FARCE OF RINGGIT:
THE EFFECT OF FINANCIAL MARKETS ON THE MALAYSIAN EXCHANGE RATE

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

(4) The word count of this research project is 32,454.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
ARCH	Auto-Regressive Conditional Heteroscedasticity
CLRM	Classical Linear Regression Model
CPO	Crude Palm Oil
COMEX	Commodity Exchange
DCFM	Discounted Cash Flow Model
DF	Dickey-Fuller
DJIA	Dow Jones Industrial Average
ECM	Error Correction Model
EMH	Efficient Market Hypothesis
EU	European Union
FBM KLCI	FTSE Bursa Malaysia Kuala Lumpur Composite Index
FDI	Foreign Direct Investment
FKLI	Futures Kuala Lumpur Index
FOREX/ FX	Foreign Exchange
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GC Test	Granger Causality Test
GDP	Gross Domestic Product
IRP	Interest Rate Parity
JB	Jarque-Bera
JJ Cointegration Test	Johansen-Juselius Cointegration Test
KLCI	Kuala Lumpur Composite Index
KLSE	Kuala Lumpur Stock Exchange
MNE	Multinational Enterprise

MPOC	Malaysia Palm Oil Council
NYSE	New York Stock Exchange
OLS	Ordinary Least Square
OMA	Official Monetary Authorities
OPEC	Organization of Petroleum Exporting Countries
PDF	Probability Density Function
P/E Ratio	Price per Earnings Ratio
PP	Phillips-Perron
PPP	Purchasing Power Parity
RESET	Regression Equation Specification Error Test
RYT	Required Yield Theory
SC	Schwarz Information Criterion
USD/MYR	US Dollar against Ringgit Malaysia
VAR Model	Vector Autoregressive Model
VIF	Variance-inflation Factor
WTI	West Texas Intermediate

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PREFACE

Exchange rate is the price of a country’s currency in terms of another country's currency. Thus, an exchange rate has two types of components which are home currency and a foreign currency. The movement of exchange rate may affected by different causes for different currency pairs. Nowadays, the movement of Malaysian Ringgit against other currency pair keeps fluctuating; it is interesting to determine the reasons which can affect the change of Malaysian Ringgit. Hence, this research investigates the movement of exchange rate.

This research selects currency pair of USD against MYR as dependent variables. Thus, this research chooses five independent variables to determine the relationship with the movement of exchange rate (USD/MYR). The five independent variables included FTSE Bursa Malaysia KLCI Futures (FKLI), Kuala Lumpur Composite Index (KLCI), gold price, West Texas Intermediate (WTI) crude oil price and crude palm oil (CPO). These independent variables are useful in getting the results of the movement of exchange rate (USD/MYR). Many of this type of research have been conducted in other currency pairs in developed country and very less in the developing country.

Lastly, this research could provide useful guidelines to several parties or individuals such as investors, researchers, governments and academicians who tend to get more information about the movement of exchange rate (USD/MYR).

ABSTRACT

This objective of this research is to investigate the effect of financial markets which are comprised of FTSE Bursa Malaysia Kuala Lumpur Composite Index Futures, FKLI (derivatives market), FTSE Bursa Malaysia Kuala Lumpur Composite Index, KLCI (stock market) as well as Crude Oil (West Texas Intermediate) and Crude Palm Oil (commodity market) on the Malaysian exchange rate, USD/MYR. A total of 81 sample size ranging from 1 January 2009 to 31 December 2015 for the empirical analysis.

This research employed Johansen-Juselius (JJ) Cointegration test to examine long run relationship and Granger Causality to investigate short run relationship along with Ordinary Least Square (OLS) to discover the general relationship between the exchange rate of between the exchange rate of Ringgit Malaysia (USD/MYR) and its determinants. The model is then separated into two models as the stock index and stock index futures were highly correlated between each other. Under the Johansen-Juselius (JJ) Cointegration test, the variables have no long-run relationship meanwhile having a significant effect towards the exchange rate of Malaysia based on the OLS results. Through the Granger Causality test, only FKLI, KLCI and Crude Palm Oil have unidirectional causality with USD/MYR. The rest remainder variables do not granger causes the exchange rate.

CHAPTER 1: INTRODUCTION

1.0 Introduction

Malaysia is the third largest economy after Indonesia and Thailand in South East Asia. It is the third wealthiest country in the region by the terms of GDP per capita (in dollar) after the global commerce, financial and transportation hub Singapore and the Oil tycoon state of Brunei (Boulton, Pecht, Tucker, Wennberg, 1997), (Malaysia, A Statist Economy, 2010). As the 21st largest exporter in the globe, its dependency on external and global economic condition is high therefore the forecast accuracy of exchange rate would be essential for all parties.

In recent studies, Edina and Tibor (2012); Imam, Tickle, Ahmed and Guo (2012); Sinha and Kohli (2013) have done their studies on the effects of stock index market on the exchange rate. There has been considerable amount of research in using interest rate and inflation rates such as Interest Rate Parity (IRP) and Purchasing Power Parity (PPP) to examine their effects on the exchange rate.

With that, it is essential to conduct a research for investors, traders or policy makers to further understand what are the factors are eligible or significant in explaining the movement of a currency's exchange rate. Stock, derivatives market and the commodity prices can be useful tools to reveal the movement and condition of a currency's exchange rate (Kim & Choi, n.d.). A strong foundation and better understanding of the foreign exchange market shall give the user of this study an advantage in forecasting the movement of the exchange market. Malaysia is well-known for it is unexpectedly comeback from economic recession during the Asia Economic Crisis in year 1997 and Global Financial Crisis in year 2008. At that instance, Bank Negara Malaysia (BNM) started with a peg with US Dollar and eventually the Malaysian financial system were stabilised when BNM ends the dollar peg at year 2004. Meantime, during the 2008 financial crisis, the FTSE Bursa Malaysia KLCI dropped 443 points within one year period (Ikhwan, 2008).

The focus of the study will be the degree of affection of Malaysia stock and derivatives market, gold market, price of crude oil and along with crude palm oil price towards the exchange rate of Ringgit Malaysia (MYR) to US Dollar (USD). FTSE Bursa Malaysia KLCI (KLCI) which consisted of 30 companies that is indicative towards the market movement of Malaysian stocks trading in Kuala Lumpur Stock Exchange (KLSE). The futures market and stock market are cointegrated and the futures market tends to have its price discovery function. Considering the fact that futures market might affect spot market (Sehgal, Rajput & Kumar, 2012), the exchange rate might be influenced by the changes of futures market is valid. To represent the derivatives market, this paper chose the FTSE Bursa Malaysia KLCI Futures (FKLI) since they represent the Malaysian derivatives market.

1.1 Background of Study

1.1.1 Exchange Rate of Ringgit Malaysia / US Dollar (USD/MYR)

Forecasting exchange rates has been an inevitable task. In the present era of currency war, exchange rate is inevitably a topic of the utmost importance to discuss about in the international financial market (Efendi & Ismail, 2013). Asia Pacific currencies have sharply decreased in value compared to US dollar since 1997.

From the glimpse of the history of Ringgit Malaysia, a fixed exchange rate system was imposed and pegged with Pound Sterling and then pegged with the US dollar before adopting a floating system after 1973. With the preference of a more stable and reliable exchange rate, the currency was once again pegged with a basket of major currencies. Kawai (2002) found that the US Dollar is still influential to the exchange rate arrangement of Malaysia. Besides that, he also found that the weightage of US Dollar in Malaysia Monetary Authorities exceed 0.85 from 1990 to 1998. The dollar remains the main anchor currency in Malaysia's exchange rate policies.

Ringgit Malaysia has been historically stable over the decades until it devaluated dramatically during the Asian financial crisis in year 1997 before the Malaysian Government started the Ringgit US Dollar peg at 3.4 to 3.8 USD/MYR as the aftermath for the crisis until year 2004 when BNM thinks the Malaysian financial system was back on track (Baharumshah, Mohd & Sung, 2009). According to Ibrahim (2007), Malaysia is the only Asian-crisis affected country that has peg its exchange rate against the US Dollar by strict and selective capital controls in order to restore the stability in its exchange rate.

Figure 1.1: Movement of US Dollar to Ringgit Malaysia (USD/MYR)

Adapted from:

Bloomberg Currencies – USDMYR Spot Exchange Rate USDMYR:CUR 5 year
chart (n.d.). Retrieved 23 February 2016, from http://www.bloomberg.com/quote/USDMYR:CUR

Figure 1.1 shows the 5 year trend of the exchange rate of US Dollar to Ringgit Malaysia. The value of MYR has been range bound between 2.95 to 3.40 from year 2011. Since April 2015, the MYR has been depreciated against the USD with the contribution of low crude oil prices. Weak export in year 2015 due to the dampened demand from China was another reason for the weakening demand of Ringgit in the market (Moody's Investor Service, 2015). The depreciation and volatility of the exchange rate of USD/MYR since April 2015 creates uncertainty in the financial markets. Since there might be different kinds of factors in affecting and causing volatility in the exchange rate of Ringgit Malaysia (MYR), there is an unfilled gap thus creates an urge to study deeper on the presence of this relationship, if it is positively or negatively correlated.

1.1.2 FTSE Bursa Malaysia KLCI Futures (FKLI)

Futures market tends to have price discovery function on its own (Pati & Padhan, 2009). While taking the possibility of that futures market might be significant in affecting the spot market into considerations, the exchange rate of a currency might be affected by the volatility of the futures market.

The Malaysian financial market has experienced dramatic changes as well as the trials of financial crisis over the decade with its market openness and industrialization since 1980 (FTSE Bursa Malaysia KLCI, 2016). FTSE Bursa Malaysia KLCI Futures (FKLI) has been chosen since it represents the Malaysian Derivatives Market in terms of trading volume.

In Bursa Malaysia Derivatives Berhad, both FTSE Bursa Malaysia KLCI Futures (FKLI) and Crude Palm Oil Futures (FCPO) are the most traded futures contracts on the exchange. FKLI is well known with its attractiveness as a cheaper alternative to the competitively-valued FCPO Futures among the retail investors in the market. In addition, FKLI is also well known with its other abbreviations as FBM KLCI Futures and KLCI Index Futures.

