim and Azilawati (2013) who stated that the insignificant long-run relationship between the exchange rate and stock market prices could be influenced by not only the observed financial factors, but also political factors such as government policy, expectation

patterns and impact of election. These impacts could contribute to different predicting power of stock market prices and exchange rates.

Interestingly, Ibrahim and Yusoff (2001) state that the movements of Malaysian stock market are driven more by domestic factors rather than by the external factor such as exchange rate. In general, it means that exchange rate as an external factor has less significant impact to Malaysian stock market compared to those domestic factors. For instance, the stock prices have immediate positive responses to the monetary expansion. Increase in money supply will lead to an increase in the stock prices. In another way, appreciation of exchange rate is positively related to money supply. Hence, the stock price increases due to the increase of money supply. In brief, the stock price is driven more by internal factors than the external factors.

5.2.2.2 Crude Oil Price

The crude oil price is found insignificantly related to the Malaysian stock market performance in this study. In other words, the movement of crude oil price will not affect the performance of the Malaysian stock market. The result is consistent with various studies such as Murthy et al. (2017), Nordin et al. (2014) and Puah et al. (2009). The insignificant result of crude oil price obtained might be due to the government subsidization on the oil price in Malaysia. For instance, the government will set the retail oil prices below the actual prices by providing subsidies, especially when the crude oil price increases. In 2014, the government has provided RM 17.7 billion for the petroleum subsidies alone. Therefore, the subsidised price might eliminate the impact of crude oil price movement to the stock price.

5.3 Implications of the study

5.3.1 For the potential investors

Consideration of the macroeconomic factors is important for the investors before entering the stock market. Hence, the knowledge and deep understanding of the performance of the macroeconomics are a key success for the future investors. The investors and stockholders will be more preferred to enter and hold their stocks when there is a bull market while considering factors such as inflation rate and US stock market performance at the same time. On the other hand, from the discussion on major finding, it might help the potential investors and shareholders to determine the relationship between the macroeconomic variables (inflation rate, exchange rate, crude oil price and US stock market performance) and the Malaysian stock market performance. Also, they might able to analyse and make a right decision by focusing more on the significant variables.

Besides, the investors and shareholders might need to pay attentions on the monetary policy implements by the government. As stated in the previous part, the monetary policies would affect the internal monetary function of Malaysia such as the interest rate and money supply. Moreover, it might also affect the stock market performance indirectly. Hence, it is suggested for the investors and shareholders to be more alert of the changes in monetary policies and analyse the impacts of the changes.

In addition, since US stock market is a relatively uncommon variable that introduced in this research, the result of this research might help the potential investors to

understand more about it. As shown by the result in this study, Malaysian stock market performance has a positive and significant relationship with US stock market performance. Undoubtedly, investors would be suggested to analyse US stock market when constructing their portfolio investments in Malaysia. Nevertheless, due care might be taken since there is a positive relationship between these two markets. First, according to Markowitz (1991) who is known as the Father of Modern Portfolio Theory, diversification in investment could reduce the uncertainty which was referred as risks. However, portfolio diversification might not be appropriate since Malaysian stock market and US stock market move in a same direction. This implies when investors lose their investments in US stock market, the same incident will occur too for their investments in the Malaysian stock market. Definitely, this is not the result expects by diversification as the risks do no reduce in this case. In short, the positive and significant relationship in the two stock markets indicates that Malaysia is not a suitable country for portfolio diversification particularly for investors who hold stocks in US market.

5.3.2 For the Government and Policy Makers

According to Janor et al. (2005), the researchers found that the stock market performance could reflect the expectation of the future economy of Malaysia. Furthermore, different stock market conditions will lead to the changes on economy in Malaysia.

Indeed, the Malaysian government plays a vital role in influencing the factors that affect the country. Hence, it is important for the government to have a clearer concept on the relationship between the factors and the stock market performance. By

referring to the results of this study, the government might have to analyse deeply about the inflation rate and the US stock market performance since they are significant to the stock market performance which eventually affect the country's economy.

Besides, insignificant variables do not indicate that they are irrelevant to the stock market performance. In other words, they might represent a very limited effect to the stock market performance in Malaysia. For instance, crude oil price is found to be insignificant in this study. However, government has eliminated the subsidization in recent year and will adjust the oil price monthly according to the changes of global oil price. This implied the oil price volatility would eventually affect the stock market performance in Malaysia. Hence, the government might need to consider the adverse effect particularly the impact to the stock market after terminating the oil subsidization policy. Besides, the policy makers might also need to take the consequences into consideration when handling the government policy especially the oil subsidy. This is to ensure the impact of oil price volatility to the stock prices will be minimized.

