OIL PRICE VOLATILITY AND MACROECONOMIC FACTORS INFLUENCE STOCK MARKET RETURN: A STUDY IN MALAYSIA

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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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DEDICATION

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LIST OF ABBREVIATIONS

ADF	AUGMENTED DICKEY-FULLER
APT	ARBITRAGE PRICING THEORY
AR	AUTOREGRESSIVE
ARCH	AUTOREGRESSIVE CONDITIONAL HETEROSCEDASTICY
ARIMA	AUTOREGRESSIVE INTEGRATED MOVING AVERAGE
BLUE	BEST, LINEAR, UNBIASED AND ESTIMATOR
BNM	BANK NEGARA MALAYSIA
CPI	CONSUMER PRICE INDEX
CPO	CRUDE PALM OIL PRICE
FC	FINANCIAL CRISIS
GSE	GHANA STOCK EXCHANGE
JB	JARQUE-BERA
KLCI	KUALA LUMPUR COMPOSITE INDEX
KLSE	KUALA LUMPUR STOCK EXCHANGE
KPSS	KWIATKOWSKI-PHILLIPS-SCHMIDT-SHIN
OLS	ORDINARY LEAST SQUARE

PP	PHILLIPS-PERRON
RER	REAL EXCHANGE RATE
RIR	REAL INTEREST RATE
RM	RINGGIT MALAYSIA
VAR	VECTOR AUTOREGRESSIVE MODEL
VIF	VARIANCE INFLATION FACTOR
WDI	WORLD BANK
WLS	WEIGHTED LEAST SQUARE
WPI	WHOLESALE PRICE INDEX

PREFACE

To investigate the stock market return is very important yet interesting topic nowadays. By employed the multi-regression model, we able to know that the effects of macroeconomic factors and oil price volatility influence stock market return.

This study contributed to several parties, for example, the policymaker, commercial company, investors and university educator and any parties that interested to have a better understanding of the response of stock market return in Malaysia.

ABSTRACT

This study aims to examine the relationship between oil price volatility and macroeconomic variables such as real interest rate, real exchange rate, inflation rate and financial crisis that influence stock market return in Malaysia. This study is using quarterly data from 1994 to 2010. Moreover, this study employed Ordinary Least Square model to examine the regression model.

The result obtained shows that the oil price and macroeconomic factors are significant and positively related except for financial crisis is significant and negatively related with stock market return in Malaysia.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

This research attaches much weight on effect of crude palm oil price volatility and macroeconomic factors on stock market returns in Malaysia for 17 years, 1994 to 2010. Consequently, purpose of conducting this research is to examine that stock market returns in Malaysia will be influenced by crude palm oil price volatility, inflation rate, real exchange rate, real interest rate, and financial crisis. This chapter includes several parts which are research background, problem statement, research objective, research question, hypothesis of study, significance of study, and chapter layout.

1.1 Research Background

Bursa Malaysia was formerly familiar as Kuala Lumpur Stock Exchange (KLSE) is a very influential exchange holding company in Malaysia. Bursa Malaysia acted as a main reference in the share market and country’s capital. Bursa Malaysia is an exchange holding company set up in 1973 and registered in 2005. Bursa Malaysia has provided infrastructure to create a globally competitive marketplace in assisting the Malaysia capital market. Bursa Malaysia is committed to maintain an active, secure, and efficient trading market for domestic and international investors.

Kuala Lumpur Composite Index (KLCI) is a representative of Malaysian Stock Market Index since 1986 and presently recognized as FTSE Bursa Malaysia KLCI. Malaysia stock market is growing significantly in last decade and become one of the dominant Asian emerging markets. Most of the analysts review on the future economic outlooks in Malaysia and other Asian countries through KLCI because KLCI is presently admitted as one of the best sources for the Asia-Pacific equity markets to refer.

Furthermore, according to Idrees (2014), Malaysia is one of the largest oil exporters in the world as currently assigned for 44% of world exports and 39% of world oil production. Malaysia exerts an important role to fulfill the global growing need for oils and fats. Palm oil industry in Malaysia expands rapidly as the planted area was only 55,000 hectares in year 1960 but the planted area increased to 3.38 million hectares in year 2000. The number is growing in year 2009 which reached 4.567 million hectares. However, the expansion of oil palm areas started to slow down as the industry facing the land constraint. The supply and demand of palm oil could affect the oil price performance. Thus, the oil price has reached its highest in December 2010 during the period of 2003 to 2013, which is RM3,665.21 per metric ton. The oil price has reached its lowest at RM1,406.34 in December 2004.

In favor of provide to this line of research in developing country like Malaysia, this research studies on several determinants which are oil price volatility, real interest rate, real exchange rate, inflation rate and financial crisis on the stock market returns in Malaysia.

1.2 Problem Statement

There are many researches focus on the studies of relationship between macroeconomic variables and returns of stock market. However, Zakaria and Shamsuddin (2012) stated that there are many studies focus on developed countries but a few studies on Malaysia. Economic growth of Malaysia can be affected by stock market returns. Stock market returns increased indicated the upturn of economy and vice versa. Malaysia is one of the largest countries that exporting oil in the world and the earnings gained from crude palm oil are contributed to the country as a part of national income. This is because Hadi, Yahya and Shaari (2009) suggested that Malaysia is a country that produces and exports oil, therefore Malaysia is expected to gain some economic benefits from the increasing of oil price. Hence, oil price is an important variable that could affect stock market return.

According the research of S. Nordin, N. Nordin and Ismail (2014), the researchers had done an analysis study in Malaysia regarding the effect of palm oil price, interest rate and exchange rate fluctuate toward Malaysian stock market index. Nevertheless, the researchers revealed that the exchange rate and interest rate are potential factors to determine the performance of stock market return. Interest rate is always considered extensively as reverse relationship with stock market index. Meanwhile, the exchange rate that will highly influence the Ringgit Malaysia (RM) value against other countries currency value is a crucial factor for foreign investor to penetrate domestic stock market if the value of RM is depreciated. On the other hand, for the palm oil price, oil production industry is considered as one of the significant contributions to exports and the formation of derivative instrument such as the Crude Palm Oil Futures. The findings based on S. Nordin et al (2014) shows that, the interest rate and exchange rate are negatively related with stock market index, while the palm oil price is positively related with stock market index.

There are existing researches study on the consequences of crude palm oil price and macroeconomic variable separately on the stock market return in Malaysia, however, the result obtained from previous researchers are inconsistent. Some empirical evidences provide mixed result between the linkages of macroeconomic variables and stock prices. There are some macroeconomic variables are positively related to stock price, which including the inflation (Lee, 2010), exchange rate (Yau & Nieh, 2009; Maysami, Lee & Hamzah, 2004) and the interest rate (Srinivasan, 2011). However, some of the researchers proved that the inflation rate (Fama, 1980), exchange rate (Menike, 2006), and interest rate (Cao, 2012) have negative linkages with stock prices. Nevertheless, study of Vejzagic and Zarafat (2013) shows there is significant relationship between the interest rate, money supply, and exchange rate on returns of stock market. On the other hand, inflation rate has been statistically proven insignificant. However, Li, Narayan and Zheng (2010) proved the inflation are significantly influence stock price.

In conclusion, there are limited literatures to provide clear evidence of the effects of oil price and macroeconomic variables on stock price in Malaysia. Therefore, this research intends to include both oil price and macroeconomic variables to examine consequence on stock market return in Malaysia.

The volatility of crude palm oil price can affect the stock market returns of several industries and even a country. Therefore, many previous researchers have done the studies about the relationship between returns of stock market and oil prices. Zhang and Chen (2011) studied the consequence of stock market returns of China by separating the volatilities of oil price into expected, unexpected and negatively unexpected. Besides that, Park and Ratti (2008) indicated that the oil price shocks will significantly influence the volatility in stock market return of the United State and 13 European countries. However, Jalil, Ghani and Duasa (2009) stated that current studies focus on developed countries such as United States and OECD countries whereas Malaysia is a developing country. Therefore, this research intends to investigate the relationship between oil price volatility and stock market returns in Malaysia.

Stock market returns is varied every single minute and can be affected by several factors. One of the factors that could give fluctuation on the stock market returns is inflation rate. Therefore, there are many previous researchers study on this problem. Du (2006) studied the relationship between inflation rate and stock market returns when there were vary in the monetary regime and the corresponding crucial of supply and demand shocks. Besides this, Alagidede and Panagiotidis (2012) have done the research on the effect of stock returns under different quantiles by inflation rate. However, the findings are not consistent for various studies. Therefore, this study will investigate how the inflation affects the stock market returns in Malaysia.

Many studies have carried out to investigate the effect of exchange rate on stock price but the findings are not consistent across the numerous studies. There are some empirical findings shows that exchange rate significantly affect the stock market returns in most of the Asian countries (Granger, Huang & Yang, 2000). However, according to the research done by John, Guglielmo and Nicola (2008), exchange rate has a significant consequence only in some cases but without a clear sign pattern. Therefore, this research will investigate how exchange rate influence the stock market returns in Malaysia.

Interest rate is defined as an important variable to determine the stock market returns. According to research done by Hussain and Khan (2011), interest rate is significantly and positively affecting stock market returns. Besides that, Cao (2012) found that stock market is negatively affected by interest rate. There is no consistent point of view about the predictive power of interest rate to determine stock market returns in

Malaysia has yet observed. Therefore, this research intends to investigate the relationship between interest rate and stock market returns in Malaysia.

Financial crisis is a very famous and sensitive issue that has been concerned by the global since nowadays there is a huge impact to the world if climate change happening in the financial market. According to Lim, Brooks and Kim, (2008), the Asian financial crisis has adversely impact toward most of the Asian stock market. Besides, Kenourgious, Asteriou and Samitas, (2013) also mentioned that, Asian financial crisis has causes a dramatic disruption to the financial stability and economy performance and altered the pricing of financial instrument and financial assets. All of these influences are correlated with stock returns. Thus, financial crisis is an important factor that should be covered to examine its effects on stock market returns.

1.3 Research Objective

- To examine the relationship between the stock market returns and crude palm oil price.
- To examine the relationship between the stock market returns and inflation rate.
- To examine the relationship between the stock market returns and real exchange rate.
- To examine the relationship between the stock market returns and real interest rate.

- To examine the relationship between the stock market returns and financial crisis.

1.4 Research Questions

1. How does the crude palm oil price volatility affect the stock market returns in Malaysia?
2. How does the inflation rate affect the stock market returns in Malaysia?
3. How does the real exchange rate affect the stock market returns in Malaysia?
4. How does the real interest rate affect the stock market returns in Malaysia?
5. How does the financial crisis affect the stock market returns in Malaysia?

1.5 Hypothesis of the study

1.5.1 Oil Price

H_0: There is no relationship between oil price and stock market returns.

H_1: There is a relationship between oil price and stock market returns.

1.5.2 Inflation Rate

H_0: There is no relationship between inflation rate and stock market returns.