FKLI is an equity index futures contract which is denominated in Ringgit Malaysia (MYR) and the underlying index is the FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBM KLCI) which consists of 30 company stocks of Bursa Malaysia weighted by market capitalization. (Oriental Pacific Futures, n.d.). By trading the FKLI, it provides opportunity for the market participants' exposure to the underlying FBM KLCI constituents. With that, institutional and retail investors may speculate and take position in the KLCI to gain profit from its daily movement. FKLI is cash settled contract while its contract size is FBM KLCI multiplied by RM 50 (Product services and properties of FKLI, 2015)

FKLI was not only for providing a platform for market exposure, it also offer global access as the stock index futures is electronically traded on a global electronic trading platform named CME Globex®. This platform permits individual as well as professional traders to have access to all Bursa Malaysia Derivatives' products anywhere around the world (Product services and properties of FKLI, 2015). Based on Bursa Malaysia Berhad (n.d.), traders can utilize the FKLI to gain exposure on leverage arising from FBM KLCI Index's daily price volatility. An institution with a tight cash flow budget may also use FKLI to temporary hold stocks until it has adequate available funds to obtain the physical stocks. The FKLI position would then be liquidated once the stocks are acquired. This imply a lower cost of entry via initial margin deposits with identical exposure to the value of underlying stocks after taking off the cost of an openly purchase. Trading the FKLI also gives the investors the ability to short sell and purchase later in the spot market to close out their trading position.

Figure 1.2: Movement of FTSE Bursa Malaysia KLCI Futures (FKLI)

Adapted from:

Bloomberg Stock Futures – KLCI Futures IK1:1ND 5 year chart (n.d.). Retrieved 22 July 2016, from http://www.bloomberg.com/quote/IK1:IND

Figure 1.2 shows the trend of FKLI in 5 years. Generally, the KLCI Futures tends to fluctuate over the 5 years with changes in external economies and market sentiment across the financial and derivatives market. The market has stepped into a mini bull market after mid of year 2012 and reaches nearly 1890 historical high in July 2014. It was obvious to see that the market started to collapse in year 2015 from around 1850 to almost 1590 point (3-year low) when the demand of Malaysia export from China dampened. The dramatic fall of crude oil prices (Moody's Investor Service, 2015) has brought an impact towards the Malaysian market, which is an oil exporting country.

Figure 1.3: Movement of FTSE Bursa Malaysia KLCI Futures (FKLI) and USD/MYR

FKLI USD/MYR

Adapted from:

Bloomberg Stock Futures – KLCI Futures IK1:IND VS MYRUSD:CUR 5 year chart (n.d.). Retrieved 12 July 2016, from http://www.bloomberg.com/quote/I K1:IND

On the other hand, Figure 1.3 shows the comparison between the spot exchange rates, the price of 1 MYR in USD (USD/MYR) with the FKLI. From figure 1.3, there was a huge selloff from the beginning of April 2015 and the value of MYR was carrying a heavy selling pressure within the same time period. Surprisingly, the chart illustrated that the spot exchange rate of USD/MYR goes in-line with the movement of Malaysian stock market. Another noteworthy point is, USD/MYR exchange rates do not follow the movement of stock futures index all the time. The exchange rate did not rebound when the FKLI has a slight comeback during the middle of year 2015. This unconventional relationship creates a room or a need to conduct further studies to examine the relationship between the FKLI and USD/MYR.

1.1.3 FTSE Bursa Malaysia Kuala Lumpur Composite Index (KLCI)

FTSE Bursa Malaysia Kuala Lumpur Composite Index (KLCI) is a market value weighted index. Investors usually follow the index by referring to the KLCI which represents the overall performance of the stocks listed in Bursa Malaysia. The KLCI was introduced in 1986 as Malaysia's stock market performance indicator. Initially, the KLCI made up by 100 most actively traded stocks from approximately 500 to 650 companies listed in the Main Board of Bursa Malaysia (FTSE Bursa Malaysia KLCI, 2016).

However, Bursa Malaysia has integrated the KLCI with its index partner, FTSE with internationally accepted index calculation methodology to provide more transparently, investable and tradable managed index. The integrated of KLCI and FTSE known as the FTSE Bursa Malaysia KLCI where carried out on 6th July 2009. The FTSE Bursa Malaysia KLCI is different with the KLCI which is only comprises 30 biggest companies listed on the main board of Bursa Malaysia. Thus, FTSE Bursa Malaysia KLCI retains the continuity of the KLCI index value to hold the historical trend of Malaysian stock market (Bursa Malaysia Berhad, n.d.).

Figure 1.4: Movement of FTSE Bursa Malaysia KLCI (KLCI) and USD/MYR

KLCI USD/MYR

Adapted from:

Bloomberg Stock – FTSE Bursa Malaysia KLCI Index FBMKLCI:IND VS MYRUSD:CUR 5 year chart (n.d.). Retrieved 12 July 2016, from http://www.bloomberg.com/quote/FBMKLCI:IND

Figure 1.4 shows the 5 year comparison of FTSE Bursa Malaysia KLCI Index with the spot exchange rates, the price of 1 USD in MYR (USD/MYR). The overall exchange rate trend of USD/MYR was in-line with the movement of KLCI in the stipulated 5 years period. However, it is pondering to see that, the exchange rate and KLCI diverged during May 2013. This provides an opportunity to study what are reasons behind the divergence.

The studies of relationships between stock index and exchange rate obtained different conclusions by referring to different researches and literatures. Thus, some of the researches study the causality in mean related to the relationships between stock index and exchange rate. According to Abdalla and Murinde (1997), they find that the causality from the exchange rate to stock market in South Korea, Pakistan and India, but not in the Philippines. Moreover, the causality between stock index and exchange rate is not found in Malaysia, Thailand, Singapore and Hong Kong (Ajayi, Friedman & Mehdian, 1998). In Taiwan, there is a double-sided effect between stock index and exchange rate.

In Indonesia and the Philippines, the causality is from stock index to exchange rate (Ajayi et al., 1998).

According to Dornbusch and Fischer (1980), the author introduced - goods market approach in order to examine the relationship between stock prices and exchange rate. They stated that the impact of exchange rates fluctuation will influence the competitiveness of a firm. When the competitiveness of a firm has been influenced, it will affect the earning of the firm and its stock price will be affected. On the other hand, according to Frankel (1983), the researcher introduced another approach - portfolio balance approach. A growing stock market attracts capital flows which strengthen the demand for domestic currency and will make exchange rate to appreciate.

In addition, that will bring effect to movement of exchange rate when the stock prices have been changed. For example, if there is a continuous upward trend in stock prices, it will increase the inflow of foreign capital (Kadir, Masinaer & Rahmani, 2011). Therefore, when stock price falls, it will cause a reduction in domestic investor's wealth and will decrease in demand of money. When demand of money decrease, it will affect the interest rate falls that could results in currency depreciation. Thus, there is a negative correlation between stock price and exchange rate in portfolio balance approach.

For the argument of causality between exchange rate and stock market, Ramasamy and Yeung (2002) explained that changes in stock price can cause exchange rate volatility or vice versa which is depend on country and time. Additionally, there are evidences showed a weak relation between exchange rate and stock prices at a micro level (Tabak, 2006). According to Ma and Kao (1990), they found that when currency appreciation, it will negatively affects the domestic stock market for an export-dominant country. Thus, it will also positively affect the domestic stock market for an import-dominant country.

1.1.4 Gold Price

For over the centuries, gold is the asset that has attracted people for thousands of years and this attraction continues to the present day because gold is unlike other commodities, gold is strong and durable, comparatively transportable, universally acceptable and easily authenticated (Worthington & Pahlavani, 2006). In addition, gold's acceptableness and its marketability are high in worldwide. The demand of gold is ever increasing, not only for jewellery, coins, and bars but also for many industries, such as electronics, space, as well as medical technology. Besides that, a gold futures option had introduced by The Commodity Exchange of New York (COMEX) in October 1982 and has proven particularly successful. Volume and open interest have been large and growing (Bailey, 1987).

Furthermore, there is a relationship between the gold price with the stock market price and also the domestic currency exchange rate. According to the research from Wang and Lee (2010), proven that different fluctuation levels have different effects on the effectiveness of gold as a hedge against exchange rate depreciation. During the stock crisis, gold can be considered as a safe heaven or hedge tools that against stock market performance or even the domestic currency exchange rate (Joshi, 2012).

In the meantime, from the economic view, there is a negative relationship between the gold spot price and the stock market price indicates that whenever there is a fall in stock price, there is an increment in the gold price (Baur & Lucey, 2010). Investors tend to cash in their holding stocks during the bearish market, they turn their investment into the gold investment. At that instance, investors are likely to channel the fund into the gold market to safeguard it and act as store value by preventing from any big losses in other investments (Baur & Lucey, 2010).

However, for now the gold price begins to be changeful and rocky to be like past years. In fact, this let the researchers have more curiosity and motivate them to determine whether the gold price is still confining by this historical relationship. Standing on the characteristical aspect of the gold, this precious metal is unique and it can be as a substitute investment for stock. Meantime, there is a significant relationship between exchange rate and gold price. Thereby, it is to be concerned about either a positive or negative relationship between these two variables.

Figure 1.5: Trend of gold price (XAUUSD) from 2011 to 2016

Adapted from:

Bloomberg Business platform – Interactive gold price index (n.d.). Retrieved February 23, 2016, from http://www.bloomberg.com/quote/XAUUSD:CUR

Figure 1.5 presents the movement of the gold price per dollar index (XAUUSD) from 2012 to 2016. There clearly showed that the gold futures index has highest value in 2011 with more than 1,600 USD and then keep on decreasing from 2013 onward until the recent year in 2016 with 1208.75 USD. In conclusion of this chart, there are some factors in influencing the gold price, for example like stock market futures index and domestic currency exchange rate. Investors have to beware of the factors that influence the gold price.

Figure 1.6: Trend of gold price (XAUUSD) and USD/MYR

Adapted from:

Bloomberg Business platform – Interactive gold spot price and USD/MYR chart (n.d.). Retrieved February 23, 2016, from http://www.bloomberg.com/quote/XAUUSD:CUR

Figure 1.6 shows the relationship between the exchange rate of Ringgit Malaysia (MYR) to US Dollar (USD) and gold per dollar (XAU/USD) spot price. Generally, the graph is showing a time frame of 5 years from 2011 to 2015. There is a clear picture showing that there is negative relationship between the gold spot price and the movement of USD/MYR. The gold price fell after recorded its historical high of 1882.96 USD per ounce in September 2011. However, the exchange rate of USD/MYR fell together with the gold price instead of hiking up with the gold fall. Meanwhile, there was a divergence in the movement of the gold price and the exchange of USD/MYR. The uncertainty lies in the relationship between gold price and USD/MYR has provided a reason for further investigation in this paper.

Figure 1.7: Trend of gold price (XAUUSD) with FTSE Bursa Malaysia KLCI (KLCI)

Adapted from:

Bloomberg Commodity – Interactive gold spot price and FTSE Bursa Malaysia KLCI (n.d.). Retrieved February 27, 2016, from http://www.bloomberg.com/quote /XAUUSD:CUR

Figure 1.7 shows the negative relationship between the gold spot price (XAUUSD) to the FTSE Bursa Malaysia KLCI (KLCI) from 2011 to 2016. This graph generally shows there is a huge difference between the gold price and KLCI over the five years. There was a significance divergence between the gold spot price and KLCI in March 2013. Before this, the gold price always traded above the level of KLCI. Despite the great divergence in both gold spot price and KLCI, the in-line movement was observable during May 2015. At an instance, the gold price remains range bound while KLCI took back its ground in the beginning of year 2016.