For the policy makers, this study is important for them to identify shortcomings in the policy implementation such as the monetary policy and make improvements. By understanding this study, the policy makers might able to create the policy with the consideration of several aspects instead of only focusing on the inflation problem. Thus, with the cooperation of the policy makers and government, the stability of the stock market can be achieved.

5.3.3 For the Future Researchers

Refer to the literature review, there is a lot of argument on the topic of determinants of the stock market performance which leads to different results. For example, Chia and Lim (2015) and Kaur (2015) had concluded the relationship between the inflation rate and stock market performance was in an opposite way. Nonetheless, this study has provided the future researchers another prospective result by substituting the common macroeconomic variables with the US stock market performance. Moreover, this study provides future researchers a new model which is a combination of selective variables such as the inflation rate, exchange rate, crude oil price and US stock market. In other words, this study could be a guidance for future researchers who study the determinants of the stock market performance.

5.4 Limitation

The limitations are very important for the development of the future research. They allow the next researchers to investigate the issue in a more comprehensive way. However, it is important to know that the limitations of this research are raised for the further research purpose without distorting the finding of this research.

5.4.1 Restriction of Kuala Lumpur Composite Index (KLCI)

The Malaysian stock market performance is measured by using Kuala Lumpur Composite Index (KLCI) in this study. In fact, many researches on this topic are using KLCI as the indicator of Malaysian stock market performance. However, KLCI is not the perfect indicator to examine all companies in the Malaysian stock market

since KLCI only comprises the largest 30 companies by full market capitalization that meet stated eligibility requirements (Rahman et al., 2009). Hence, the outcome of this research may not be suitably applied to the other listed companies, especially for the companies that are not included in the KLCI index. The potential users for the finding of this research are required to be aware of this limitation.

5.4.2 Conversion Factor

As stated in Chapter 3, the data of CPI which is directly retrieved from the website of Bank Negara Malaysia (BNM) involved two different base year which are 2005 and 2010. The overall study period is from 2009 to 2016, but the base year of the study period for 2009 is based on 2005, while the base year of the study period from 2010 to 2016 is based on 2010. Thus, in order to make the data comparable, the 2005 based year data has been converted into based year 2010 by using a conversion factor.

However, there is a limitation on the precision of the converted data of 2009 due to the limited decimal places available. The data that showed on the website of BNM are involved only two decimal points. Thus, it may violate the precision of the result by using only two decimal places for the data conversion, but noted that the accuracy of the result would not be affected (Sabo, 2003).

For illustration, Bertuzzi (2017) stated that the current world's record in the 100-meter dash is 9.58 seconds, but the actual time for the winner to finish the 100-meter dash is 9.572 seconds, to be more precisely. He stated that there would be a difference at the finish line between gold and silver if a third decimal place was encountered.

Similarly, a lower decimal place used in the data conversion would affect its precision level in obtaining the results.

5.4.3 Limited Resources

Limited resources in this research has caused the exclusion of selective independent variables in the model such as money supply and interest rate. Both the excluded independent variables are found significant to the Malaysian stock market performance in prior studies. For example, Alzaid (2016) stated that the interest rate and the money supply were significant to explain the Malaysian stock market performance in a negative and positive manner respectively. Besides, these findings are supported and proved by Asmy, Rohilina, Hassama and Fouad (2010) and Rahman et al. (2009). However, due to limited resources, the study is prohibited from further employing more independent variables in the model.

5.5 Recommendations for Future Research

Firstly, Kuala Lumpur Composite Index (KLCI) is not always the prefect indicator for Malaysian Stock market performance because it only includes 30 listed companies. Indeed, there are other Malaysia indexes which include Top 100 Index, EMAS Index, Palm Oil Plantation Index, Hijrah Shariah Index and ACE Index. These indexes could be used to measure the performance of the Malaysian stock market in different sectors such as conventional, Shariah principles and palm oil plantation. The future researcher could consider to use other indexes in order to better match their objectives.

On the other hand, future researches are suggested to try different data frequency such as in yearly, quarterly basis or weekly basis. This is because different independent variables might have different sensitivity on a different frequency. For example, the exchange rate may act more sensitive in daily data due to its high volatility. However, there is always a challenge while collecting secondary data. In fact, numerous researchers are always facing a problem and limitation while collecting data. Thus, they might need to consider this limitation and overcome it when collecting the secondary data.