H_1: There is a relationship between inflation rate and stock market returns.

1.5.3 Real Exchange Rate

H_0: There is no relationship between real exchange rate and stock market returns.

H_1: There is a relationship between real exchange rate and stock market returns.

1.5.4 Real Interest Rate

H_0: There is no relationship between real interest rate and stock market returns.

H_1: There is a relationship between real interest rate and stock market returns.

1.5.5 Financial Crisis

H_0: There is no relationship between financial crisis and stock market returns.

H_1: There is a relationship between financial crisis and stock market returns.

(Dummy variable)

1.6 Significance of study

This research aims to investigate the relationship between dependent variable (stock market returns) and independent variables (oil price, inflation rate, real exchange rate, real interest rate, and financial crisis). Moreover, this research is based on the Malaysia perspective to find out the effects of stock market returns by the macroeconomic variables.

This research is gathering the relevant concrete information and methodology that used to conduct the research on the consequences of oil price volatility and macroeconomic variables to the stock market returns. Hence, this research could be used by the university educator as a reference to guide students in future. In addition, the result of this research can provide useful information to the commercial company on their investment decision making and allocation of the financial resources to ride out the financial crisis or markets volatilities.

Moreover, based on the investors' perspective, this research contributed the understanding of whether stock market returns respond to the crude palm oil price volatility and macroeconomic factors. This research also provides useful information to them to manage the diversification of their investment portfolio. Crude palm oil price volatility may affect the investors' estimation on domestic stock market and hence attract international investors to invest in local stock market if in favorable conditions.

Last but not least, the understanding of the relationship between macroeconomic factors and stock price has important indications for policymakers in conduct national macroeconomic policies. Moreover, the fast moving volatile stock markets and unexpected change economic condition will have a great influence on stock market returns. Therefore, this research aims to provide a clear reference on how macroeconomic factors affect stock prices movement. Besides that, this research also assists them in formulate an appropriate policy to avoid volatility of stock market and maintain the stability of financial market.

1.7 Chapter Layout

- Chapter 1 comprised of the introduction to this research and come with a brief background of the research, the problem statement, research objectives, research questions, hypothesis of study and significance of study, and a list of chapter layout.

- Chapter 2 covers the literature review of this research and will discuss the theoretical models and concepts that have been applied by the past researchers.

Moreover, the hypothesis for the independent variables also will be explained in this chapter.

- Chapter 3 covers the descriptions of data sources and discussion of the methodology.

- Chapter 4 will conduct statistical test, diagnostic checking and analysis of results.

- Chapter 5 will summarize the research findings of the study, implication that obtained from study and limitations that confront in the study and along with the recommendation for future researchers.

1.8 Conclusion

Overall, this research provides empirical proof on the impacts of macroeconomic factors on returns of stock market by testing significant relationship between the macroeconomic variables (oil price volatility, real interest rate, real exchange rate, inflation rate and financial crisis) and stock market returns.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

In this chapter, the literature review based on the previous studies which related to this research topic will be discussed after the discussion on research background, problem statement, research objectives, hypotheses and significance of study in Chapter 1. The literature review will provide a better understanding for the future researchers about the relationship among dependent variables (stock market returns) and independent variables (oil price volatility, inflation rate, real exchange rate, real interest rate, and financial crisis). The contents of chapter 2 will divide as review of literature; review of relevant theoretical models; proposed conceptual framework; and hypothesis development.

2.1 Review of the Literature

2.1.1 Oil Price

Study done by Mohanty, Nandha, Turkistani and Alaitani (2011) proved that the oil price volatility have asymmetric impact on stock market return at different country level and industry level. The stock market is highly sensitive to fluctuation of crude oil price. The evidence showed that increasing of crude oil price will have positive impact onto the stock price at the country level. Whereas, a mixed result is provided at industry level, is either positive or negative relationship between oil price and stock market return.

According to the Mollick and Assefa (2013), the changes in oil price only slightly influence the stock return before financial crisis, but in the mid 2009 onwards, the oil price is positively influences the stock return. Chang and Yu (2013) also suggested that the impact of oil price toward stock price is varies on different time frame, at present and post period of oil price shocks. In addition, the researchers also stated that last period oil price shock can affect the stock market return in the next period.

Based on the research done by Li, Zhu and Yu (2012), the research result was showing that oil price and the stock returns are positively correlated in the long run. The positively influences is mainly due to the increasing of the leveraged investment in stock. However, a contradict view was contributed by Cunado and Gracia (2014) which stated that oil price have significance and negative relationship on stock price.

According to the empirical result which done by Cong, Wei, Jiao and Fan (2008) in China market indicates that oil price shock showed insignificant correlation on the stock returns of Chinese market indices. Nevertheless, the stock market return is proved to be greatly influenced by the oil price movement in manufacturing and some oil price companies. In other word, growth of the oil price does not seem to have direct influence on the stock price but will indirectly increase the petro-chemical index, which resulted in increasing of stock returns.

Park and Ratti (2008) investigate the effects of oil price volatility on the real stock market returns in the U.S. and 13 European countries starting from 1986 to 2005 by using VAR analysis. The findings also show that the oil price shock statistically influence stock market returns across all countries.

According to Zhang and Chen (2011), the empirical findings indicate the oil price has exhibit positively shock to the stock market returns. This is because the researchers have found out that although the increase in the oil price will bring detrimental effect on economic growth. However, there is a positive relation with the inflation rate which will also drive up the interest rate that increase the stock market returns. Moreover, Huang and Guo (2007) also indicated that the shock in oil price will lead the long term real exchange rate to a minor appreciation which will has a positive influence to the stock market.

In a nutshell, most of the studies show that the oil price influences the stock return positively. Besides that, the impact on stock return is varied across different time period, country and industry level.

2.1.2 Inflation Rate

There are existence of positive relationship between stock price and inflation rate based on the research result showed by Geske and Roll (1983) due to the equities is hedges against inflation because equities are representing the claims on real assets. However, the result is contrasted with Bodie (1976), Fama (1980) and Adams et al. (2004), which showed that the stock market return is negatively related to inflation rate.

Other than that, Li, Narayan and Zheng (2010) studied the relationship between stock returns and inflation rate by using United Kingdom. The empirical finding showed that the result obtained regarding the relationship between inflation rate and stock market return will be affected by different inflationary regime. Additionally, the levels of inflation also play a matter role in influencing the result, either in high or low level of inflation. During low inflation rate economy period, inflation rate and stock market return are negatively related. Whereas, during high inflation rate economy period, the stock return is positively related. Besides that, this study also showed that the stock returns would be affected by the unexpected inflation announcement whereas there is less impact on stock return by the expected inflation announcement. The researchers concluded that the stock returns are positively affected by expected inflation and negatively affected by unexpected inflation.

Other than that, Du (2006) suggested that the monetary policy regime and the relative demand and supply shocks will critically affect the relationship between stock market return and inflation rate. This researcher found out that there are three structural breaks during the period from year 1926 to year 2001. The three structural breaks consists of four regimes, the first regime are during the periods of 1926 to 1939, the inflation is positively affected the stock return because of the strongly pro-cyclical monetary policy. Nevertheless, in the third regime the relationship between stock return and inflation rate is negative correlation, this is due to the supply shocks during that time period.

Kim and In (2005) suggested that the relationship between stock return and inflation rate is vary following the different time horizons. This study shows the stock return and inflation are positively correlated during short time horizon, mostly less than a year and at long time horizon, typically 128-month of periods. On the other hand, at the intermediate time horizon, the stock return and inflation rate will posted an inverse relationship.

Other than that, study in different time period will produce different result. Lee (2010) obtained different findings when investigating the relationship between the stock price and inflation rate in pre- and post-war period. The inflation rate is positively correlated to stock return during pre-war period. On the contrary, the correlation between stock return and inflation rate are proved to be negatively related during post-war period. The negatively result also supported by Alagidede and Panagiotidis (2012), provided that when inflation increase, the stock return will decrease which can be fully explained by money demand and quantity theory of money.

In short, the relationship between stock return and inflation is varied according different time periods which can be positively and negatively related.

2.1.3 Real Exchange Rate

The effect of exchange rates on volatility of stock price has received attention lately because of risk increment in international transaction. Therefore, there are many empirical researches are carry out to investigate the impact of exchange rate on stock price. However, the findings are different across the various studies.

Plenty of the empirical findings supported the view that exchange rate fluctuation lead to stock price movements. Granger, Huang & Yang (2000) investigate the relationship between the currency value and stock price during Asian Financial Crisis 1997 by using daily data. The findings proved that there are strong correlation relationship between exchange rate and stock price in the Asian countries such as Taiwan, Malaysia, Singapore, Hong Kong and Thailand. The study in Shanghai done by Liu and Wan (2012) also provided similar result, the exchange rate appear to be significant factor to influence the stock price.

There are some studies stated that the exchange rate and stock price are positively related. Maysami et al. (2004) suggested that the positive relationship between exchange rate and stock price can be proven from various Singapore Exchange Sector Indices (finance index, property index and hotel index). Singapore currency appreciated will attract more foreign investments from foreign country. Demand for Singapore dollars increase will drive up the stock price in local market. Furthermore, the empirical research done by Yau and Nieh (2009) showed a positive and significant relationship between NTD/JPY and the stock prices of Japan and Taiwan in the long run from January 1991 to March 2008. This supported the traditional approach which shows that depreciation of local currency make firms more competitive, amounts of exported good increase, and the stock price increase. In addition, Granger et al. (2000) implied that rise in exchange rate drive up stock prices in Japan and Thailand.

However, based on the study done by Menike (2006) in emerging Sri Lanka stock market, there is a negative relationship between exchange rate and stock prices in the Colombo Stock Exchange (CSE). This can be explained when the local currency appreciates, demand for imported good increases which causes losses to the exporters because sales and profit drop. Hence, the stock prices for export firms drop and lose competitiveness in local market. Liang, Lin and Hsu (2013) reexamined the causality relationship between stock price and exchange rate in ASEAN-5 countries (Indonesia, Malaysia, Philippines, Singapore and Thailand). The researchers employed monthly data from August 2008 to June 2011 to conduct their research which implied that exchange rate influences stock market negatively via capital mobility in the capital accounts. This is because appreciation of currency will encourage international funds searching for investment opportunity and outflow of portfolio management from these countries.

On the contrary, Du and Hu (2012) argued that foreign exchange volatility solely cannot explain either in cross-section or time-series stock returns in US market. This is because the research does not differentiate volatility of exchange rate into long run and short run effect. Furthermore, Rahman and Uddin (2009) indicate that there is no causal and cointegrating relationship between the stock prices and exchange rates in three emerging countries of South Asia named as Bangladesh, India and Pakistani. Therefore, the past exchange rate cannot used to forecast the future stock price.

2.1.4 Real Interest Rate

According to Srinivasan (2011), the interest rate has significance and positive relationship on stock market returns in the long run. At the same time, the researcher also found that there is a significant unidirectional causation from interest rate to stock market return. This result is consistent with Zakaria and Shamsuddin (2012), interest rate is significantly Granger-caused stock market return and the causality is unidirectional from interest rate to stock market return.