1.1.5 Crude Oil Price – West Texas Intermediate (WTI)

Crude oil is one of the most important commodities and most commonly traded commodity in the global economy. Crude oil is generally traded in the Dubai Mercantile Exchange, the ICE Futures, the Central Japan Commodity Exchange and New York Mercantile Exchange (Brayek, Sebai & Naoui, 2015). Over the last three decades, crude oil price has been significantly inconsistent and more volatile during the Second World War period. This paper choose to study the West Texas Intermediate (normally known as the crude oil in American terms) on its affects on the exchange rate of Ringgit Malaysia to US Dollar.

In the global financial crisis era, most of the literature mainly found a significant positive relationship between crude oil price and exchange rates. In general, a growth in crude oil prices influences the appreciation or depreciation of the domestic currency as indicated by Ferraro, Rogoff and Rossi (2012) and Nikbakht (2010).

According to Ferraro, Rogoff and Rossi (2012) and Nikbakht (2010), the real oil prices may be the dominant source of real exchange rate movements and there is a connection between real oil prices and real exchange rates. Schnept (2008) highlight the effects of the crude oil price on exchange rates, which ‘‘dribble down’’ to the commodity prices. On the other hand, an estimation of the relationship between crude oil price and exchange rates has not been showed.

Another link between oil price and exchange rate by Bénassy-Quéré, Mignon and Penot (2007) found that increasing by 10 percent of oil prices, the dollar will be appreciated by 4.3 percent in long term. Another studied by Turhan, Hacihasanoglu and Soytas (2012), a rise in oil prices leads to a significant increase in developing economy’s currencies against the U.S. dollar. Those existing literature showed that crude oil price affects the exchange rate oscillations.

Figure 1.8: Movement of West Texas Intermediate crude oil price and USD/MYR

Adapted from:

Bloomberg Business platform – Interactive West Texas Intermediate crude oil price index and exchange rate of MYRUSD chart (n.d.). Retrieved February 23, 2016, http://www.bloomberg.com/quote/CL1:COM

Figure 1.8 shows that the relationship between WTI crude oil prices per Dollars per barrel and exchange rate (USD/MYR) from year 2011 to year 2015. The chart illustrated that the WTI crude oil prices experienced a great halt since August 2014 and traded below 60 USD per barrel until now. Ever since year 2011, the movement of Ringgit Malaysia was synchronous with the WTI crude oil price. It is worth mentioning that the Ringgit also began its depreciation against the US Dollar within the same time period as the crude oil price initiated its great fall.

1.1.6 Crude Palm oil

Over the past decade, palm oil achieves 32.8% of global total vegetable oil, the highest yielding vegetable oil crop. Malaysia is the second-biggest producers and exporters of palm oil and palm oil products. According to Malaysia Palm Oil Council (MPOC), a Malaysia current account holds 39% of world palm oil production and 44% of world exports currently in year 2011. There were around 41 palm oil production companies listed on Bursa Malaysia, the larger listed companies comprises Sime Darby, IOI, KLK and FELDA. With the Malaysia and Indonesia was contributing to raise the production, the world production of palm oil had nearly doubled from 1990 to 2001 (Teoh, 2002). Table 1.1 and 1.2 showed that the supply and demand of crude palm oil has been increased during the period of 2005 to 2012.

Table 1.1: Production of palm oil from period 2005 to 2012

Palm Oil Supply (Mn tonnes)

	2005	2006	2007	2008	2009	2010	2011	2012*
Indonesia	15.2	15.5	15.3	17.7	21	22.1	23.9	24.9
Malaysia	13.5	15.5	16.7	18.9	17.6	17	18.8	18.7
Others	4.7	5	5.7	6	6.7	6.8	7.3	7.6
Total	**33.4**	**36**	**37.7**	**42.6**	**45.3**	**45.9**	**50.1**	**51.2**
Production Growth (%)	11.7	7.8	4.8	12.8	6.3	1.3	9.3	2.1

Adapted from:

Malaysian Palm Oil Board – Production of palm oil from period 2005 to 2012(n.d.). Retrieved 23 February 2016, from http://bepi.mpob.gov.my/

Table 1.2: Consumption of palm oil from period 2005 to 2012

Palm Oil Demand (Mn tonnes)

	2005	2006	2007	2008	2009	2010	2011	2012*
EU	4.2	4.4	4.5	4.9	5.6	5.7	5.4	5.5
China	4.3	5.2	5.5	5.7	6	6	6.2	6.6
India	3.4	2.9	3.7	4.9	6.6	6.8	6.7	7
Indonesia	3.5	3.7	3.9	4.4	4.8	5.4	6.2	6.8
Malaysia	1.9	2.2	2.2	2.4	2.4	2.1	2	2.1
Others	15.4	17	17.7	19	20	20.5	22.2	23
Total	**32.7**	**35.4**	**37.5**	**41.3**	**45.4**	**46.5**	**48.7**	**51**
Consumption Growth (%)	11.4	8.4	5.9	10.1	8.7	2.4	4.8	4.4

Adapted from:

Malaysian Palm Oil Board – Consumption of palm oil from period 2005 to 2012 (n.d.). Retrieved 23 February 2016, from http://bepi.mpob.gov.my/

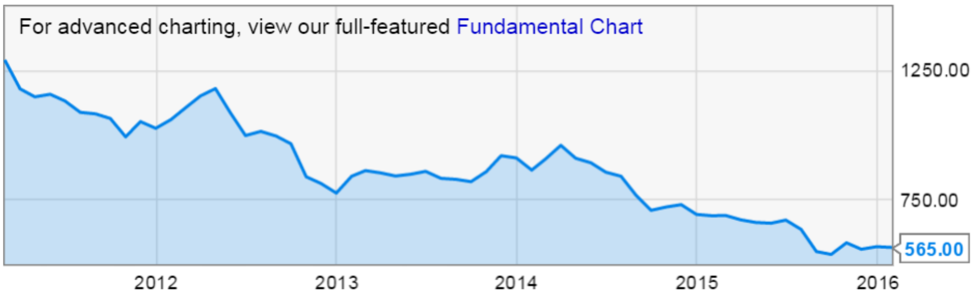
Table 1.3: Malaysian Export of Palm Products, Breakdown, Quantity, Value at year 2011

Product category	Quantity (Mn tonnes)	Qty (%)	Value (RM, Bn)	Value (%)
Palm Oil	17.99	74.1%	60.46	75.2%
Oleochemicals	2.18	9.0%	10.84	13.5%
Palm Kernel Cake	2.23	9.2%	0.92	1.1%
Palm Kernel oil	1.18	4.9%	7.6	7.6%
Finished products	0.4	1.7%	1.72	2.1%
Biodiesel	0.05	0.2%	0.18	0.2%
Total	**24.27**	**100%**	**80.4**	**100%**

Adapted from:

Malaysian Palm Oil Board – Malaysian Export of Palm Products, Breakdown, Quantity, Value at year 2011 (n.d.). Retrieved 23 February 2016, from http://bepi.mpob.gov.my/

Figure 1.9: Malaysia Palm Oil Price from period 2011 to 2016



Adapted from:

YCharts – Malaysia Palm Oil Price (n.d.). Retrieved 23 February 2016, from https://ycharts.com/indicators/palm_oil_price

Figure 1.9 shows the price of crude palm oil in Malaysia has been declined since 2012 to 2016. It is interesting to compare the declining crude palm oil price with the increasing global demand of the crude palm oil. Table 1.1 pictured that most of the crude palm oil producer and exporter has increased their production scale in order to meet the higher global demand. Since Malaysia main crude palm oil exporting country across the globe, the changes in crude palm oil price tends to influence the Malaysian stock market index.

1.2 Problem Statement

The Malaysian currency are often termed as Ringgit Malaysia (RM), it is known as the Malaysian Dollar (M$) in year 1967. Previously, the official currency was Dollar Malaya which was also used by Singapore and Brunei. The value of Ringgit was “tied” against the pound sterling at par value. After the Smithsonian Agreement, the pound sterling appreciated due to increase in gold price. This led to the increase in value of the Ringgit. When the pounds sterling was floated, the Malaysian government was undecided in revaluing the ringgit, afterwards, government decided to shift to the US dollar instead of the pounds sterling as its ‘official currency’ in the foreign exchange market (Talib, 2005). As earlier mentioned, foreign exchange rate may be influence by many factors and there are 5 variables that will be studies.

Futures market tends to have price discovery function on its own (Pati & Padhan, 2009). The relationship between the spot market bid-ask spread and futures market investor have significant influence on the spot exchange rate returns (Safa & Maroney, 2012). Since there is a positive sign of futures market and the negative sign of the sentiment indices indicate that spot market returns suffer. In the research of Kim and Choi (n.d), there is a negative sign of the sentiment indicate that spot market returns suffer and positive sign of futures market since the investors' higher interest in futures market. Therefore, the question of is stock market as well as the stock futures market the main reason that influence foreign exchange rate of Malaysia depreciate, along with other variables.

As the previous discussion, the stock index and exchange rate are related. Nevertheless, the relationship between two variables is still unclear as studies. According to Dar, Bhanja and Samantaraya (2013), there is a long-term significant positive relationship between stock price index and exchange rate. What about short-term? Currently there is no any research in investigating its effects in short run. Among the studies which ratify exist some conflict about the relationship. Kim (2003) and Rahman and Uddin (2009) argued that there is an insignificant relationship between stock price index and exchange rate. Subsequently, there is no fixed result to state that the relationship between stock index and foreign exchange rate are significant positive or negative relationship. Correspondingly, this give rise to start off this research to complete the unfilled gap.

Gold is one of the important, malleable, dense, conductive, and beautiful commodities which are paramount for both societal and investment purpose. It is a unique set of qualities has made it a popular object for most of human olden times (Fergal, Lucey, Batten, & Baur, 2015). Figure 1.6 shows that, there is an uncertainty results. When the gold price increases, there is no "must increase" or "will decrease" in foreign exchange rate. Once more, the statistical results showed that they negatively correlated. This fluctuating price deeds uncover the matter of is whether the relationship between gold and foreign exchange rate still preserving or not. Another paradox will be do gold still embrace its function in a class by oneself as another substituting instrument. The other argument arises henceforth is the cointegration relationship between gold price and exchange rate.

Certainly, not a single person is able to forecast how the oil price move in future as it is very delicate towards numerous factors. Amano and Van Norden (1998) showed that the real exchange rate appears to be cointegrated with the real oil prices. Therefore, oil prices may have been the dominant source of determined shockwaves. Another research comment their empirical result are provide clear evidence to show that the relationship between oil prices and exchange rates fluctuations in short-run are related which is strongly significant (Ferraro, Rogoff & Rossi (2012).Thus, as a developing country, the question rised whether is it statistically correct in assuming the Malaysian exchange rate performance is affected by the rises of oil prices.