Furthermore, future researchers are recommended to include more determinant in the scope of research. They can consider qualitative variables such as current issues in their study. For instance, the global stock markets are affected by uncertainties created by the Brexit and election of US president recently but their relationships with the stock market are yet to be studied. Besides, future researchers might examine the relationship of the stock market performance in Malaysia with macroeconomic variables of its neighbouring countries such as Singapore and Thailand by using a more recent data. For example, from the evidence of the Asian Financial Crisis, there might be a contagion effect between neighbouring countries.

5.6 Conclusion

The main objective of this study is to investigate the relationship between the selective variables and the Malaysian stock market performance. From the empirical result, it showed that two variables were significant while the another two variables were not. More specifically, there was an insignificant relationship between both crude oil price and exchange rate to the Malaysian stock market performance. On the other hand, the inflation rate and US stock market performance were having a significant negative and positive relationship respectively with the Malaysian stock market performance.

There was not much difficulty when performing the diagnostic checking. The only problem faced in this study was the autocorrelation problem. Nevertheless, this autocorrelation problem had been solved by using the Newey West (HAC) standard error method.

While conducting this study, limitation on KLCI, conversion factor and limited resources had hindered this study from providing a more comprehensive understanding about the determinants of Malaysian stock market performance. Hence, the recommendation section of this study had drawn some suggestions which might be helpful for the future researchers of this relevant study.

Lastly, this research provided an opportunity for the members of this research to practice on the techniques and knowledge acquired previously in the classroom. Besides, the members were also able to obtain a deeper understanding about the relationship of selective variables with the Malaysian stock market performance by carrying out the literature review and the data collection. Also, it was a good learning experience for the degree students to communicate effectively and work with others as a preparation for their future career paths.

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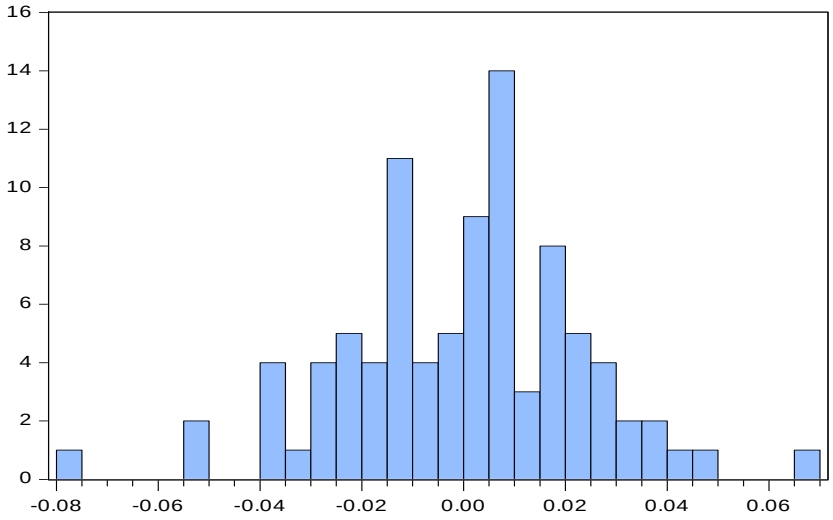
APPENDICES

Appendix 1: Normality Test



Series: Residuals	
Sample 2009M01 2016M07	
Observations 91	
Mean	2.10e-17
Median	0.003694
Maximum	0.068819
Minimum	-0.076546
Std. Dev.	0.023877
Skewness	-0.241573
Kurtosis	3.726312
Jarque-Bera	2.885300
Probability	0.236301

Appendix 2: Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.203573	Prob. F(4,82)	0.0038
Obs*R-squared	15.48461	Prob. Chi-Square(4)	0.0038

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 03/08/17 Time: 22:36
Sample: 2009M01 2016M07
Included observations: 91
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	-0.004683	0.016898	-0.277151	0.7824
CPI	7.98E-05	0.000394	0.202482	0.8400
LNSPX	0.042914	0.059687	0.718974	0.4742
OIL_PRICE	-4.78E-05	0.000219	-0.218762	0.8274
C	0.011271	0.059507	0.189409	0.8502
RESID(-1)	-0.334893	0.107517	-3.114779	0.0025
RESID(-2)	0.004525	0.113638	0.039817	0.9683
RESID(-3)	-0.048663	0.113974	-0.426962	0.6705
RESID(-4)	-0.260336	0.109551	-2.376399	0.0198