On the other hand, Hussain and Khan (2011) showed there is a significant and positive relationship between Pakistan's stock market return and interest rate. Interest rate is positively affects stock market returns because when interest rate increases, risk premium for investors will reduce due to increase in risk free rate. Therefore, investors who are risk averse will start trading in stock and in return stock prices go up. Besides that, empirical researches done by Issahaku, Ustarz and Domanban (2013) also obtained similar results, the research showed that the interest rate is key determinant to impact the stock return in the short run.

Based on findings done by Cao (2012), interest rate will bring significance negative impact to the stock returns. The researcher showed that Chinese stock market returns are negatively related to the interest rate in China. Rehman, Yousaf, Ejaz and Sardar (2011) also found that stock market returns have negative and significant relationship with the interest rate in USA and Korea. This is because when the rising in interest rate will encourage more people tend to deposit savings amount in the bank accounts instead of investing in stock market and hence decrease the stock prices.

In view of Kasman, Vardar and Tunç (2011), empirical research of the impact of interest rates on bank stock market returns have become a popular topic in recent years. The findings showed that the interest rate has a negative and significance impact on the bank stock returns. The similar result is obtained by Jain, Narayan and Thomson (2011). The aim of the research is examined the relationship between interest rate and Australia banking sector. The researcher found that rise in the short-term interest rate has a statistically significant negative impact on the stock market returns of banks in Australia.

In conclusion, based on the researches done by previous researchers, there are positive and negative relationship between interest rate and stock market return in different countries.

2.1.5 Financial crisis

According to Calomiris, Love and Peria (2012), firms' stock returns usually reflect a combination of expected returns and residual returns that associated with firms-specific news. Nevertheless, financial crisis shocks have a negative influence on the stock return to investors. An analysis of portfolio firms investigate that the investors will bears the consequences of the risk solely regarding with the crisis shocks. The financial crisis shocks played a critical role in explaining equity returns during the crisis as compared with several pre-crisis periods. Moreover, the researchers consider 3 key features of crisis shocks of year 2007-2008 for emerging and developed economics which are the collapse of global trade, a sharp contraction in credit supplies which restricted the firms to funding and limited their effective debt capacity and crisis has imposed a selling pressure in equity market.

Next, according to Davydov and Vahamaa (2013), financial crisis in 2008 has increased the risk aversion of the investors and caused a significant liquidity shock on capital market since the terms of borrowing have been tightened. Furthermore, the financial crisis is a negative related to the firm's stock return but the seriousness of the impact is depends on choice of debt resources. The researchers investigated that the firms relied on bank debt will achieve better result on their stock return than relied on public debt during the financial crisis period. This is because bank debt will be remarkably valuable during the crisis. However, the bank debt dependent firms' stock return will be recovered slowly than public debt firms after the crisis period since banks require more on risk-adverse investment. Besides that, banks constraint the firms to involve in risky economic evolvement that might alleviate the firms' rate of return. In contrast, the public debt firms are more financial flexibility in any investment and growth opportunities. Therefore, if the firms are capable to redesign the sources of debt financing immediately, the firms could be able to reduce adverse impact rooted from crisis shocks, and bring the firm's to a maximum level during the post-crisis period.

Based on the research done by Engkuchik and Kaya (2012), the researchers have found that the global financial crisis has a negative impact on the liquidity of capital market and the liquidity market is negatively related with the stock returns since the liquidity will cause the expected return decreased. In addition, the researchers found that during the crisis period, the liquidity level will go up since the investors forced to exit the stock market quickly to avoid further loss during the crisis that will inflict heavy losses on stock return.

Other than that, Karunanayake, Valadkahni and O'brien (2010) supported that the Asia crisis and the most recent global crisis has a high degree of volatility among all the markets and the investors will be highly unlikely to benefit from diversifying their portfolio. This is because the crisis has a negative effect on risk-averse investors and the transmission of volatility will influence the pricing of securities, trading strategies, regulatory and terms strategies and the hedging strategies across the markets and finally contributed to the volatilities of stock return.

Lastly, Nikkinen, Omran, Shalstrom and Aijo (2008) also shared the same point of view which is the impact of crisis or important event will significantly increase the volatilities of stock return and cause significant negative returns or below-average returns in the short run but this will be recovered or above-average return quickly on the post period.

In short, all the researches have a consistent result which is the stock returns are always associated with the effect of financial crisis and always a negative relation in between.

2.2 Review of Relevant Theoretical Models

2.2.1 Fisherian Theory

Fisherian theory could determine the effect of inflation rate by differencing the nominal interest rate and the real interest rate. When the real interest rate on the assets dropped, the inflation will be increased. Li, Narayan and Zheng (2010) used this theory to analyze the research of inflation and stock market returns. Besides that, Du (2006) also applied Fisherian theory to carry out research regarding the inflation and stock market returns. The theory could identify the relationship between inflation rate and stock market returns in order to find out which type of stocks could be good hedged against the inflation. There is no exception for Kim and In (2005) applied the Fisherian theory on the study. The researchers make use of the theory together with a new approach to better explain the correlation for the stock returns and inflation. Furthermore, Fisherian theory assumes that a nominal interest rate could reflect the usable information to concern about the future changes in values of the inflation rate and to make decision on holding of the stock. Thus, Lee (2010) applied this theory on the survey.

2.2.2 ARIMA Model

ARIMA (auto-regressive integrated moving average) model is to forecast a time series by using the method of differencing and logging to create stationary model. Li, Narayan and Zheng (2010) used ARIMA model to forecast the expected inflation rate of sample data for different period of time.

2.2.3 Vector Autoregressive Model (VAR)

Vector Autoregressive model (VAR) examines the short run and long run relationship among series in more details. Du (2006) applied this model to determine whether the money supply shocks have any long term result on real stock prices. Time period effect of money supply shocks on real stock prices and the price level could be determined by the one-period effects on inflation and stock market returns. Karunanayake, Valadkhani and Brien (2010) have applied a vector autoregressive stochastic process to examine the stock return on an equation. Vector autoregressive model is used to test the multivariate time series data by estimating the factors own lags evolution and capture the trend behavior. The equation has included a dummy variable that captures the effects on crisis. Finally, the result showed that there are volatiles on the stock return during the crisis period.

2.2.4 Monetary Policy

Monetary policy is an action that will be adopted by the central bank to control interest rate whenever there is an increasing or decreasing of the money supply. Based on policy, when the money supply grows fast, the inflation rate will increase and affect the interest rate. Du (2006) applied this policy to define the relation of stock returns and inflation. The researcher found out that counter or pro-cyclical monetary policy would give different correlation of stock returns and inflation. Different time period applies different types of monetary policy would provide different relation to the stock returns and inflation. Lee (2010) also applied the same policy on the correlation of inflation and stock market returns during the period before the war and after the war.

2.2.5 GARCH Model

GARCH model aims to determine the volatility movement for financial time series across different periods in order to estimate the volatility in the future. This model uses the high frequency data such as daily data to estimate the model to increase the accuracy of model. Mollick and Assefa (2013) applied this model on the studies. The researchers used the daily data which the time range is January 1999 to December 2011 to investigate the relation of US stock returns and oil price.

2.2.6 Weighted least square

Weighted least square is one of the methods to estimate the varying data. This is because the weighted least square assumed the standard deviation of the error variance is constant. Weighted least square could overcome the econometric problem of heteroscedasticity. Calomiris, Love and Peria (2012) also employed weighted least square with weighted proportional to parallel processing the data from different countries.

2.2.7 Unit Root Test

Unit root test can be employed to examine the stationary of time series data and improve the preciseness and dependability of the models constructed.

Time series data is stationary when the mean and variance are remaining unchanged over a given period of time. Cong, Wei, Jiao and Fan (2008) was using unit root test to prove the stationary of real stock return. These researchers choose Phillips and Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test to examine the variables. The PP test indicated that the series has a unit root at 5% significant level while there is no unit root at 1% significant level. The results from KPSS test indicated that the stock returns series are stationary.

Karunanayake, Valadkhani and O’brien (2010) have implemented the Augmented Dickey-Fuller （ADF） to examine the stationary of the variable. ADF is used to examine the stationary of different countries stock market volatilities. Moreover, after implemented the ADF test, the researchers use an ADF t statistic to standardize the stationary problem. Hence, the researchers found that all the standardized residual series are stationary.

2.2.8 Cointegration Test

Cointegration test is been used by many researchers to examine the relationship between macroeconomic factors and stock markets. Cointegration test is used to analyze the long term relationship between macroeconomic factors and stock market price. Li, Zhu and Yu (2012) use cointegration test to identify the long-run equilibrium relationship between oil price and sectoral stock return, given that the variables are integrated of same order which examine by unit root test. The results obtained by researchers suggested that the sectoral stock return and oil prices have a long run relationship because both of the variables are cointegrated.

2.2.9 Granger Causality Test

Granger causality test was first introduced by Clive Granger in 1969. The relationship between variables does not prove causality or the direction of influence, therefore, Granger causality test has been proposed. Researchers use Granger causality test to examine the dynamic effect of variables. If variables X granger causes Y, then changes in X should change before Y. Issahaku, Ustarz and Domanban (2013) used the pair-wise Granger causality to detect the presence of causality between macroeconomic factors and returns of Ghana Stock Exchange (GSE) listed companies. The result shows that a one direction causality running from stock market returns to interest rate implying that the stock returns can be used to estimate the interest rate.

2.2.10 Arbitrage Pricing Theory (APT)

Arbitrage Pricing Theory (APT) is a multiple-factor model developed by Ross (1976). APT assumed that macroeconomic variables have a systematic consequence on return of stock market. Maysami and Koh (2000) states that economic forces will have effects on discount rates, the capability of corporations to give rise to cash flow and future payouts of dividend. Thus, macroeconomic factors will become risk factors in equity market. The greater the interest rates, the greater the discount factor and hence caused stock prices lower. Thereby, APT uses the expected return of risky asset and risk premium of macroeconomic variable.

APT is represented by a series of linear equation where each economic variable is assigned to a factor specific beta coefficient and this represents the sensitivity to changes in each macroeconomic variable.