Crude palm oil is the one of the important agriculture product of Malaysia. Table 1.1 shows that the supply of the crude palm oil was always in a surplus. However, the likelihood of crude palm oil in influencing foreign exchange rate movements remain as an unsolved myth. According to Omar and Kabir (2013), the theoretical concept of the empirical result shows that the exchange rate is determined by the commodity prices, interest rate and other factors as well. But most of the researches more focused on explaining the changes in palm oil prices due to changes in exchange rate. Hence, the importance of crude palm oil to the foreign exchange rate is to be asked.

In conclusion, this research is investigating the relationship between foreign exchange rate with FLCI, KLCI, gold price, WTI crude oil price and crude palm oil.

1.3 Research Objective

1.3.1 General Objective

This study accesses the effect of FTSE Bursa Malaysia KLCI Futures (FKLI), Kuala Lumpur Composite Index (KLCI), gold price, West Texas Intermediate (WTI) oil prices as well as palm oil price on foreign exchange rate. To study the effect of theses independent variables on foreign exchange rate by applying Ordinary Least Square (OLS) test. This research used monthly data of the period from 1st January 2009 to 31st December 2015 consisting 81 observations.

1.3.2 Specific Objective

This research tends to focus on:

i. To examine the effect of monthly FKLI on foreign exchange rate.
ii. To examine the effect of monthly KLCI on foreign exchange rate.
iii. To examine the effect of monthly gold price on foreign exchange rate.
iv. To examine the effect of monthly WTI price on foreign exchange rate.
v. To examine the effect of monthly crude palm oil price on foreign exchange rate.

1.4 Research Question

i. Is there any significant relationship between FKLI and foreign exchange rate?
ii. Is there any significant relationship between KLCI and foreign exchange rate?

iii. Is there any significant relationship between gold price and foreign exchange rate?
iv. Is there any significant relationship between WTI crude oil price and foreign exchange rate?
v. Is there any significant relationship between crude palm oil and foreign exchange rate?

1.5 Hypotheses of the Study

1.5.1 FTSE Bursa Malaysia KLCI Futures (FKLI)

H_0: *There is no relationship between FTSE Bursa Malaysia KLCI Futures (FKLI) and exchange rate.*

H_1: *There is a relationship between FTSE Bursa Malaysia KLCI Futures (FKLI) and exchange rate.*

1.5.2 FTSE Bursa Malaysia KLCI (KLCI)

H_0: *There is no relationship between FTSE Bursa Malaysia KLCI and exchange rate.*

H_1: *There is a relationship between FTSE Bursa Malaysia KLCI and exchange rate.*

1.5.3 Gold Prices

H_0: *There is no relationship between gold prices and exchange rate.*

H_1: *There is a relationship between gold prices and exchange rate.*

1.5.4 West Texas Intermediate (WTI) oil prices

H_0: There is no relationship between West Texas Intermediate (WTI) oil prices and exchange rate.

H_1: There is a relationship between West Texas Intermediate (WTI) oil prices and exchange rate.

1.5.5 Crude Palm Oil Prices

H_0: There is no relationship between crude palm oil prices and exchange rate.

H_1: There is a relationship between crude palm oil prices and exchange rate.

1.6 Significance of Study

This study can offer guidance to policy makers usually the members of the board of directors who have authority to set the policy framework of an organization or in government or Official Monetary Authorities (OMA), Central Bank in the country, International organization like International Monetary Fund and World Bank who are have interest in foreign exchange market. Policy maker in other term call official exchange rate which have intervention in the foreign exchange market that authorities buy or sell foreign exchange, normally against their own country currency and in order to affect the exchange rate. Moreover, official exchange rate intervention is effective in influencing exchange rates, given the policy importance of official intervention; it is perhaps not surprising that this literature has been the venue for a substantial and ongoing economic controversy. Insofar as a consensus is discernible among economists and policy makers concerning the effectiveness and desirability of exchange rate intervention, it appears to have shifted several times over the past quarter of a century (Sarno & Taylor, 2001).

On the other hand, data from exchange rate market that also found attractive to the Multinational Enterprise (MNE) which refers to a wide range of domestic firms that are engaged in business with foreign countries in different ways, for example like an export import corporation and the firms are engaged in Foreign Direct Investment activities across the region. MNE have to buy or sell foreign currency as part of their daily business. Therefore, these companies involve themselves into foreign exchange rate market, facing the foreign exchange rate risk in the market. Thus, MNE need more data information about the foreign exchange rate and the independent variables to determine the exchange rate that might bring risk to their daily business (International Finance for Dummies, n.d.).

To add in, this research also can help the investors who have interest in foreign exchange rate market; those mostly are speculators, bankers, arbitragers and hedges. Therefore, this research provides guidance to them about the fluctuation in exchange rate. In short, this study is able to provide a guideline in making investment decision in currency exchange. Before they invest, they can refer to the data of the independent variables that has a significant relationship with the exchange rate in USD/MYR to predict the currency exchange rate appreciate or depreciate.

Last but not least, this research can also provide guidance to the others academicians, which might help them have further research in the independent variables affect the foreign exchange rate. Lastly, this research will show the result on the relationship between exchange rate in USD/MYR and its determinants.

1.7 Chapter Outlay

Chapter 1

In this chapter, a general picture on Malaysia's currency exchange rate influence by the stock index futures and commodity prices. Introduction, research background [EXR (USD/MYR), FKLI, KLCI, Gold, West Texas Intermediate (WTI), Crude Palm Oil Futures (USD)], problem statement, research objectives, research questions, hypothesis of study, significance of study, chapter outlay and conclusion which study on how the stock index futures in this country and commodity prices influence the changes of exchange rate for the domestic currency.

Chapter 2

In this chapter, this research will have a further elaboration on the theory for the study and the relationship between independent variables and dependent variables for our study. Chapter 2 comprised the introduction, review of the literature, review of the theoretical models, proposed theoretical framework, hypothesis development and paragraph conclusion.

Chapter 3

This chapter demonstrates the research process including quantitative data collection method and analysis method. This chapter also contains the introduction, research design, data collection methods which include secondary data, sampling design, data processing, econometric model, data analysis and denouement of this chapter.

Chapter 4

This chapter illustrate the results gathered from the secondary data and explain further about the mode of the results that has been analyzed alone this chapter.

Chapter 5

The research's major findings, policy implications, limitations as well as suggestions for future research will be presented in this chapter.

1.8 Conclusion

The primary goal of the research is to discover the stock index futures, stock index and commodity prices that can affect the domestic currency exchange rate. Basically this chapter explained and introduced the domestic exchange currency (Malaysia Ringgit), the stock index futures, stock index and the commodity prices. In addition, this chapter stated the reason as well in examining the relationship between the domestic currency with the stock index futures, stock index and commodity prices. The variables included the stock index future - FKLI, stock index - KLCI and the commodity prices like gold prices, crude oil prices, and crude palm oil prices. The following in Chapter 2, this paper will provide a thorough review on literature with respect to how does the selected variables affect the domestic currency exchange rate.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The preceding chapter has presented the subject matter of this research. This chapter is about to discuss the literature review in previous studies. Distinctive representations on the results from journals that concerning to this study are illustrated. In this study, FKLI, KLCI, gold price, WTI oil price, and crude palm price as independent variables were comprised to study the exchange rates (dependent variable) movement. To add, the theoretical framework of each independent variable and hypothesis of study from several researchers are clearly presented to investigate the connection between independent variables and dependent variable. Therefore, the variables that will influence exchange rate had been selected for this research.

2.1 Review of Literature

Foreign exchange market plays an important role in an economy of a country. A change of foreign exchange rate may leads to variability of the economic activities in a country. Since 1997, global financial crisis, the value of currencies in some Asian countries (Indonesia, Bangladesh, Nepal, Philippines and Thailand) depreciated sharply against the US dollar (Efendi & Ismail, 2013). It is complicated and interesting to study the exchange rate movement through variables like FKLI, KLCI, crude oil as well as crude palm oil in Malaysia.

Wu, Lu, Jono and Perez (2012) and Sinha and Kohli (2015) studied the relationship between the stock price behavior and the exchange rate movement. The methodology involved in the study such as Unit Root Test, Granger's causality test (GC test) and Ordinary Least Square (OLS) regression.

Based on copula-GARCH model in determining the relationship between crude oil price and exchange rate, Hamilton (2011) and Amano and Van Nordan (1998) discovered a negative relationship is depending on the period where the relationship was negative in short run but positive in long run. Ashfahany and Priyatna (2015); Otieno, Dai, Barba, Bahman, Smedbol, Rajeb and Jaton (2016); Edwards and Ahamed (1986); and Bashar and Kabir (2013) have studied how the behavior of crude palm oil will affect the exchange rate. Among these researchers are based on present time series data to investigate the relationship between both variables.

2.1.1 Exchange rate

According to O'Sullivan and Sheffrin (2003), exchange rate is the value of a nation’s currency in terms of another nation’s currency. Exchange rate is also known as foreign-exchange rate or FOREX and FX. The exchange rate is determined in the foreign exchange market.

The exchange rate is a vital and sound policy in determining the trade and capital flows, international reserves as well as inflation in country’s economy. With that, there is no doubt to suggest that the stability of the exchange rate tends to have significant impact towards a country’s economy or macroeconomic fundamental (Wong, Ho & Dollery, 2012). Due to Malaysia’s saliency in its exchange rate regimes arrangement over the decades in order to reduce volatility during major financial events over different periods, the author take the case of Ringgit Malaysia as a rare and precious natural experiment (Wong et al., 2012). Malaysia has been using the exchange rate as a policy tool to combat and achieve inflation target and exchange rate stability. The Malaysian government used managed floating rate since 1973 and shifted to fixed exchange rate pegged with the greenback at RM 3.80 to 1 USD after the Asian Financial Crisis. It reversed back to a managed floating rate system during 2005. As a result of this exchange rate regime changes, the Malaysian exchange rate has become relatively stable (Wong et al., 2012). The researchers conducted a non-linear Granger causality test which eventually showed no cointegration exists between exchange rate volatility and imports for both the Malaysia and US.

Not only Wong et al. (2014) had found there is no cointegration between currency rate and stock market, Ghazali, Samsu, Ooi and Lajuni (2008) who used daily closing of KLCI and nominal exchange rate of USD/MYR for 3 periods (1993-1997, 1997-1998 and 2005-2007) found that, under pegged regime, there are empirical evidences to show that there is no relationship existed between the Malaysian exchange rates and its domestic stock prices. In that circumstance, foreign exchange and stock markets were segmented or the information flow between the two markets became efficient during the crisis. Stock market participants cannot hedge their position effectively by using foreign exchange, ceteris paribus.