R-squared	0.170161	Mean dependent var	2.10E-17
Adjusted R-squared	0.089201	S.D. dependent var	0.023877
S.E. of regression	0.022787	Akaike info criterion	-4.631557
Sum squared resid	0.042580	Schwarz criterion	-4.383230
Log likelihood	219.7358	Hannan-Quinn criter.	-4.531372
F-statistic	2.101786	Durbin-Watson stat	2.049311
Prob(F-statistic)	0.044724		

Appendix 3: Heteroskedasticity Test

Heteroskedasticity Test: ARCH

F-statistic	0.847209	Prob. F(4,82)	0.4994
Obs*R-squared	3.452777	Prob. Chi-Square(4)	0.4851

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 03/08/17 Time: 22:34
Sample (adjusted): 2009M05 2016M07
Included observations: 87 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000388	9.60E-05	4.046444	0.0001
RESID^2(-1)	0.088611	0.097986	0.904328	0.3685
RESID^2(-2)	-0.068472	0.083601	-0.819034	0.4151
RESID^2(-3)	0.029745	0.080154	0.371093	0.7115
RESID^2(-4)	0.091256	0.074858	1.219046	0.2263

R-squared	0.039687	Mean dependent var	0.000463
Adjusted R-squared	-0.007157	S.D. dependent var	0.000612
S.E. of regression	0.000615	Akaike info criterion	-11.89520
Sum squared resid	3.10E-05	Schwarz criterion	-11.75348
Log likelihood	522.4411	Hannan-Quinn criter.	-11.83813
F-statistic	0.847209	Durbin-Watson stat	1.889180
Prob(F-statistic)	0.499358		

Appendix 4: Model Specification Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LNKLCI EXR CPI LNSPX OIL_PRICE C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.480284	85	0.6323
F-statistic	0.230673	(1, 85)	0.6323
Likelihood ratio	0.246621	1	0.6195

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.000139	1	0.000139
Restricted SSR	0.051311	86	0.000597
Unrestricted SSR	0.051172	85	0.000602
Unrestricted SSR	0.051172	85	0.000602

LR test summary:

	Value	df
Restricted LogL	211.2490	86
Unrestricted LogL	211.3724	85

Unrestricted Test Equation:
Dependent Variable: LNKLCI
Method: Least Squares
Date: 03/08/17 Time: 16:48
Sample: 2009M01 2016M07
Included observations: 91
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	2.51E-05	0.014938	0.001681	0.9987
CPI	-0.001446	0.000484	-2.984937	0.0037
LNSPX	0.359573	0.095936	3.748043	0.0003
OIL_PRICE	-0.000113	0.000172	-0.653987	0.5149
C	0.165696	0.060489	2.739274	0.0075
FITTED^2	-3.436333	9.241215	-0.371849	0.7109

R-squared	0.354047	Mean dependent var	0.006970
Adjusted R-squared	0.316050	S.D. dependent var	0.029668
S.E. of regression	0.024536	Akaike info criterion	-4.513678
Sum squared resid	0.051172	Schwarz criterion	-4.348127
Log likelihood	211.3724	Hannan-Quinn criter.	-4.446888
F-statistic	9.317701	Durbin-Watson stat	2.649423
Prob(F-statistic)	0.000000		

Appendix 5: OLS Regression Result (after correcting autocorrelation)

Dependent Variable: LNKLCI
Method: Least Squares
Date: 03/08/17 Time: 16:50
Sample: 2009M01 2016M07
Included observations: 91
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	-0.001610	0.014727	-0.109296	0.9132
CPI	-0.001254	0.000372	-3.370780	0.0011
LNSPX	0.334770	0.081481	4.108571	0.0001
OIL_PRICE	-0.000106	0.000169	-0.626157	0.5329
C	0.149515	0.052724	2.835799	0.0057

R-squared	0.352294	Mean dependent var	0.006970
Adjusted R-squared	0.322168	S.D. dependent var	0.029668
S.E. of regression	0.024426	Akaike info criterion	-4.532946
Sum squared resid	0.051311	Schwarz criterion	-4.394987
Log likelihood	211.2490	Hannan-Quinn criter.	-4.477288
F-statistic	11.69407	Durbin-Watson stat	2.654524
Prob(F-statistic)	0.000000		