The APT formula can be expressed as:

$$E\,(r_j) = r_f + \beta_{j1} RP_1 + \beta_{j2} RP_2 + \beta_{j2} RP_2 + \ldots\ldots + \beta_{jn} RP_n$$

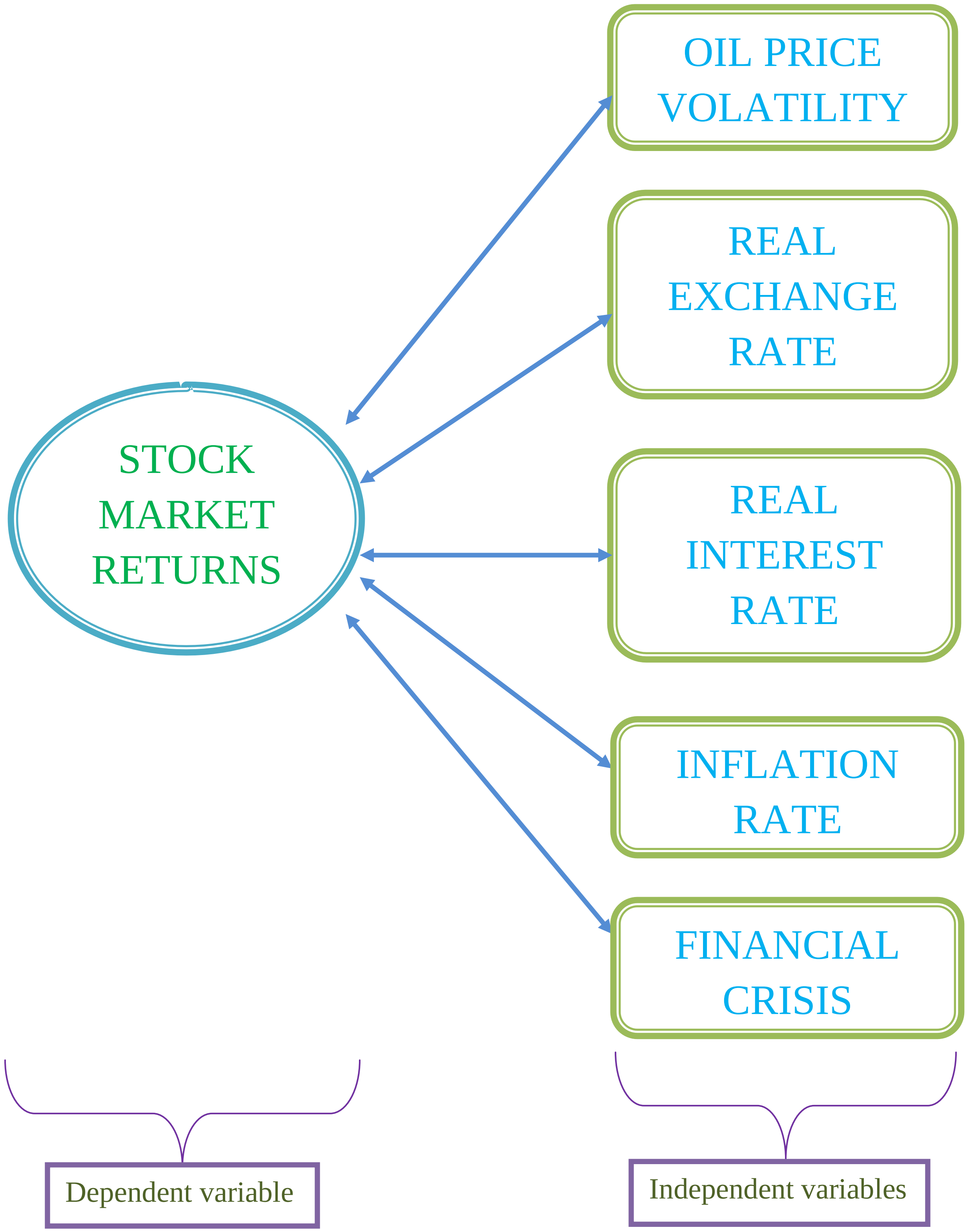
- $E\,(r_j)$ = Expected rate of return on asset
- r_f = Risk free rate
- RP = Risk premium of the factor
- β_j = Sensitivity of the j^{th} asset to the factor

2.2.11 Ordinary Least Square Method （OLS）

Ordinary Least Square is an approach applied to estimate the unknown parameters in linear regression model (Gujarati and Porter, 2009). Researchers was identified the relationship between two variables by using sample data. Liang, Lin and Hsu (2013) used the OLS approach to identify the relationship between stock price and exchange rate in ASEAN-5 countries, namely Indonesia, Malaysia, Philippines, Singapore and Thailand from August 2008 to June 2011. The researcher states that the exchanges rate influence stock price negatively. In addition, OLS is used to detect econometric problem by conduct correlation analysis. OLS included simple and multiple regression analysis.

2.3 Proposed Theoretical/ Conceptual Framework

Figure 2.0: Dependent variable and independent variables in this study.



The figure 2.0 shows that the stock market return is influenced by all the independent variables which are oil price volatility, real exchange rate, real interest rate, inflation rate and financial crisis.

2.4 Hypothesis Development

Oil price trend was highly influenced the stock market performance especially for the oil production country. This is because the oil is always an important driver for the industrial and economy activity and the oil return will be the important factors to sustain the economic growth for the oil production country. According to Lardic and Mignon (2008), the researchers have investigated that the oil price increase will cause inflation due to the increase in money demand and lead to negative effect to the consumption of investment since inflation will increase the investment cost, or in other words, the real return of stock will decrease. This research expects that oil price is positively related with stock market returns.

H_0: There is no relationship between oil price volatility and stock market returns.

H_1: There is a relationship between oil price volatility and stock market returns.

Inflation rate is measured of lost value of a currency while the price of goods and services are increasing. This could be measured by the CPI (Consumer price index) or the WPI (Wholesale price index). In other words, inflation also attenuates the real value of one currency. Therefore, inflation rate will influence the real value of the portfolio investment return, especially for the fixed return securities. Inflation might cause the investment return unable to compensate the investor since the real value of return has been depreciated. Thus, the investment interest rate must be greater than the interest rate in order to protect the stock return profitability. This research expects that the inflation rate is negatively related with stock market return.

H_0: There is no relationship between inflation rate and stock market return.

H_1: There is a relationship between inflation rate and stock market return.

Real exchange rate described as the price of currency by comparison of two countries' currencies. Real exchange rate always exerts as a crucial role in determining the country's Balance of Trade. Price of currency is fluctuating due to the influential of the demand and supply or known as the export and import. In addition, the real exchange rate is liquid enough to move quickly in response to different unexpected news. This will affect the investor's real value of return and the profitability from the investment if the real exchange rate volatiles. This impact is not only for the multinational company or investors but also will affect the country's local firms by altering cost of production. Thus, this real exchange rate is economically meaningful as one of the factors to explain the stock market returns' variation. This research expects that the real exchange rate is positively related with stock market returns.

H_0: There is no relationship between real exchange rate and stock market returns.

H_1: There is a relationship between real exchange rate and stock market returns.

Interest rate is generally recognized as a borrowing rate or a yield of investment to compensate the investor by growing the real value of an investment. Besides that, interest rate is generally differentiated into two types which are real interest rate and nominal interest rate. Meanwhile the nominal interest rate is not encounter for inflation effect while the real interest rate has counteracted the effect of inflation.

Real interest rate = nominal interest rate - inflation rate

This research expects that the real interest rate is positively related with stock market returns.

H_0: There is no relationship between real interest rate and stock market return

H_1: There is a relationship between real interest rate and stock market return.

Financial crisis also known as the economic recession or to be very close to an economy collapse as usually considered to bring about serious impact to the economy and market participants since most of the financial assets will attenuate on real value or growth potential. According to Rachdi (2013), the financial crisis causes a decline in global demand, lead to a deterioration in global trade and cause a decline in investment since the impact in the stock market returns especially for the stock market that frequently interact with the origin financial crisis country. This research expects that financial crisis is negatively related with stock market return.

2.5 Conclusion

To sum up, there are several independent variables could affect the stock return in Malaysia. Hence, each of the independent variables such as oil price volatility, inflation rate and interest rate is applied to determine the relationship between stock returns and independent variables. Previous researchers applied some models and theories to identify the relation between stock return and independent variables. For examples, Fisherian theory, Auto-regressive integrated moving average model (ARIMA), Unit Root test, Granger causality test and Weighted Least Square (WLS). Some of the models and theories are used in different independent variables; however, the results are varied. Further explanation will be carried on in the next chapter.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter included research design, data collection methods, sources of data, statistical test and diagnostic checking that will be applied to examine the research model by the following chapter. The goal of this chapter is to identify the clear procedure that should be followed in chapter 4.

3.1 Research Design

This research propose to examine the relation between dependent variable (stock market returns) and independent variable (macroeconomic factors, such as oil price volatility, inflation rate, real interest rate, real exchange rate, and financial crisis). The data using in this research will be quantitative data because quantitative data is numerical data that can be used to do the hypothesis testing. Quantitative data is any data that in numerical form, such as descriptive statistics, percentages, index and so on. In the quantitative research, the collection and analysis of data are in numerical form. The mathematically method and statistical techniques is employed to examine the parametric regression model.

3.2 Data Collection Method

The data collected to use in this research is secondary data. The data will be in quarterly basis which collected from several sources. This research consists of 68 observations for every variable which the sample period from 1994:Q1 to 2010:Q4.

3.2.1 Stock Market Return (Index)

Kuala Lumpur Composite Index (KLCI) is using as a proxy to represent stock market return in Malaysia. This is a quantitative data which the unit measurement is in index form. The data will be in quarterly basis and the data is collected from Reuters.

3.2.2 Oil Price Volatility (%)

Changes of crude palm oil price is using as a proxy for oil price volatility. Crude oil price is a quantitative data which measured in percentage form (%). The data using is based on quarterly data. This data is collected from OECD Economic Outlook.

3.2.3 Inflation Rate (Index)

Consumer Price Index (CPI) is represented as a proxy for inflation rate. CPI is a quantitative data which measured in index number. CPI is measured in quarterly basis. CPI is collected from Oxford Economics.

3.2.4 Real Exchange Rate (Index)

Real exchange rate is a quantitative data which the unit measurement is in index number. The data is based on quarterly basis. Real exchange rate is collected from Oxford Economics.

3.2.5 Real Interest Rate (%)

Base lending rate minus inflation rate is represented as a proxy for real interest rate. Real interest rate is a quantitative data that estimated in percentage form (%). This data is collected from World Bank WDI.

3.2.6 Financial Crisis

Financial crisis is a quantitative data that measured in quarterly basis. The crisis in year 1997 and 1998 will be used in this research.

3.3 Data Analysis

3.3.1 Augmented Dickey Fuller (ADF) Unit Root test

ADF Unit Root Test was developed by Dickey and Fuller (1981). ADF unit root test could be used to detect the data whether associate with unit root problem and determine whether the time series data should be first or second difference. The unit root problem also same as a shock or an outlier occur in the time series data. Furthermore, examining the stationary of time series data is a crucial part before implementing statistical test since the estimated regression will produce a spurious result if there is non-stationary movement in the data. This spurious result will cause the other statistical test not reliable. The stationary movement of time series data is the mean, variance, and covariance of series are constant over the period. Graphical method or hypothesis testing can be used to detect the stationary. Karunanayake et al (2010) has implemented this test to detect the stationary of the residual errors. There are two types of model that used to conduct unit root test which are model constant with trend and without trend.