Interestingly, while in the currency unpegged period, there was a unidirectional link from stock prices to exchange rates, where the portfolio balance models of exchange rate determination holds (Ghazali et al., 2008). In short, the investors could use the information retrieved from the stock market to forecast the exchange rate movement. Malaysia official monetary authorities could use the stock prices as an effective attraction to attract more foreign portfolio investment by taking stabilization measures in the stock market.

On the other hand, after taking the annual and monthly data of real effective exchange rate index, aggregate import and GDP deflator of Malaysia from 1975 to 2009, Wong et al. (2012) in his study of the determination of real exchange rate show that there is a long-run relationship among the real exchange rate, real interest rate differential, productivity differential, the real oil price and reserve differential. The results from Bound Testing Approach for cointegration showed whenever there is an increment in the real interest rate differential, productivity differential, the real oil price or reserve differential will lead to an appreciation of the real exchange rate in long term.

This finding is further explained by Kabir, Bashar and Masih (2014) by showing cointegration relationship among the stock price, exchange rate in Malaysia and the S&P 500 index. Their study also found that the Malaysian stock price is dependent on the exchange rate where the exchange rate appears to be more exogenous such as a leading variable in affecting the stock market. Either appreciation or devaluation of MYR will have a causality effect on the average stock price. Market participants shall concern the stock price before engage in exchange rate activities.

In fact, there are numerous researchers who found that the real oil price could bring significant impact towards the real exchange rate (Bergvall, 2004; Chen & Chen, 2007; Huang & Guo, 2007; Lizardo & Mollick, 2010). Malaysia, as a net-oil exporting country who adopts a managed floating exchange rate regime (Fischer, 2008), external shocks like world oil price shock tend to have a strong influence towards its exchange rate. Therefore, the real oil price would have a positive impact towards the Malaysian Ringgit exchange rate movements (Bergvall, 2004). The volatility in Malaysian Ringgit is reasonable since the world oil price is volatile at the same time (Askari & Krichene, 2008).

In short, there is a room for this paper to discuss the significance of the stock index and stock index futures market, crude oil and crude palm oil in affecting the of exchange rate of Ringgit Malaysia.

2.1.2 FKLI

Value line contract introduced by the Kansas City Board of Trade back in year 1982 is the world's first ever stock index futures contract. According to Gulen and Mayhew (2000), the FTSE Bursa Malaysia KLCI Futures (FKLI) is the forth Asian country that initiated its stock index futures with Kuala Lumpur Composite Index (KLCI) as its underlying equity index.

One of the advantages of futures market is its price discovery function where new information or news will first spread in the futures market and spot market later (Xie & Huang, 2013). This finding was in-lined with the research by Kim and Choi (n.d.), who concluded that stock index futures prices should move concurrently with the underlying spot prices without any lead or lag in price movements from one market to other. With that, the authors have observed significant lead and lag relationships between the spot and futures market due to market frictions. Many researchers found that the futures market lead spot market supporting the price discovery ability in the futures market (Min & Nanjand, 1999; Pizzi, Economopoulous & O'neill, 1998; Zhong, Darrat & Otero, 2004).

Besides, shocks from the stock index futures market and the stock index market tend to have negative effects on the foreign exchange market. When shocks or drastic change take place in the futures market, the authorities could prevent second or imminent shocks and stabilize foreign exchange market with appropriate measures (Kim & Choi, n.d.). The author stated in their study that there have been many studies to such as Ramasamy and Yeung (2002); Ibrahim and Aziz (2003) in analyzing the relationship between bond or stock market and foreign exchange market, neglecting the emerging and dominant futures market.

In their paper, they continue to elaborate that futures price has a strong explanatoray power in predicting the exchange rate of a nation's currency as well as stock price. The author then tested their assumption with both portfolio approach and price discovery function of stock index futures market and it was further backed. In short, there is a significant effect of stock index futures market on foreign exchange market.

There is a high correlation between the stock index market and stock index futures market since they fluctuate in the same direction. According to the portfolio approach, the stock market leads foreign exchange market with a negative correlation so that it is conclusive to say that the stock futures market might lead the foreign exchange market with negative correlation as well (Kim & Choi, n.d.).

From the epilogue of the turmoil 1980's to pre-Asian financial crisis, the Malaysian economy had a rapid economy growth with a 9% annual growth on average with the contribution from export diversification and increasing foreign and domestic investment to the country (International Monetary Fund, 2006). A massive capital inflow had led the Kuala Lumpur Composite Index to trade above 1,300 level in year 1994. At an instance, the index was the most active exchange in the world with even a higher trading volume than the NYSE. With such economic environment, (Kim & Choi, n.d.) suggested that the linkage between the domestic stock market and foreign exchange market will be further enhanced. With that, either the stock index or stock index futures market will be strong explanatory variables to illustrate the movement of exchange rates. Meanwhile, Park (1999) also supported that foreign investment towards the stock market is a sound variable in explaining the exchange rate of a currency using the VAR model.

However, Zukarnain and Sofian (2012) used cointegration test to prove that there is an existence of long run stable relationship between the Malaysia stock market's spot index and futures contract indexes. Besides that, the researchers also conducted a granger causality test which eventually suggests that the direction of causality is unidirectional deviate from cash/spot market index towards futures market indexes. However, authors' finding was inconsistent with their prognosis. Through the tests, the authors also concluded that futures market in Malaysia is not able to act as a price discovery vehicle for stock price.

Based on the reading, both positive and negative relationship between exchange rate and stock index futures market were proven by the researches with their very own samples. In a nutshell, the relationship between the FKLI and exchange rate of Ringgit Malaysia remain unclear since the findings are inconsistent.

2.1.3 KLCI

FTSE Bursa Malaysia KLCI (KLCI) is one of the independent variables included in the model to examine the changes of exchange rate (MYR/USD). According to Ramasamy and Yeung (2002) explained that changes in stock price can cause exchange rate volatility or vice versa which is depend on country and time. The changes in exchange rate will direct affect in business profitability and international competitiveness of the firms. For example, the appreciation of exchange rate will decrease the sales of exporters, thus the earnings and stock prices will fall. Meanwhile, the importers will face lower costs for their goods; hence it will increase the earnings and their stock prices. For the exchange rate depreciates, the adverse effects are presented.

Nieh and Lee (2001); Morley (2002) and Mishra (2004) investigated the relationship between stock price and exchange rate in long-run and short-run. The researchers used cointegration analysis to examine the dynamic relationships between stock price and exchange rate for G-7 countries (Italy, France, Canada, Japan, United Kingdom (UK), United States (US), and Germany). The studies showed that no relationship between stock prices and exchange rates in long-run, but have a significant relationship in short-run in certain G-7 countries. Morley (2002) showed that the stock prices and exchange rates are related across countries in the European Union (EU) using error correction model (ECM). The researcher stated that the stock prices and exchange rates are significant related in short-run in UK and Netherlands, and weak evidence of relationship in Italy and France, and no evidence of relationship in Germany in short-run.

Furthermore, Ibrahim (2000) and Ibrahim and Aziz (2003) examined the relationship between Malaysia' stock price and exchange rate. They use the multivariate cointegration and bivariate analysis to test the interaction between stock prices and exchange rates by using monthly data in 1979-1996. Their studies showed that there is no relationship between stock prices and exchange rate in long-run by using both analysis methods. Ibrahim and Aziz (2003) stated that there is no relationship between stock prices and exchange rates but the stock market has significant relationship with four macroeconomic variables such as the industrial production, the money supply, the bilateral exchange rate, and the price level.

On the other hand, there are some studies to show that there are no relationship between stock prices and exchange rates. According to Franck and Young (1972), it states that there is no significant relationship between stock price and exchange rate. Moreover, the boosting of the stock market attracts more investors to invest and the demand for domestic assets and currency increase. Hence, the domestic currency will appreciate, and the uptrend of asset prices leads to the same result but in another way. The demand for domestic currency is increasing the interest rates and appreciating the domestic currency. In contrast to precedent theories the theory of asset market models by Frenkel (1976) supports the absence of any connection between exchange rates and stock prices. Hence, the changes for stock prices and exchange rates are due to different factors. Thus, Ajayi and Mougoue (1996) mentioned that there are some other common factors can influence the stock market and exchange rates such as interest rate. So, there is no relationship between stock prices and exchange rates.

However, Aggarwal (1981) tested the relationship between stock prices and exchange rates, but in the studies showed that he did not find in which direction is moving in the correlation. Bahmani-Oskooe and Sohrabian (1992) used the cointegration analysis to test the relationship between stock prices and exchange rates, but the studies showed there is no relation between these two variables in long-run. Thus, the non-significance of long-run relationship between these two variables is proved by other studies by using cointegration tests (Granger, Huang & Yang, 2000; Nieh & Lee, 2001; Smyth & Nandha, 2003; Kollias, Mylonidis & Paleologou, 2010). In addition, Abdalla and Murinde (1997) used cointegration method to test the relationship between stock prices and exchange rates in Pakistan, Korea, India and Philippines. The studies showed that there are no long-run relationship for Pakistan and Korea but did find a long-run relationship for India and the Philippines. Other than that, Solnik (1987) and Ozair (2006) showed that there is no evidence could be found to show that there is a relationship between stock prices and exchange rates in the long run (Solnik, 1987; Ozair, 2006).

Furthermore, there are some studies to show that there are positively related between stock prices and exchange rates. According to Aggarwal (1981), the researcher shows a positive relationship between exchange rates of US Dollar and the changes in the US stock prices and found a positive correlation. According to Najang and Seifert (1992), the fluctuation of exchange rates is positively affected by the changes in stock prices by using Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models to test. According to Ma and Kao (1990), the researchers stated that a currency appreciation positively affects the domestic stock market for an import-dominant country on the macro level.

Moreover, the studies revealed that there is significant relationship between foreign exchange market and equity markets by using daily date for eight countries for example US, Canada, Japan, UK, Germany, Italy, France and Netherlands (Ajayi & Mougoue, 1996). By using an error correction model (ECM), the long run increases in stock prices have a positive effect on domestic currency. Sevuktekin and Nargelecekenler (2007) found positive and bidirectional causality between the stock prices and exchange rates in Turkey for the study period 1986 to 2006. Therefore, there are some studies to show the evidence to support the positive relationship between stock prices and exchange rates by using monthly date of US stock prices from 1974 to 1978 (Aggarwal, 1981).

On the other hand, numerous of studies showed that there are negatively related between stock prices and exchange rates. According to Soenen and Hennigar (1988), their result showed that there is a significant negative relationship between stock prices and the exchange rates in US market by using the data from 1980 to 1986. The researchers mentioned that when the exchange rates appreciate, it would affect the firm's foreign operation performance and get a lower profitability. Hence, it would affect its stock prices. Ajayi and Mougoue (1996) using the error correction model and causality test in US, UK, Canada, Germany, France, Italy, Japan and Netherlands to analyse the relationship between stock prices and exchange rates. The result showed that there is a negative relationship in both long-run and short-run between exchange rates and stock markets. They explained that a growing in domestic equity market is a signal of a growing economy, where it comes along with a higher expectation in the real inflation rate. As investors abroad recognise a higher, the currency value tends to depreciate when the investors tend to decrease their demand for the currency. .