Model constant with trend:

$$\Delta Y_t = \mu + \beta t + \delta Y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta Y_{t-i} + \varepsilon_i$$

Model constant without trend:

$$\Delta Y_t = \mu + \delta Y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta Y_{t-i} + \varepsilon_i$$

H_0: Y_t is non stationary (Y_t has unit root), $\delta=0$

H_1: Y_t is stationary (Y_t has no unit root), $\delta<0$

$\alpha = 0.10$

The test statistic value can be computed by the following formula:

$$\text{Test statistic} = \frac{\hat{\delta} - \delta}{SE(\hat{\delta})}$$

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 shows that the model is stationary while do not reject H_0 shows that the model is non stationary.

3.3.2 Phillip-Perron Test (PP Test)

Phillip-Perron test (PP test) is an alternative test to the ADF test. PP test modifies the test statistic to correct the autocorrelation that may exist. PP test modifies test statistic for ease of no additional lags of dependent variable are needed. Model of PP test is estimated as below:

$$\Delta Y_t = \alpha + \pi_{2xt-1} + \varphi \left(t - \frac{T}{2} \right) + \sum_{i=1}^{m} \varphi i \Delta Y_{t-i} + \varepsilon_{2t}$$

H_0: Y_t is non stationary

H_1: Y_t is stationary

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 shows that the model is stationary while do not reject H_0 shows that the model is non stationary.

3.3.3 Diagnostic Checking

Diagnostic checking will be conducted based on time series data. Time series model will face econometric problems such as multicollinearity problem, heteroscedasticity problem and autocorrelation problem. The model will be the BLUE (Best, Linear, Unbiased and Estimator) model if all of the econometric problems can be avoided.

3.3.3.1 Multicollinearity

Multicollinearity exists when there are linear relationships between some 2 or more explanatory variables in the regression model. In tackling a multicollinearity problem, Pearson's correlation analysis is used to detect any high pair wise correlation between independent variables. Correlation is a statistical technique used to measure the intensity of relationship between 2 variables (including the relationship between independent variables and dependant variables). The measurement scale ranges from -1.00 to +1.00. Generally, the value of +1 represents a perfect positive correlation, which the two variables are moving toward the same direction. However, the value of -1 represents a perfect negative correlation. Whereas, zero correlation means that there is no relationship between two variables. If the correlation between independent variables is larger than 0.8, multicollinearity problem happened.

Next, the regression analysis is done for the highly correlated pair of independent variable. The auxiliary regression model is formed to detect multicollinearity problem between the two variables:

$X_1 = \beta_0 + \beta_1 X_2$

Variance Inflation Factor (VIF) is calculating for each independent variable to detect severity of multicollinearity. If the VIF less than1, there is no multicollinearity problem; VIF ranges in between 1 to 10 indicates low multicollinearity or no serious multicollinearity problem; when VIF larger than 10, serious multicollinearity problem exist. In cases of high multicollinearity, some consequences are likely to encounter. For example, multicollinearity can increase variance of coefficient estimates will make the precise estimation becomes more difficult. The T-statistic of coefficient tends to be statistically insignificant and may not be able to isolate the unique effect of each variable. The standard error can be sensitive to slightly changes in the data, make the coefficient unstable and difficult to interpret. The multicollinearity has weakened the statistical power of analysis which more difficult to specify the correct model.

VIF Formula:

$$VIF = 1/R^2$$

Where:

R^2 = Coefficient of determination

The decision rule is that do not reject H_0 if VIF<10, means that problem of multicollinearity does not exsist; reject H_0 if VIF>10, means that there is a severe multicollinearity problem

3.3.3.2 Heteroscedasticity

Heteroscedasticity means unequal spread in Greek. There are two types of heteroscedasticity which are conditional and unconditional. Conditional heteroscedasticity means volatility of data in future period cannot be identified while unconditional heteroscedasticity means volatility of data in future can be identified. Heteroscedasticity existed when the variance of the error terms is not constant. Heteroscedasticity can be caused by the nature of data such as outlier, missing value and the distribution of dependent and independent variables are not normally distributed. Heteroscedasticity problem can be detected by using the Autoregressive Conditional Heteroscedasticity (ARCH) test. This test is established by Engle (1982). ARCH test is applied to detect heteroscedasticity problem in time series data.

Hypothesis is shown as below:

H_0: There is no heteroscedasticity problem

H_1: There is heteroscedasticity problem

$\alpha = 0.10$

Critical value = $\chi^2_{\alpha,\, p}$

Test statistic value can be computed by the following formula:

$$\text{Test statistic} = (n-p)R^2$$

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 indicate that there is heteroscedasticity problem in the model while do not reject H_0 indicate that there is no heteroscedasticity problem in the model.

3.3.3.3 Autocorrelation

Autocorrelation problem existed when there is relationship or correlation between the error terms. Autocorrelation problem mostly occur to time series data. Error terms at a next period are correlated to error terms at previous period. The error terms are autocorrelated if the covariance is not equal to zero.

$$\text{Cov}(\varepsilon_i , \varepsilon_j) \neq 0$$

Where:

Cov = Covariance

ε_i = error term at time period i

ε_j = error term at time period j

Autocorrelation problem can be detected by using Durbin-Watson test, Durbin's h test and Breusch-Godfrey LM test. Breusch-Godfrey LM test will be used to detect autocorrelation problem because Durbin-Watson test cannot be used to examine higher order autoregressive (AR) schemes and Durbin's h test is not applicable to use in lagged dependent variable.

Hypothesis is shown as below:

H_0: There is no autocorrelation problem in the model

H_1: There is autocorrelation problem in the model

$\alpha = 0.10$

Critical value = $\chi^2_{\alpha, p}$

Test statistic value can be computed by the following formula:

$$\text{Test statistic} = (n-p)R^2$$

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 shows that there is autocorrelation problem in the model while do not reject H_0 shows that there is no autocorrelation problem in the model.

3.3.3.4 Model Specification

Model specification occurs when irrelevant independent variable is chosen and selected independent variable is correlated with error term. Model specification is correct if choose the relevant independent variables include in the model, or select appropriate form of variable into the model. The model specification problem exist if wrong functional form of independent variables is included in the model. Futhermore, if the model includes the irrelevant variable but the relevant variable is omitted, the model becomes incorrectly specified. Model specification problem can be detected by using Ramsey RESET test. This test is developed by Ramsey in 1969.

Hypothesis is shown as below:

H_0: Model specification is correct.

H_1: Model specification is incorrect.

$\alpha = 0.10$

Critical value = $F_{\alpha,2,n-3}$

Test statistic value can be computed by the following formula:

$$F = \frac{(R^2_{unrestricted} - R^2_{restricted}) / (k_{unrestricted} - k_{restricted})}{(1-R^2_{unrestricted}) / (n - k_{unrestricted})}$$

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 shows that model specification is incorrect while do not reject H_0 shows that model specification is correct.

3.3.3.5 Normality Test

Jarque-Bera test used to investigate the normality of the residual term, if the residual term is normally distributed, the specification model is correct.

Hypothesis is shown as below:

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

α=0.10

Critical value = $X^2_{\alpha,2}$

Test statistic value can be computed by the following formula:

Test statistic: $JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right]$

Where:

n=Sample size

S= Skewness coefficient

K=Kurtosis coefficient

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 means that the error term is not normally distributed while do not reject H_0 indicate that the error term is normally distributed.

3.3.4 Ordinary Least Square (OLS) Regression Model

Ordinary Least Square (OLS) is used to determine the relationship between independent variable and dependent variable. OLS tries to find the function with the best fit, which means the distance between the actual data and the predicted is low. Therefore, model is estimated with OLS is created as follow:

$$KLCI_t = \beta_0 \pm \beta_1 CPO \pm \beta_2 CPI \pm \beta_3 RER \pm \beta_4 RIR \pm \beta_5 FC + \mu_t$$

Where:

$KLCI_t$ = Stock market return at time t

β_0 = Intercept term

CPO = Crude palm oil price

CPI = Inflation rate

RER = Real exchange rate

RIR = Real interest rate

FC = Financial crisis

μ_t = Residual error

The model estimated with OLS is important to find out the significance of every single independent variable towards the dependent variable. Besides that, the OLS method can detect the econometric problems such as multicollinearity and heteroscedasticity. The model is considered valid and best fit when there is no econometric problems existed in the model.

3.3.4.1 T-test

This is the simplest form of individual statistical test to examine the significant effect of each single independent variable in the model toward the dependent variable. This t-test assumed the samples drawn are independently, error terms are normally distributed and usually the sample size that are not more than 30. The concern of this t-test was under the assumption to reject the null hypothesis. However, there are two types of errors that should be concern too, which is the type I and type II error. Type I error is occur when reject the true or real null hypothesis while type II error is occur when fail to reject the false null hypothesis, but both types of errors could be avoided if the sample size increase (Banerjee, Chitnis, Jadhav, Bhawalkar& Chaudhury, 2009).

H_0: $\beta_i = 0$ (insignificant)

H_1: $\beta_i \neq 0$ (significant) *Where i = crude palm oil price, inflation rate, real exchange rate, real interest rate and financial crisis.*

$\alpha = 0.10$

Critical value: $T_{\alpha,\ n\text{-}k\text{-}1}$

Test statistic value can be computed by the following formula:

$$t = \frac{\beta - \hat{\beta}}{SE(\widehat{\beta})}$$

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 shows that the independent variable significantly affects dependent variable while do not reject H_0 shows that the independent variable insignificantly affects dependent variable.

3.3.4.2 F-Test

F-test is used to determine the overall significant of the estimated multiple regression models. This test used to examine the hypothesis that with a multiple parameters.

The features of this test is similar as T test as a joined significant test for all the parameters. Apart from that, the key assumptions are also similar as T test, such as the sample size is large enough, randomly drawn and the error term is normally distributed.

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

H_1: At least one of the β_i is not equal to zero, where i = 1, 2, 3, 4, 5 represent the parameters in the regression model.

$\alpha = 0.10$

Critical value = $F_{\alpha, k, n-k-1}$

Test statistic value can be computed by the following formula:

$$F = \frac{R^2/K}{\frac{(1-R^2)}{(n-k-1)}}$$

The decision rule is that rejects H_0 when probability value is less than 10% significance level, otherwise, do not reject H_0. Reject H_0 shows that at least one of the independent variable significantly affects dependent variable while do not reject H_0 shows that none of the independent variables significantly affects dependent variable. The expected result of F-test is to reject H_0 to prove that the regression model is significant.

3.4 Conclusion

In a conclusion, Augmented Dickey Fuller (ADF) Unit Root Test, Phillip-Perron test (PP test), diagnosis checking and OLS Regression Model will be use to conduct this research. The purpose of applying these tests is to meet the objective of this research.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter is to analyze the identified statistical tests that complied with the research objective by collecting data from Thomson 5.1 Data stream and the data are conducted by Eviews 6. In addition, diagnostic checking will be implemented to ensure the model with minimum econometric problem. Meanwhile, the significance level (α) is 0.10 for all tests.