Ma and Kao (1990) found that a currency appreciation will negatively affects the domestic stock market for an export-dominant country on the macro level. Moreover, Dimitrova (2005) stated that an upward trend in stock market may affect the currency depreciation, whereas the weak currency may affect the fall in the stock market in short-run. Ajayi and Mougoue (1996) showed that an increase in aggregate domestic stock price has a negative short run effect on domestic currency value. Additionally, Soenen and Hennigar (1988) showed that the influence of exchange rate on US stock prices is negatively by using the data from 1980 to 1986. Kim (2003) used the multivariate cointegration method and error correction model to analysis the relationship between exchange rates and stock markets in the US from 1974 to1998. The result showed that the relationship between stock prices and exchange rates is negatively correlated whether in long-run and short-run. Kim

(2003) explained that the changes in exchange rates will direct affect the business profitability and international competitiveness of the firms. The exchange rates appreciate will decrease the sales of exporters; hence the earnings of the firms and stock prices will be declined. On the other hand, the importers will increase the earnings by import their products at lower prices, hence the stock prices will increase.

Standing on the reviews above, this research anticipates a positive correlation between exchange rates and stock indexes. When the stock indexes increase, the exchange rates will appreciate.

2.1.4 Gold Price

Kaliyamoorthy (2012) implies that, since last century, gold is the oldest international currency that trade among the world wide and had played a critical part in many countries' monetary system. There are 10 top gold-producing countries (China, Australia, United States, Russia, South Africa, Peru, Canada, Ghana, Indonesia and Uzbekistan). China is the country that kept its place in number one which is the largest gold producer in the world. In the meantime, gold production keep on increase in China, as well as several countries like Australia, Canada, United States and Russia (United States Geological Survey (USGS) report, 2014). In addition, here are the mine production quantity produced by the top 10 gold producers in the world wide, China was 450 metric tons, Australia was 270 metric tons, Russia was 245 metric tons, United States was 211 metric tons, Canada was 160 metric tons, Peru was 150 metric tons, South Africa was 150 metric tons, Mexico was 92 metric tons and Ghana was 90 metric tons (Gold Investing News, 2016).

Nonetheless, gold price begins to vary due to some factors like political turmoil, interest rate variability, volatility in exchange rate, economic business cycle and lasting speculation. Besides that, the research result from Yang and Hamori (2014) has demonstrated the gold price and currencies are positively related. When the gold price increases, currency returns increase as well. Therefore, there is an emerging need to conduct the research on gold price as one of the independent variable to posit its relationship with the Malaysian exchange rate.

A research finding stated that gold served as a safe haven for investors seeking to avoid risks during the global spread of the financial contagion and those other assets (namely currency) were less valuable during the financial crisis. In the conditional dependence, including the lower and upper dependences, between currency and gold was weaker during the financial turmoil period than in the normal period, thus implying that the currencies mostly deviated from their real value. Besides that, the research was found that if there is a rise in the gold price will depreciate a currency's value more compared to the appreciation in the currency's value due to a decrease in the gold price (Yang & Hamori, 2014).

These findings showed that the US dollar is the only currency for which a increase in gold price will results in a depreciation in the dollar while an appreciation of the local currency is observed in most other cases (Beckmann, Czudaj & Pilbeam, 2015). Furthermore, if the gold price is likely to climb, it will cause the depreciation in dollars where the dollar is offered by Americans who wish to obtain pounds in order to buy gold. At this instance, the dollar will be weakened on account of the gold shipments in the first quotation (Lutz, 1937).

However, O'Connor and Lucey (2012) argued that the weakness of U.S. dollar makes gold prices depreciate and demand of gold will increase as well. The relationship between gold prices and value of dollar are significantly negative. In addition, Patel (2013) said that the role of gold was as a strategic prophecy against the inflation and exchange rate for the period January 1991 to September 2012 which means that the gold price and exchange rate are stationary at first difference.

Besides that, gold could be a hedge tool that against an exchange rate which means that gold has the ability to resist changes in the internal and external purchasing power of a domestic currency. That is, essentially, when the domestic price index rises, the domestic currency price of gold rises at the same time. Besides that, when the domestic currency depreciates against a foreign currency, the domestic currency price of gold would reduce at exactly the same time. Due to the features of gold, various of financial products are related to spot gold and there are lots of gold derivative financial products such as gold futures, gold options etc. Thus, in Japan, different fluctuation levels of the Yen have different effects on the effectiveness of gold as a hedge tool against the exchange rate movement (Wang & Lee, 2010).

Based on the review of the research on gold price, the expectation for the significance of the gold price and the exchange rate is a negative relationship, which means that gold price can affect the changes in the exchange rate. For example, when the gold price is increase, the exchange rate in U.S. dollar will be decrease.

2.1.5 Crude Oil

Crude oil is one of the most significant commodities of the global economy. Since crude oil is denominated in U.S dollars, crude oil price oscillations in domestic currency may be different which is dependent on the exchange rate regime (Bénassy-Quéré, Mignon, & Penot, 2007). Based on the previous studies (Chen & Chen, 2007; Nikbakht, 2010), there are several empirical evidences to state that changes in crude oil prices will influence the exchange rate volatility. Crude oil price has been significantly fluctuating over the past decades and become more volatile than during the World War II. Raised of volatility in crude oil prices was observed after the global oil crises of 1973 and 1979 (Hamilton, 2011).

Existing empirical research on the link between crude oil price and exchange rate found a significant positive relationship where a rise in the oil price will result to an appreciation of the exchange rate (Amano & Van Norden, 1998; Bénassy-Quéré et al., 2007; Narayan, Narayan & Prasad, 2008). According to Amano and Van Norden (1998), the causality runs from oil price discrepancies to exchange rate changes in the United States, Germany and Japan. Apart from that, the long run analysis done by Aliyu (2009) indicates that a rise in crude oil price will cause the gross domestic product (GDP) to increase and eventually leads to an appreciation of exchange rate. The GDP of the country has increased due to an increment in crude oil price. Thus, oil price shock has will effect income and output on a country economy, while exchange rate unpredictability and it may influence international trade. Dawson (2007) found that crude oil price was significantly influence the relative value of currencies. The author stated that if the trade balance deficit grows which is import more than export increase will leads to a depreciation of currency.

Chen and Chen (2007) investigated the relationship between real oil prices and real exchange rates in long-run by using monthly data period from 1972 to 2005. The result shows that an increase in oil prices will lead to an appreciation of the exchange rates in long run. Nikbakht (2010) investigate the long term relationship between crude oil prices and exchange rates by using monthly panel of seven countries of Organization of Petroleum Exporting Countries (OPEC) members which are Kuwait, Venezuela, Algeria, Saudi Arabia, Indonesia, Nigeria, and Iran from 2000 to 2007. Nikbakht (2010) suggest that there is a strong positive relationship between crude oil prices and exchange rates when considering monthly data. Nikbakht (2010) and Ferraro, Rogoff, and Rossi (2012) concluded that when crude oil price drop significantly, exchange rates will show a significant reaction, and therefore researcher focuses on daily frequencies to capture the relationship. In Ferraro et al. (2012) research, authors found that a paradoxically little systematic relation between crude oil price and exchange rate at the monthly and quarterly frequencies. However, the research left a question which unable to prove the predictive power in oil prices to predict the movement of exchange rate.

Several numbers of researches (Bénassy-Quéré, et al., 2007; Nikbakht, 2010; Ferraro, et al., 2012) used Johnansen Cointegration Test to examine the relationship between oil prices and exchange rates. Bénassy-Quéré et al. (2007) found that there is a long term stability relationship between the crude oil price and the exchange rate. The authors predicted that oil price increases by 10%, on average, the exchange rate will appreciation by 4.3%. Narayan, et al. (2008) stated that an increase in oil prices lead to an appreciation of the exchange rates. Results show that every 10% of increases in oil price will leads to a 0.2% appreciation of the dollar. October 2005, Reserve Bank of Fiji (RBF) increased interest rates and on 26 February, RBF increased 2% of official interest rate to 4.25%. The inflation increased 100% to 6% and there is a deficit of the current account, incompletely as a result of the raise of the oil prices and increased the GDP lead to an appreciation of the exchange rate.

Adversely, there are researchers who used cointegration test has showed that there is an opposite relationship between oil price and exchange rate which the appreciation of crude oil price may lead to a depreciation of currency (Zhang, Fan, Tsai and Wei, 2008). The promoting influence of constant devaluation of the U.S. dollar on continuously record breaking oil prices has been demonstrated since the long run equilibrium and significant positive cointegrating relationship can be identified the relationship between oil price and exchange rate. Zhang et al. (2008) found that the effect of a standard deviation disturbance of exchange rate on oil price is growing slowly and hit the highest point after the one year. Furthermore, research done by Brahmasrene, Huang, and Sissoko (2014) comment that oil prices had been precious by the changes of the exchange rate at a nominal level and also implies that the exchange rates decline may lead by a significant negative influence on oil prices. In the instinct responses, the exchange rate shock has a significantly negative impression on crude oil prices, while the instinct reaction of the exchange rate variable to a crude oil price shock is insignificant. Kutan and Wyzan (2005) found that a depreciation of the domestic currency effect by the beginning of 3 months lag oil prices, while at the 5 month lag oil prices leads to an appreciation of the domestic currency.

Akram (2009) also proved that commodity prices increase when the exchange rate depreciates. Based on Golub's (1983) study (as cited in Basher, Haug, & Sadorsky, 2012), an increase in oil prices will create a current account surplus for exporter but shows deficits for importers. It may create a reallocation of prosperity that influence exchange rate. Turhan, Hacihasanoglu and Soytas (2012) used daily data series from January 2003 to June 2010 to examine the oil price and developing economies currencies relationship against the US dollar which is Argentine peso, Brazilian real, Columbian peso, Indonesian rupiah, Mexican peso, Nigerian naira, Peruvian nuevo sol, Philippine peso, Polish zloty, Russian ruble, South African rand, Korean won, and Turkish lira. The results show that an increase of oil price after the financial crisis when crude oil prices rise, there is an outward depreciation of the local currency against the US dollar.

Brayek, Sebai and Naoui (2015) claimed that the best model to examine the relationship between crude oil prices and exchange rates is Clayton copula. The result shows that an increase in crude oil prices is correspond with the depreciation of a currency. In addition, Brayek et al. (2015) concluded that the existence of influence between crude oil prices and exchange rates during the crisis. In addition, there is a significant negative relationship that found by Cifarelli and Paladino (2010) by using multivariate GARCH model to study the crude oil prices dynamic are related with exchange rate performance. The unpredictable fluctuation of crude oil price influence the increase inflation, the lower the incomes, the developed the trade deficit and leads to depreciation of exchange rate.

Wu, Chung and Chang (2012) examined the relationship between crude oil prices and exchange rates by using Copula-GARCH model to figure out the movement of exchange rates and there is a significant negative relationship between crude oil price and exchange rate. The Copula-GARCH model with Gaussian copula holds a better explanatory ability for crude oil and exchange rate returns while the result suggest that the tail dependence structure between crude oil price and exchange rate is not apparent. Therefore, the influence between crude oil price and exchange rate are proved that insignificant relationship. Wu et al. (2012) also examined the marginal distribution with the element of GARCH model, and found that the short run volatility is less significant compare in long run volatility for crude oil futures and there is an insignificant for exchange rate futures.

Basher et al. (2012) discovered that a positive oil price shock leads to an immediate depreciate in exchange rate. This outcome has a statistically significant influence in the short term. As Krugman (1983) mentioned, raises of oil prices leads to increase the incomes for exporters, however, if the petrodollars are recycled into home currency, the demand for currency will increases in the short term, therefore, exchange rate will appreciation in short term as well. In the long term expectation, oil importers will face depreciation in their currencies because of the adverse terms of trade effect and this expectation of future depreciation is enough to produce a drop in the dollar in the short term even if petrodollars are recycled.

Based on the review, most of the past researchers found that there is a negative relationship between crude oil price and exchange rate (Kutan & Wyzan, 2005; Brayek et al., 2015; Basher et al., 2012; Wu et al., 2012). Therefore, the relationship between oil price and exchange rate still remain uncertainty.

2.1.6 Crude Palm Oil

Crude palm oil (CPO) can be considered as one of the important commodities exports in Malaysia. According to Otieno et al., (2016), stated that due to the steady growth in global demand for crude palm oil and attractive higher market price which result to increase the export volumes. Therefore, the increment in export volume generally implies that the benefit will be generated from foreign exchange earnings. Thus, the economy of Malaysia grows rapidly due to the earnings from CPO which is the main agricultural commodity exports. Harron, Shamsudin and Latif (2001) stated that Malaysia was emphasizing on expansionist policy when Malaysia had sufficient agricultural land, especially crude palm oil. At the same time, the investment was mainly in infrastructures and develops new land in order to produce more crude palm oil. This will increase the employment rate, the volume of international trade and foreign exchange. The government has generated the revenue from agricultural sector exports taxes. Meanwhile, a lot of foreign earnings are generated through the value added exports of agricultural commodities.

According to Ashfahany and Priyatna (2015), they have proved that the price of crude palm oil could affect the Rupiah and Ringgit. They analyzed the impact of changes in price of crude palm oil on the foreign exchange rate by using an Error Correction Mechanism (ECM) to examine the long-term and short-term time series between CPO price and exchange rate. The increment in the value of CPO trade is due to the higher world CPO price. Thus, it tends to the raise the foreign exchange. Since, the exporter receive the earnings from CPO in term of foreign currency, the value of home currency will appreciate as the exporters exchange the foreign currency for domestic currency. An increasing in world price of CPO tends to appreciate the exchange rate significantly in long term but not in short term.

Edwards and Ahamed (1986) implies that behavior of commodity export prices strongly affects the real exchange rate behavior. In Columbia, an exporter of coffee, experience that changes in world price of coffee tends to have an important effect on real exchange rate (as cited Weisner 1978; Urrutia 1981; World Bank 1984). The relationship between the world price of coffee and Columbia peso proved that changes in coffee prices had been positively related to appreciation of Columbia currency (Edwards & Ahamed, 1986). He also explained that an increase in world price of coffee result an increase in disposable income and the demand for tradable and untradeable goods. This effects will leads to a higher relative price of non-tradable and appreciate the value of peso. Besides, a rise in price of coffee will tend to generate a surplus in balance of payments and international reserves accumulated. However, if it is not fully sterilized in an increase of international reserve, it would be an increase in monetary supply and inflation which results in a further appreciate on peso.

In the studies of Bashar and Kabir (2013), they have confirmed the exchange rate is influenced by the commodity prices in long run. For example, the higher price of commodity in Australia implies foreigners need to purchase more Australian dollar in order to pay for Australian goods and services. Furthermore, the higher value of Australia dollar may reduce the demand from foreign consumer on non-essential Australia goods and services.

Based on these several studies, there is a significant relationship between price of crude palm oil and exchange rate in long term but not in short term. The behavior of CPO prices is positively affecting the changes of exchange rate in long run but not in short run.

2.2 Review of Relevant Theoretical Models

2.2.1 Purchasing Power Parity (PPP)

Purchasing Power Parity was developed by Gustav Cassel in 1918 where this theory implies that an individual could buy the same basket of goods in any country for the identical value when prices are denominated in a common currency (Alba & Papell, 2005). In short, it postulates that exchange rate will adjust so that the same good in two different countries will have the same price when denominated in the same currency.

Formula:

$$S = \frac{P_1}{P_2}$$

Where:

S = Exchange rate of currency 1 to currency 2

P_1 = Cost or price of good X in currency 1

P_2 = Cost or price of good X in currency 2

Purchasing power parity theory is based on the law of one price, which is in the absence of transaction cost and official trade barriers (Krugman & Obstfeld, 2009). PPP measure the price levels of goods between two countries in a trade. Real-world complications such as transaction cost, taxation, nontradables, trade restrictions and intervention of exchange rate market could possibly affect the working of purchasing power parity (Diebold, Husted & Rush, 1991). PPP theory forecast that there are positive relationship between domestic purchasing power and value of domestic currency. Since, energy products are largest exports segment in Canadian. Mémoire (2013) studied the relationship between crude oil or energy prices and exchange rate in Canadian during a period from 1999 to 2011. An increase in oil prices leads to an appreciation of CAD/USD exchange rate significantly when outside the parity area. However, once it is in parity area, the increment in oil prices does not have any substantial effect on the movement of CAD/USD exchange rate (Mémoire, 2013). Let's apply case in Canadian as an example into Malaysia. For instance, the current MYR/USD exchange rate is MYR 1= USD 0.26 (USD 1 = MYR 3.89). If the price of crude oil sells for USD 500 per metric ton in United Sates, then the cost of crude oil in Malaysia sell at MYR 1,945 per metric ton. This calculation is follow the MYR/USD exchange rate which given by the ratio MYR Price/ USD Price = $P_{MYR}/P_{US.}$ It can also be interpreted in a way of the difference in the inflation rates is always equal with the percentage of appreciation or depreciation of the exchange rate (Alba & Papell, 2005).

According to Metcalf (n.d.), purchasing power is no doubt the major determinant in long-term exchange rates meanwhile there are more factors to consider about in the short-run. Inflation and changes is taste will have an impact towards the exchange rate for short-term adjustment while purchasing power parity holds in the long run. This is supported by Taylor and Taylor (2004), suggesting that short-run PPP does not hold whereas the long-run PPP hold because of there is significant mean reversion of the real exchange rate, despite there are factors trenching on the equilibrium real exchange rate over time.

At this point, Alba and Papell (2005) raised an issue that during their investigation of PPP by using panel unit root test with US Dollar, they found that PPP holds for panels for Latin American and European countries meanwhile it fails in the panels for African and Asian countries. The paramount of their findings are PPP relies on country characteristics in ways that are consistent with economic theory. The authors also found that country with higher trade-openness and lower in the inflation tends to have a stronger PPP. Besides, country that has a moderate exchange rate volatility and growth rates of per capita real GDP similar to US will also possesses a stronger PPP.

Furthermore, Johnson (1990) found that the exchange rate is actually determined by foreign price relative to domestic price but not by the ratio of foreign price relative to domestic price. The researcher also found that the theory of PPP will be disrupted as the market becomes more integrated. Thus, for the purpose of forecasting the movement of the foreign exchange market, money supplies or interest rates should be included so that short-term variation could be captured. As the foreign exchange market is flooded by more and more capital flows, interest rate parity (IRP) is perhaps a better tool to compliment the theory of purchasing power parity. Currently, more and more capital flows in the foreign exchange rate market. The investors are required to lend funds from bank if they intends to invest in foreign exchange market. Meanwhile, they will facing an interest risk. Thus, the interest rate parity is more suitable tool for measure the flows of capital compared to purchasing power parity theory. As the foreign exchange market is flooded by more and more capital flows, interest rate parity (IRP) is perhaps a better tool to compliment the theory of purchasing power parity.

2.2.2 Efficient Market Hypothesis (EMH)

According to Naseer and Tariq (2015), Efficient Market Hypothesis (EMH) is among the famous and widely applied financial theories. EMH express that the new information easily merged in market activities and stock prices with analysis of present and past data, but it cannot assist investors to estimate future to avoid risk and uncertainty. Thus, the expected return based on this price is persistent with risk, meaning that the arbitraging opportunities are not suitable to use. Initially, EMH is based on random walk model, following to information with randomly in the market and changes in price are expected to be stochastic and independent. It is proposed that the higher average return is following by higher average risk. In addition, EMH is based on three main assumptions and arguments. Firstly, investors are presumed to be sensible and value of securities is based on the maximum expected effectiveness. Secondly, the investor trades are assumed to be stochastic if the investors are not rational, to offset any impact on prices. Thirdly, rational arbitragers are assumed that without affected by groundless investors have on market or security prices.

On the other hand, EMH can be divided in to three categories which are weak form, semi-strong form and strong form (Fama, 1991). Weak form EMH is persistent with random walk hypothesis such as stochastic movement in stock prices, and price changes are independent of each other. It states that market or security prices changes follow all market information such as historical price data regarding the security. Thus, it is impossible to beat the market to earning extra returns on the basis of technical analysis. Researchers examine the effect of different trading rules on stock prices with measure the autocorrelation among returns to test the weak form efficient market hypothesis. The studies show that over a short period such as 1, 4, 9 and 16 days, a serial correlation was discovered among returns of 30 stocks of Dow Jones Industrial Average (DJIA) for year 1957-1962. But these correlations are usually found to be amount to zero, this is mean that a linear independency among returns and thus consistent with market efficiency model (Fama, 1970).

Moreover, researchers also examined the performance of different trading criteria and rules to give grounds for the existence of nonlinear independency among stocks returns. Y filter test is 'one security and cash' trading rule where is ratified to be persistent with Fair Game Model. The researcher test the price indices for filters ranging from 1% to 50% from 1897-1959 (Alexander, 1961). Additionally, Fama and Blume (1966) tested and compared the effectiveness of different filters to buy-and-hold policy for DJIA's stocks. The study showed that filters cannot vanquish the simple buy-and-hold policy. However, Osborne (1962) and Fama (1965) also studied the test to prove the random walk model and showed the independence of stock price changes over time. They proved that the security prices adjusted swiftly follow the present new information. Price adjustment may be flawed because sometimes prices will be under-adjusted or over-adjusted, but their randomness makes unbiased revision.