4.1 Ordinary Least Square (OLS)

$$KLCI_t = -1300.259 + 1.669689CPO + 6.173677CPI + 16.42187RER + 25.50512RIR - 87.91022FC$$

Table 4.0 shows the results obtained from E-view

Components	Coefficient	Standard Error	T-Statistic	P-value
C	-1300.259	182.2391	-7.134909	0.0000*
CPO	1.669689	0.932497	1.790576	0.0782*
CPI	6.173677	1.406297	4.390024	0.0000*
RER	16.42187	1.091701	15.04246	0.0000*

RIR	25.50512	10.37004	2.459500	0.0167*
FC	-87.91022	51.86592	-1.694951	0.0951*
R-squared= 0.826921 p-value of F-test= 0.000000				

Source: Developed for research via EViews 6.

Note: * denoted as significant at 10% significance level

4.1.1 T-test

Table 4.1 shows the t-test result that obtained from Eviews output.

Independent variables	Probability	Significances
CPI	0.0000	Significant
CPO	0.07828	Significant
FC	0.0951	Significant
RER	0.0000	Significant
RIR	0.0167	Significant

Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: $\beta_i = 0$ (insignificant)

H_1: $\beta_i \neq 0$ (significant) where i = CPO, CPI, RER, RIR, FC

$\alpha = 0.10$

Decision rule:

Reject H_0 if probability value of test statistic is less than 0.10 significance level, otherwise do not reject $H_{0.}$

Conclusion:

Reject H_0 since the probability value of each independent variable obtained is less than the 0.10 significance level. The t-test for OLS model shows that all of the independent variables like crude palm oil price, inflation rate, real exchange rate real interest rate and financial crisis are significantly affect stock market return.

4.1.2 F-test

Table 4.2 shows the result obtained from E-views.

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	-1300.259	182.2391	-7.134909	0.0000
CPO	1.669689	0.932487	1.790576	0.0782
CPI	6.173677	1.406297	4.390024	0.0000
RER	16.42187	1.091701	15.04246	0.0000
RIR	25.50512	10.37004	2.459500	0.0167
FC	-87.91022	51.86592	-1.694951	0.0951

R-squared	0.826921	Mean dependent var	929.4259
Adjusted R-squared	0.812963	S.D. dependent var	252.6000
S.E. of regression	109.2438	Akaike info criterion	12.30914
Sum squared resid	739921.1	Schwarz criterion	12.50498
Log likelihood	-412.5107	Hannan-Quinn criter.	12.38674
F-statistic	59.24365	Durbin-Watson stat	1.044105
Prob(F-statistic)	0.000000		

Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

H_1: At least one of the β_i is not equal to zero, where i = 1, 2, 3, 4, 5

$\alpha = 0.10$

Decision rule:

Reject H_0 if probability value of test statistic is less than 0.10 significance level, otherwise do not reject $H_{0.}$

P-value of F-Statistic = 0.000000

Conclusion:

Reject H_0 since the probability value (0.000000) obtained is less than the 0.10 significance level. There is enough evidence to summarize that the model is significant at the 0.10 significance level.

4.2 Diagnostic Checking

4.2.1 Multicollinearity

Table 4.3 shows the Correlation Analysis that obtained from Eviews 6 output.

	KLCI	CPO	CPI	RER	RIR	FC
KLCI	1.000000	0.135583	0.287915	0.861320	-0.157936	-0.331390
CPO	0.135583	1.000000	-0.014331	0.033271	0.206803	0.179328
CPI	0.287915	-0.014331	1.000000	0.071509	-0.271664	-0.233460
RER	0.861320	0.033271	0.071509	1.000000	-0.264981	-0.281639
RIR	-0.157936	0.206803	-0.271664	-0.264981	1.000000	0.324063
FC	-0.331390	0.179328	-0.233460	-0.281639	0.324063	1.000000

Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: There is no multicollinearity problem in the model.

H_1: There is multicollinearity problem in the model.

Decision rule:

Do not reject H_0 if VIF<10, means that problem of multicollinearity does not exsist; reject H_0 if VIF>10, means that there is a severe multicollinearity problem.

By using Pearson's correlation analysis, the data shows that the highest pair wise correlation between independent variables of RIR and FC is 0.324063. Hence, the paper will carry out regression analysis for the high pair-wise correlation to get R-Square (R^2) and determining the value Variance Inflation Factor (VIF).

Table 4.4: Regression Result of RIR and FC

Dependent Variable: RIR

Method: Least Squares

Sample: 1994Q3 2010Q4

Included observation: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FC	1.640215	0.589395	2.782881	0.0070
C	4.256452	0.175076	24.31199	0.0000
R-squared	0.105017			
Adjusted R-square	0.091457			
F-statistic	7.744428			
Prob (F-statistic)	0.007019			
Durbin-Watson stat	0.610596			

Source: Developed for research via EViews 6.

$VIF = (1/ 1-R^2)$

= 1/ 1-0.105017

= 1.1173

Conclusion:

This can be concluded that the model has no serious multicollinearity problem between RIR and FC since the VIF (1.1173) is less than 10.

4.2.2 Autocorrelation Problem (Breusch-Godfrey Serial Correlation LM Test)

Breush-Godfrey Serial Correlation LM test is using to test the autocorrelation problem in a model. The lag length included is 2.

Breush-Godfrey LM test hypothesis:

Table 4.5 shows the test statistic value of Breush-Godfrey LM test that are obtained from Eviews output.

Types of test	Test statistic value
Breush-Godfrey LM tests.	Prob.Chi-Square (2) = 0.0028

Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: There is no autocorrelation problem in the model.

H_1: There is autocorrelation problem in the model.

$\alpha = 0.10$

Decision rule:

Reject H_0 if probability value of test statistic is less than significance level, otherwise do not reject H_0.

Conclusion:

Reject H_0 since probability value (0.0028) obtained is less than the 0.10 significance level. There is enough evidence to summarize that there is problem of autocorrelation existed in the model.

4.2.3 Heteroscedasticity Problem (ARCH test)

Autoregressive Conditional Heteroscedasticity (ARCH) test is using to investigate the problem of heteroscedasticity as the data using is time series data. The lag length included is 2.

Heteroscedasticity Test: ARCH

Table 4.6 shows the test statistic value of ARCH test that are obtained from Eviews output.

Type of test	Test statistic value
ARCH Test	Prob. Chi-square(2) = 0.3286

Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: There is no heteroscedasticity problem in the model.

H_1: There is heteroscedasticity problem in the model.

$\alpha = 0.10$

Decision rule:

Reject H_0 if probability value of test statistic is less than significance level, otherwise do not reject H_0.

Conclusion:

Do not reject H_0 since probability value (0.3286) obtained is more than the 0.10 significance level. There is not enough evidence to summarize that there is heteroscedasticity problem.

4.2.4 Model Specification Test

Ramsey RESET Test:

Table 4.7 shows the probability of Ramsey RESET test that are obtained from Eviews output.

F-statistic	1.302938	Prob. F(2,14)	0.2793
Log-likelihood ratio	2.890991	Prob. Chi-square (2)	0.2356

Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: The model is correctly specified in the model.

H_1: The model is not correctly specified in the model.

$\alpha = 0.10$

Decision rules:

Reject H_0 if the probability value of the F-statistics is less than the 0.10 significance level, otherwise do not reject H_0.

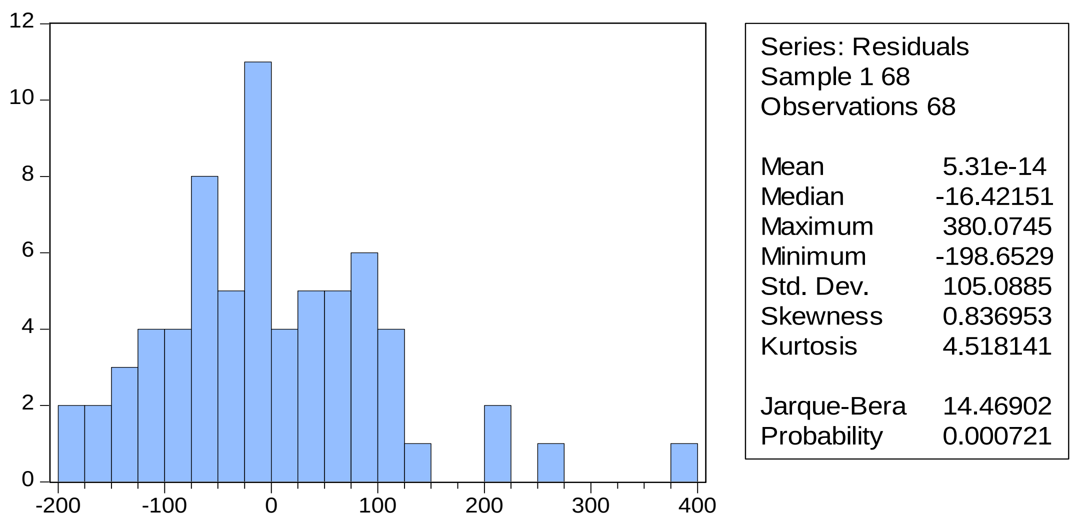
Conclusion:

Do not reject H_0 since the probability value of F-statistic 0.2793>0.10, thus the model is accurately specified.

4.2.5 Normality Test

Jarque-Bera (JB) test:

Graph 4.0 shows the Jarque-Bera test result.



Source: Developed for research via EViews 6.

Hypothesis is shown as below:

H_0: Error term is normally distributed in the model.

H_1: Error term is not normally distributed in the model.

$\alpha = 0.10$

Decision rules:

Reject H_0 if the probability of the Jarque-Bera (JB) test statistic is less than the 0.10 significance level, otherwise do not reject H_0.

Conclusion:

Reject H_0 since the probability of the JB statistic $0.000721 < 0.10$, thus there is enough evidence to summarize that the error term is abnormally distributed in the model.

The model that abnormally distributed but the sample size large enough is acceptable according to Lumley, Diehr, Emerson and Chen (2002). This is because the sample size that less than 100 is considered large sample size. In this research paper, the sample size is 68, therefore is common that the model is not normally distributed. Besides that, Saeed and Rasheed (2011) stated that the returns of stock market are commonly known to be not normally distributed in large data.

4.3 Unit Root Test

This test is applied to identify the stationary of the data. The hypothesis and results are shown as below:

H_0: The model is non stationary.

H_1: The model is stationary.

$\alpha = 0.10$

Table 4.8 shows Unit Root Test result.

	ADF		PP	
	LEVEL		LEVEL	
	CONSTANT WITHOUT TREND	CONSTANT WITH TREND	CONSTANT WITHOUT TREND	CONSTANT WITH TREND
KLCI	-1.641660	-2.203549	-2.016049	-2.446477
CPO	-5.665282*	-5.627786*	-5.529422*	-5.441040*
CPI	-0.250725	-2.611747	-0.224734	-2.170732
RER	-2.053601	-2.056763	-1.299748	-1.291649
RIR	-3.797414	-4.019627	-3.050528*	-3.194240*
FC	-2.559076	-2.716653	-2.718469	-2.879105
	ADF		PP	
	FIRST DIFFERENCE		FIRST DIFFERENCE	
	CONSTANT	CONSTANT	CONSTANT	CONSTANT

	WITHOUT TREND	WITH TREND	WITHOUT TREND	WITH TREND
KLCI	-8.042162*	-8.112392*	-8.043991*	-8.111029*
CPO	-9.199538*	-9.169208*	-21.82816*	-31.62243*
CPI	-6.616871*	-6.563589*	-6.446242*	-6.377493*
RER	-4.380371*	-5.029684*	-4.153455*	-4.024937*
RIR	-6.164540*	-6.118918*	-6.947575*	-6.890796*
FC	-8.000000*	-7.943225*	-8.000000*	-7.943225*

Source: Developed for research via EViews 6.

Note:*denoted as significant at 10% significance level

The table shows that CPO is stationary at level stage either with trend or without trend for ADF. However, the other variables such as KLCI, CPI, RER, RIR and FC are not stationary at level stage for ADF. On the other hand, all variables are stationary at first difference I(1) for ADF. The stationary of the data are crucial to ensure the statistical tests are reliable.

For PP result, CPO and RIR are stationary at level stage for both conditions. All the dependent variable and explanatory variables are stationary at the first difference I(1) level either with trend or without trend.

4.4 Conclusion

In a nutshell, all the independent variables in the economic model are significant to the dependent variable. Moreover, the F test also shows that, the model is significant. On the other hand, for the diagnostic checking, the model does not have serious multicollinearity symptom, no heteroscedasticity problem and the model are correctly specified. However, the result of Breush-Godfrey LM test shows that the economic model consist problem of autocorrelation and the Jarque-Bera test identified that the residual error is not normal. These results and major findings will be further discussed in chapter 5.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

In this chapter would summarize the statistical findings, major findings, implication of study, limitations of the study, recommendation and conclusion. Summary of statistical analysis would summarize the results from chapter 4 and regarding whether the results conducted are consistent with the previous studies. Next, major findings would discuss about the stock market return (KLCI) and other independent variables which including oil price, inflation, real interest rate, real exchange rate and financial crisis (dummy variable). Third part is implication of study which consists of the suggestions to the policymakers, government and other parties. Limitations of the study would point out the factors that limit the areas of research and provide some suggestion for researchers in the future. Lastly is conclusion of this chapter.

5.1 Statistical Analysis Summary

Table 5.0 shows econometric problems summary

Econometric Problems	Results Description
Multicollinearity	No severe multicollinearity problem
Autocorrelation	There is a problem of autocorrelation.
Heteroscedasticity	No heteroscedasticity problem
Model Specification	Model is accurately specified.
Normality test	The model is not normally distributed.

Based on the results obtained, there is no serious multicollinearity problem in the model. This indicates that there is no serious correlation among the independent variables which are oil price volatility, real exchange rate, real interest rate, inflation rate and financial crisis. However, autocorrelation problem is detected in the model. Next, the model is free from heteroscedasticity problem and the model is accurately specified. The result obtained shows the model is not normally distributed.

5.2 Discussion on Major Findings

Based on the results, all the independent variables are significant to influence the stock market return. First of all, the results of oil price shows positive sign and significant at 10% level. This is stable with the studies of prior researchers such as Mohanty, Nandha, Turkistani and Alaitani (2011), Mollick and Assefa (2013).

Next explanatory variable is inflation (CPI), the results provide positive sign and significant at 10% level. This means the inflation is important and positively influences the return of stock market in Malaysia. Li, Narayan and Zheng (2010) found that the return of stock market is positively influenced by the inflation. Hence, the results are consistent with the previous studies.

According to the statistical analysis, third independent variable, real exchange rate (RER) also indicates positive sign and significant at level of 10%. The finding is compatible with the prior research done by Maysami et al. (2004) which suggested the correlation between stock price and real exchange rate is positive and significant. Next, the results obtained for real interest rate (RIR) is positive sign and significant at level of 10%. The finding is consistent with the previous research done by Srinivasan (2011) and Husssain and Khan (2011) which suggested that the relationship between price of stock and real interest rate is positive and significant.

Last but not least is financial crisis, the results shows negative value and significant at 10%. The financial crisis happened will give negative impact to the stock return based on the studies done by Calomiris, Love and Peria (2012), Davydov and Vahamaa (2013) and Karunanayake, Valadkahni and O'brien (2010). Hence, this is consistent with the results obtained.

The econometric model is undergone the diagnostic checking and some of the econometrics problems are detected such as autocorrelation and normality. Breusch-Godfrey serial correlation LM test is used to identify the problem of autocorrelation in the time series model. The findings obtained indicate that there is autocorrelation problem existed in the model. Besides that, Jarque-Bera test is used to detect the normality in the model, and the result show that the model is not normally distributed. However, other problems of economics like multicollinearlity, heteroscedasticity and model specification could not be found from the model. There is no serious multicollinearlity in the model. Autoregressive Conditional Heteroscedasticity (ARCH) test is used to identify the heteroscedasticity in the time series data and the results indicate the variance of error is constant. Ramsey RESET test found that the economic model is correctly specified.

Unit root tests such as Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test are applied to detect the stationary of the model. Based on the results, there is only one variable is stationary at level stage either with trend or without trend for ADF test which is oil price (CPO). In contrast, for PP test, there are two variables which are oil price (CPO) and real interest rate (RIR) are stationary at level stage either with trend or without trend. Other variables that are not stationary at level stage will use first difference. According to the findings, all variables are stationary at first difference I(1) for ADF and PP test either with trend or without trend.

The following tables show the summary of the correlation of the explanatory variables and dependent variable:

Oil price

Table 5.1 shows statistical result and consistency journals

Statistical test result	Consistency
Positive relationship	▪ Mohanty, Nandha, Turkistani and Alaitani (2011) ▪ Mollick and Assefa (2013) ▪ Li, Zhu and Yu (2012)

Real exchange rate

Table 5.2 shows statistical result and consistency journals

Statistical test result	Consistency
Positive relationship	▪ Yau and Nieh (2009) ▪ Maysami, Lee and Hamzah (2004) ▪ Granger, Huang and Yang (2000)

Real interest rate

Table 5.3 shows statistical result and consistency journals

Statistical test result	Consistency
Positive relationship	▪ Srinivasan (2011) ▪ Hussain and Khan (2011)

Inflation rate

Table 5.4 shows statistical result and consistency journals

Statistical test result	Consistency
Positive relationship	▪ Geske and Roll (1983) ▪ Li, Narayan and Zheng (2010) ▪ Du (2006)

Financial crisis

Table 5.5 shows statistical result and consistency journals

Statistical test result	Consistency
Negative relationship	▪ Calomiris, Love and Peria (2012) ▪ Davydov and Vahamaa (2013) ▪ Engkuchik and Kaya (2012) ▪ Karunanayake, Valadkahni and O'brien (2010)

	▪ Nikkinen, Omran, Shalstrom and Ajio (2008)

5.3 Implications of the Study

The results of this research are benefits to variety of parties such as policymaker, investor, shareholders and consumers. Policymaker can obtain more information on the significance relationship of macroeconomic variables and stock market return. Policymaker could implement monetary policy and fiscal policy by getting to know the effects of macroeconomic factors on stock market return. Economic conditions could be revealed by stock market return, therefore, a healthy stock market could promote economic growth. Policymaker could use monetary policy to control the money supply in Malaysia in order to achieve monetary and financial stability.

One of the main variables that could affect money supply is interest rate. Bank Negara Malaysia (BNM) could control money supply by adjusting the discount rate and required reserve ratio. Discount rate is interest rate that financial institution required to pay when borrow money from central bank. For example, when central bank increased the discount rate, the borrowing cost for financial institution would be increased. As a result, borrowing from central bank would decrease and money supply to market would be reduced. This will influence stock market return indirectly because investor could not borrow more money to invest in stock market.

Besides that, inflation rate should be maintained at an appropriate rate. If the money supply in market grows too fast, inflation rate will increase. Thus, inflation rate will affect stock market return in Malaysia. Furthermore, financial crisis has negative impacts on stock market return. Therefore, policymaker should understand the impacts of financial crisis on stock market and take a responsibility on this issue. Policymaker should change the policy to stimulate the stock market and hence promote the economic growth.

In addition, domestic and international investors could get more knowledge on the effects of macroeconomic factors on stock market return. This would help investors in managing the investment portfolio. Interest rate and exchange rate have predictive power on return of stock market. Investors should change the investment decision if interest rate and exchange rate are changed. Foreign exchange is important for international investors to make investment decisions due to the fluctuation of exchange rate will affect the return of stock market.

Besides that, investors who are seeking for investment opportunities on crude oil should be more understanding in the correlation between oil price volatility and stock market return. For example, when the crude oil prices are expected to be high, investor would likely to invest in stock from Oil and Gas sector since there is positive correlation between oil price volatility and stock market return. An understanding on oil price volatility's impact on stock market return could assist policymaker to regulate stock market more effectively.

Other than that, shareholders can earn profits in two ways which are received dividend and earned capital gains. When stock market returns of a company is in good conditions, shareholders can sell shares to earned capital gain. Besides that, growing of stock market returns may affect consumers' spending behavior in the future. This is because growing of stock market reflects that the economy is in good conditions, therefore, consumers may increase the spending.

5.4 Limitations

This research paper consist some limitations such as data availability. The data is limited as the source of the data is not complete and not updating such as inflation rate. Initially, the proposed time period for this research is from 1991 to 2012. But due to there are some missing data in inflation rate, the time period has been shortened. Decreasing sample size may cause the result become inconsistent. Therefore, the data change from annually to quarterly to increase the sample size. However, some of missing data has restricted the study period for this research paper, which is only available from 1994:Q1 to 2010:Q4.

One of the limitations in this research is autocorrelation problem occurred in the model. Autocorrelation problem is most likely occurred in time series data (Gujarati & Porter, 2009). Existing of autocorrelation problem means the error term in past period are correlated with present error term. Autocorrelation problem could be reduced by changing the low frequency data to high frequency data. The large number of observations in time series data could reduce the autocorrelation problem. However, the sample period has been restricted due to the data constraint.

Moreover, this study is mainly focus on the stock return and macroeconomic variable of the Malaysia. Therefore, this research paper result only can benefit the investors and policymaker in Malaysia but the same result may not applicable in other countries due to different political factors and background.

5.5 Recommendation

Future researchers are suggested to extend researches on impact of macroeconomic factors on the KLCI stock market index based on sector analysis. Therefore, more precise and accurate result will be obtained in particular sector if compare to this paper findings which study on the Malaysia stock return because different result will be generating from different sector respectively. Other than that, the future researchers also can employ other type of oil commodity, such as heating oil as proxy variable of crude palm oil in the analysis.

Furthermore, future researchers can collect larger sample size of data for analysis. The data that used is based on quarterly basis, a more comprehensive data can be used to increase frequency of data, for example, monthly basis or weekly basis because the stock price movement is highly volatile in the market. Therefore, a more accurate and consistent result of the research will be obtained.

In addition, future researchers can apply a relevant model in capturing the effect on stock return. Generalized Auto Regressive Conditional Heteroscedasticity (GARCH) model is a better estimation model in capturing the presence of time-varying stock price volatility (Muneer, Butt & Rehman, 2011). GARCH model will provide more efficient coefficient than OLS estimation model especially when there is existence of autocorrelation problem in the data (Kasman et al., 2011).

5.6 Conclusion

Overall, this paper has investigated the effect of oil price and macroeconomic factors towards the KLCI. The oil price, inflation rate, real interest rate, real exchange rate and financial crisis are significantly influence the stock price returns. The oil price, real exchange rate, real interest rate and inflation rate are positively related while financial crisis are negatively related to return of stock market. Moreover, this research paper has discovered some limitations and suggested some recommendations for the future researchers. This result obtained in this study could provide useful information for investors and policymakers in understanding the stock market return variations and economic factors. In a short word, this research paper has achieved the objective which is to investigate the relationship of oil price volatility and macroeconomic variables toward the stock market return in Malaysia.

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APPENDICES

Appendix 1: Ordinary Least Square (OLS)

Dependent Variable : KLCI

Method: Least Squares

Sample (adjusted): 1 68

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1300.259	182.2391	-7.134909	0.0000
CPO	1.669689	0.932487	1.790576	0.0782
CPI	6.173677	1.406297	4.390024	0.0000
RER	16.42187	1.091701	15.04246	0.0000
RIR	25.50512	10.37004	2.459500	0.0167
FC	-87.91022	51.86592	-1.694951	0.0951

R-squared	0.826921	Mean dependent var	929.4259
Adjusted R-squared	0.812963	S.D. dependent var	252.6000
S.E. of regression	109.2438	Akaike info criterion	12.30914
Sum squared resid	739921.1	Schwarz criterion	12.50498
Log likelihood	-412.5107	Hannan-Quinn criter.	12.38674
F-statistic	59.24365	Durbin-Watson stat	1.044105
Prob(F-statistic)	0.000000		

Appendix 2: Autocorrelation Problem

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	6.278924	Prob. F(2,60)	0.0033
Obs*R-squared	11.76900	Prob. Chi-Square(2)	0.0028

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Sample: 1 68

Included observations: 68

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-34.14626	168.8262	-0.202257	0.8404
CPO	-0.748989	0.887514	-0.843918	0.4021
CPI	0.159483	1.300813	0.122602	0.9028
RER	-0.123778	1.011837	-0.122330	0.9030
RIR	8.449034	10.20717	0.827755	0.4111
FC	-20.96512	48.85199	-0.429156	0.6693
RESID(-1)	0.358254	0.129417	2.768207	0.0075
RESID(-2)	0.154652	0.135835	1.138526	0.2594

R-squared	0.173074	Mean dependent var	3.53E-13
Adjusted R-squared	0.076599	S.D. dependent var	105.0885
S.E. of regression	100.9835	Akaike info criterion	12.17792
Sum squared resid	611860.3	Schwarz criterion	12.43904
Log likelihood	-406.0494	Hannan-Quinn criter.	12.28139
F-statistic	1.793978	Durbin-Watson stat	1.776228
Prob(F-statistic)	0.105112		

Appendix 3: Heteroscedasticity Problem

Heteroskedasticity Test: ARCH

F-statistic	1.099455	Prob. F(2,63)	0.3394
Obs*R-squared	2.225928	Prob. Chi-Square(2)	0.3286

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Sample (adjusted): 3 68

Included observations: 66 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8941.912	2074.089	4.311248	0.0001
RESID^2(-1)	0.114819	0.123817	0.927329	0.3573
RESID^2(-2)	-0.085662	0.074345	-1.152222	0.2536

R-squared	0.033726	Mean dependent var	9020.194
Adjusted R-squared	0.003051	S.D. dependent var	12489.26
S.E. of regression	12470.19	Akaike info criterion	21.74446
Sum squared resid	9.80E+09	Schwarz criterion	21.84399
Log likelihood	-714.5672	Hannan-Quinn criter.	21.78379
F-statistic	1.099455	Durbin-Watson stat	1.958785
Prob(F-statistic)	0.339357		

Appendix 4: Model Specification Test

Ramsey RESET Test:

F-statistic	1.302938	Prob. F(2,60)	0.2793
Log likelihood ratio	2.890991	Prob. Chi-Square(2)	0.2356

Test Equation:

Dependent Variable: KLCI

Method: Least Squares

Sample: 1 68

Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8159.781	4838.869	-1.686299	0.0969
CPO	8.200068	4.818992	1.701615	0.0940
CPI	32.16254	18.37815	1.750042	0.0852
RER	85.53301	49.51831	1.727301	0.0893
RIR	133.4452	77.18469	1.728908	0.0890
FC	-398.8780	240.3593	-1.659508	0.1022
FITTED^2	-0.004108	0.003135	-1.310675	0.1950
FITTED^3	1.29E-06	1.06E-06	1.217299	0.2283

R-squared	0.834125	Mean dependent var	929.4259
Adjusted R-squared	0.814773	S.D. dependent var	252.6000
S.E. of regression	108.7139	Akaike info criterion	12.32545
Sum squared resid	709123.0	Schwarz criterion	12.58657
Log likelihood	-411.0652	Hannan-Quinn criter.	12.42891
F-statistic	43.10269	Durbin-Watson stat	1.018787
Prob(F-statistic)	0.000000		

Appendix 5: Unit Root Test

(I) Augmented Dickey-Fuller test

- Level

KLCI Level without trend

Null Hypothesis: KLCI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.641660	0.4560
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

KLCI Level with trend

Null Hypothesis: KLCI has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.203549	0.4797
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

CPO Level with trend

Null Hypothesis: CPO has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.665282	0.0000
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

CPO Level with trend

Null Hypothesis: CPO has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.627786	0.0001
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

CPI Level without trend

Null Hypothesis: CPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.250725	0.9258
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

CPI Level with trend

Null Hypothesis: CPI has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.611747	0.2767
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

RER Level without trend

Null Hypothesis: RER has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.053601	0.2639
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

RER Level with trend

Null Hypothesis: RER has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.056763	0.5597
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

RIR Level without trend

Null Hypothesis: RIR has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.797414	0.0047
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

RIR Level with trend

Null Hypothesis: RIR has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.019627	0.0126
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

FC Level without trend

Null Hypothesis: FC has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.559076	0.1066
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

FC Level with trend

Null Hypothesis: FC has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.716653	0.2335
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

- First Difference

KLCI First difference without trend

Null Hypothesis: D(KLCI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.042162	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

KLCI First difference with trend

Null Hypothesis: D(KLCI) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.112392	0.0000
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

CPO First difference without trend

Null Hypothesis: D(CPO) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.199538	0.0000
Test critical values:	1% level	-3.534868	
	5% level	-2.906923	
	10% level	-2.591006	

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

CPO First difference with trend

Null Hypothesis: D(CPO) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.169208	0.0000
Test critical values:	1% level	-4.105534	
	5% level	-3.480463	
	10% level	-3.168039	

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

CPI First difference without trend

Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.616871	0.0000
Test critical values:	1% level	-3.534868	
	5% level	-2.906923	
	10% level	-2.591006	

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

CPI First difference with trend

Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.563589	0.0000
Test critical values:	1% level	-4.105534	
	5% level	-3.480463	
	10% level	-3.168039	

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

RER First difference without trend

Null Hypothesis: D(RER) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.380371	0.0008
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

RER First difference with trend

Null Hypothesis: D(RER) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.029684	0.0006
Test critical values:	1% level	-4.105534	
	5% level	-3.480463	
	10% level	-3.168039	

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

RIR First difference without trend

Null Hypothesis: D(RIR) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.164540	0.0000
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

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

RIR First difference with trend

Null Hypothesis: D(RIR) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.118918	0.0000
Test critical values:	1% level	-4.110440	
	5% level	-3.482763	
	10% level	-3.169372	

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

FC First difference without trend

Null Hypothesis: D(FC) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.000000	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

FC First difference with trend

Null Hypothesis: D(FC) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.943225	0.0000
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

(II) Phillips-Perron Test

- Level

KLCI Level without trend

Null Hypothesis: KLCI has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.016049	0.2794
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

KLCI Level with trend

Null Hypothesis: KLCI has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.446477	0.3531
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

CPO Level without trend

Null Hypothesis: CPO has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.529422	0.0000
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

CPO Level with trend

Null Hypothesis: CPO has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 5 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.441040	0.0001
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

CPI Level without trend

Null Hypothesis: CPI has a unit root

Exogenous: Constant

Bandwidth: 6 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.224734	0.9294
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

CPI Level with trend

Null Hypothesis: CPI has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.170732	0.4976
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

RER Level without trend

Null Hypothesis: RER has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.299748	0.6251
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

RER Level with trend

Null Hypothesis: RER has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.291649	0.8815
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

RIR Level without trend

Null Hypothesis: RIR has a unit root

Exogenous: Constant

Bandwidth: 0 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.050528	0.0354
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

RIR Level with trend

Null Hypothesis: RIR has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 0 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.194240	0.0944
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

FC Level without trend

Null Hypothesis: FC has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.718469	0.0762
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

FC Level with trend

Null Hypothesis: FC has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.879105	0.1758
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

- First Difference

KLCI First difference without trend

Null Hypothesis: D(KLCI) has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.043991	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

KLCI First difference with trend

Null Hypothesis: D(KLCI) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.111029	0.0000
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

CPO First difference without trend

Null Hypothesis: D(CPO) has a unit root

Exogenous: Constant

Bandwidth: 65 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-21.82816	0.0001
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

CPO First difference with trend

Null Hypothesis: D(CPO) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 65 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-31.62243	0.0001
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

CPI First difference without trend

Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant

Bandwidth: 9 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.446242	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

CPI First difference with trend

Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 9 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.377493	0.0000
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

RER First difference without trend

Null Hypothesis: D(RER) has a unit root

Exogenous: Constant

Bandwidth: 5 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.153455	0.0016
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

RER First difference with trend

Null Hypothesis: D(RER) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 7 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.024937	0.0124
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

RIR First difference without trend

Null Hypothesis: D(RIR) has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.947575	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

RIR First difference with trend

Null Hypothesis: D(RIR) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.890796	0.0000
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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

FC First difference without trend

Null Hypothesis: D(FC) has a unit root

Exogenous: Constant

Bandwidth: 0 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.000000	0.0000
Test critical values:	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	

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

FC First difference with trend

Null Hypothesis: D(FC) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 0 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.943225	0.0000
Test critical values:	1% level	-4.103198	
	5% level	-3.479367	
	10% level	-3.167404	

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