Furthermore, as stated by the semi-strong EMH, prices revised speedily follow to the public information such as stock splits, new issues, political or economic event and dividend and earnings of stocks announcements. Semi-strong EMH is related with the current prices fully reflect the publicly available information. Hence, it is impossible to gain extra returns based on the fundamental analysis. The studies showed that when actual stock splits happen, the information follow stock split is fully reflected in stock prices. It is mean that investors cannot earn from the split information when it is make known to public (Fama, Fisher, Jensen & Roll, 1969).

Ball and Brown (1968) used different level of data such as dates of report announcement, contents of income reports and security price movements around announcement dates by using 261 larger firms. The results showed that only 10% to 15% of the information are following annual earnings announcement has been expected. According to Waud (1970), the researcher measures the effect of announcement of discount rate changes by Federal Reserve Bank. After the announcement, the next day of trading show a statistically significant announcement effect, but the measurement was only 5%. On the other hand, Scholes (1969) tested the effect of new issues of stock with large secondary offerings of common stock on security prices. He proved that there is fully adjusted to the information on the market average according a random pattern.

Moreover, the strong form EMH stated that the prices embody market. Private and public information such as none of the investor has monopolistic access to information. Strong form EMH is pertained with the assumption that all available information is incorporated in security prices. Hence, there is no investor is able to be paid above average risk-adjusted profit by predicting with the information. Jensen (1968) used the Sharpe and Lintner model with equilibrium to predict the returns of 115 mutual funds for a times period 1955-1964. He proved that no group has access to the private information and they cannot predict the future returns.

Furthermore, EMH theory has been challenged in both theoretical (Malkiel, 2003) and empirical (Cont, 2001) grounds regularly, but this theory still remains a popular topic in financial research. There is empirical testing in long history across different assets between capital market efficiency. Fama (1970) tested the EMH theory focus mainly on stock markets. However, Roll (1972) and Danthine (1977) tested the efficiency arriving at contradicting results in commodity markets. According to Frenkel (1976); Cornell and Dietrich (1978), EMH also tested to foreign exchange rates as well. On the other hand, according to Booth and Kaen (1979), the termination of the Bretton Woods system in 1971 affected the separation between gold and currency prices, but the relation between the gold and currency prices still remains tightly connected. According to Koutsoyiannis (1983), the researcher tested on the efficiency of gold prices and explains that the EMH cannot be refuted. Thus, the researcher finds a tight connection between gold prices and the strength of US dollar as well as the interest rate, inflation and a general state of US economy. Furthermore, the foreign exchange rates and gold prices are thus found to be interconnected (Ho, 1985).

According to Lo and Mackinlay (1988) and Wright (2000), they examine the random walk hypothesis in Colombian, Indonesian, Vietnam, Egypt, Turkish and South African exchange rates by using data from February 2007 to April 2012. Their study showed that the Colombian, Indonesian, Turkish and South Africa exchange rates market relative to the US dollar is under category of weak-form efficient. They mentioned that the future exchange rates are not based on the past rates but rates are based on all public information. Hence, traders cannot use past or historical rates to estimate the future exchange rates by using technical analysis. On the other hand, their study showed that there is strong evidence of rejection of random walk or Egypt and Vietnam pounds relative to the US dollar. They mentioned that traders may attempt to estimate these rates (Egypt and Vietnam) to gain profit by using technical analysis.

According to Charles, Darné and Kim (2012), they test the return predictability of exchange rates by using data from 1975 to 2009. Their results showed that the exchange rates are unpredictable for future rates. They explained that there are some reasons will cause inefficiencies in short-term such as financial crisis, banking crisis and central bank interventions. Moreover, Ahmad, Rhee and Wong (2012) focus on the Asia-Pacific region to the crisis perspective for further studied. Their result showed that the Asian crisis in 1997-1998 was more unstable compared to the global financial crisis in 2008-2009. Furthermore, the countries with fixed exchange rate markets are more stable than the floating exchange rate markets. On the other hand, Al-Khazali, Pyun and Kim (2012) studied the random walk and martingale definitions of the market efficiency in Asia-Pacific region. Their results showed that Malaysian ringgit, Korean won and Australian dollar are found to be efficient and unpredictable future exchange rates.

In conclusion, all the investors could not able to forecast and estimate the exchange rates to gain excess profit under EMH. According to Lo and Mackinlay (1988) and Wright (2000), traders cannot use past or historical rates to estimate the future exchange rates by using technical analysis. However, EMH has been used to forecast the trend of stock market, but EMH cannot predict the stock market future prices. Even though the performance of the stock market is well according to the historical data, but it does not represent that the performance of the stock market will go through preferable or awful scenario in the future.

2.2.3 Required Yield Theory (RYT)

Faugere and Erlach have further expand the Required Yield Theory (RYT) in gold price which in year 2005. Some instance, the existing literature has found empirical relationships between gold prices and macroeconomic variables such as inflation and exchange rates; little evidence has been offered for connections between gold and other asset classes. Without any hesitation, gold in fact is view as a wealth keeping tool. Besides that, none of the gold valuation theory projects how currency rate, inflation and other asset classes which may affect the gold price. In this research, the authors further elaborates the objectives of RYT which is derived from Faugere-Van Erlach, in 2003 by adding in the value of gold and the way of ascertan its return. RYT is able to evaluate financial assets via investors' general requirement to earn a minimum expected after tax real return equal to the long term GDP per capita growth.

The extent of the written works was well documented empirical relationships between the price of the precious metal - gold and worldwide macroeconomic variables such as inflation and currency exchange rates.

After rulling out the dramatically upsurge in gold prices in the early 1980’s, about half of the variance in $USD gold prices came into view to be reckoned by oscillation in real exchange rates during the period from 1982-1990 (Sjaastad & Scacciavillani, 1996). Furthermore, Ghosh, Levin, McMillan and Wright (2002) found out that gold is mainly an inflation hedge in the long run and further give justification for short-term gold price volatility by appealing for example to changes in the real interest rate and $USD versus rest of the world exchange rates fluctuations. Moreover, focuses primarily on gold as a hedging instrument and finds the gold market was free to fluctuate for the period time. Thus, gold tended to move in an opposite direction towards to the price of other financial assets (Coyne, 1976).

According to Faugere and Erlach (2005), the purposes of extending the Required Yield Theory to gold pricing are: First, the global real price of gold virtually is a real P/E ratio for gold, where “earnings” represent purchasing power or a global price index. Second, the global real price of gold must vary inversely to all other main financial asset classes’ real P/E to preserve the real value of any investor’s capital against adverse movements in the values of financial asset classes. Third, the Law of One Price shows that the exchange rate fluctuations must impact local currency-denominated gold prices to eliminate potential international gold arbitrages. Last but not least, mining supply must be steadfast in order to supply movements in the above on stock and the worldwide stock of gold per capita should not be growing in the long run (Faugere & Erlach, 2005).

For the purpose of extending the result to domestic currency denominated gold prices, Faugere and Erlach (2005) take into considertation the relative significance of each country in the global economy yet the effect of currency exchange rates. In general, the relationship between the local gold price and the exchange rate exhibits that as the domestic currency devalutes, the real domestic gold price appreciates, holding other variables constant.

Faugere and Erlach (2005) also implied that, the Required Yield Theory also include certain special predictions towards the gold price by following:

i. The real gold prices vary in pro rata to changes in the foreign exchange rate in direct quotation when the domestic required yield is constant.
ii. When the foreign exchange rate is constant and there are no major geopolitical (natural crises), real domestic gold price increases with domestic inflation.
iii. That foreign exchange effects will influence the domestic real gold price to the extent that equalization of required yields is not taking place worldwide and/or that Purchasing Power Parity (PPP) is violated as well.
iv. GDP per-capita growth gauged the real gold price differs proportionately to the change in long-term economic productivity.
v. In the long-term, the gold per-capita supply remains constant.

The average long-term absolute price of gold is marked-up cost where the profit margin is given by the global average long-term per-capita rate of GDP growth.

In conclusion, Required Yield Theory (RYT) designed by Faugere-Van Erlach (2003) is to evaluate gold and to determine its return. RYT expressed that global assets will yield a constant return and since gold can be act as wealth keeping tool, the price will differ straight to the required yield and as well as the inflation rate across the globe. Thus, once the gold price is directly influenced by the required yield, it makes to the changes in exchange rate. This made Required Yield Theory is used to determine the gold price that allowed this project to have further study on how the gold price affect the exchange rate.

2.2.4 Discounted Cash Flow Model (DCFM)

Discounted cash flow model (DCFM) is a financial pricing model to measure the investment return with a consideration on incorporate risk. This approach is based on the future expected cash flow discounted at a rate which reflects the riskiness of the cash flow to estimate a value of business. Discounted cash flow model recognizes the present value of an individual asset or portfolio assets. It is known as discounted reflecting cost of waiting, risk, discounted value of expected net cash flows and expected future inflation. Discounted cash flow model is commonly applied to corporate valuation and investment project. Discount rate is the combination of opportunity cost and risk which to calculate the analysis of present value of expected future cash flows.

Free cash flow refers to the remaining amount of operating cash flow after cover the investments in non-current assets and working capital. Arumugam (2007) stated that free cash flow is important since it gives an opportunity to improve the value of shareholder in a business. The important key to measure the value of a firm’s equity is to concern their present value of all the free cash flows to take a high opportunity and reduce the risk at the same time.

Discounted cash flow model had been used generally as a valuation method for stocks and inventories since money was first lent at interest after the stock market crash. Irving Fisher, in his book “The Theory of Interest”, presented the discounted cash flow model, in 1930 and John Burr William had text “The Theory of Investment Value” in 1938 as the first man who lawfully applied the discounted cash flow method in the economic terms. There are a several researchers such as Emhjellen and Alouze (2002) and Kvalevåg (2009) applied discounted cash flow method into their research. The model is presented as below:

$$Value = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots \frac{CF_\infty}{(1+r)^\infty} = \sum_{n=i}^{\infty} \frac{CF_n}{(1+r)^n}$$

Where, CF = cash flow

r = discount rate

n = time periods from one to infinity

In perspective of investors they apply discounted cash flow model in order to decide which investment are worth to invest (D'Arcy, 1999). The calculation on Present Value is generally performed on the cash inflow from investment without the cash outflow.

$$\mathrm{PV} = \sum_{t=0}^{n} \frac{\mathrm{CF_t}}{(1+\mathrm{r})^{\mathrm{t}}}$$

However, most of the cash flow from investment made in a project is normally need to be considering both cash inflow and cash outflow, and most of the projects need an up-front investment of capital at initial time. The Net Present Value calculation needed to be applied:

$$\mathrm{NPV} = \sum_{t=0}^{n} \frac{\mathrm{CF}}{(1+\mathrm{r})^{\mathrm{t}}}$$

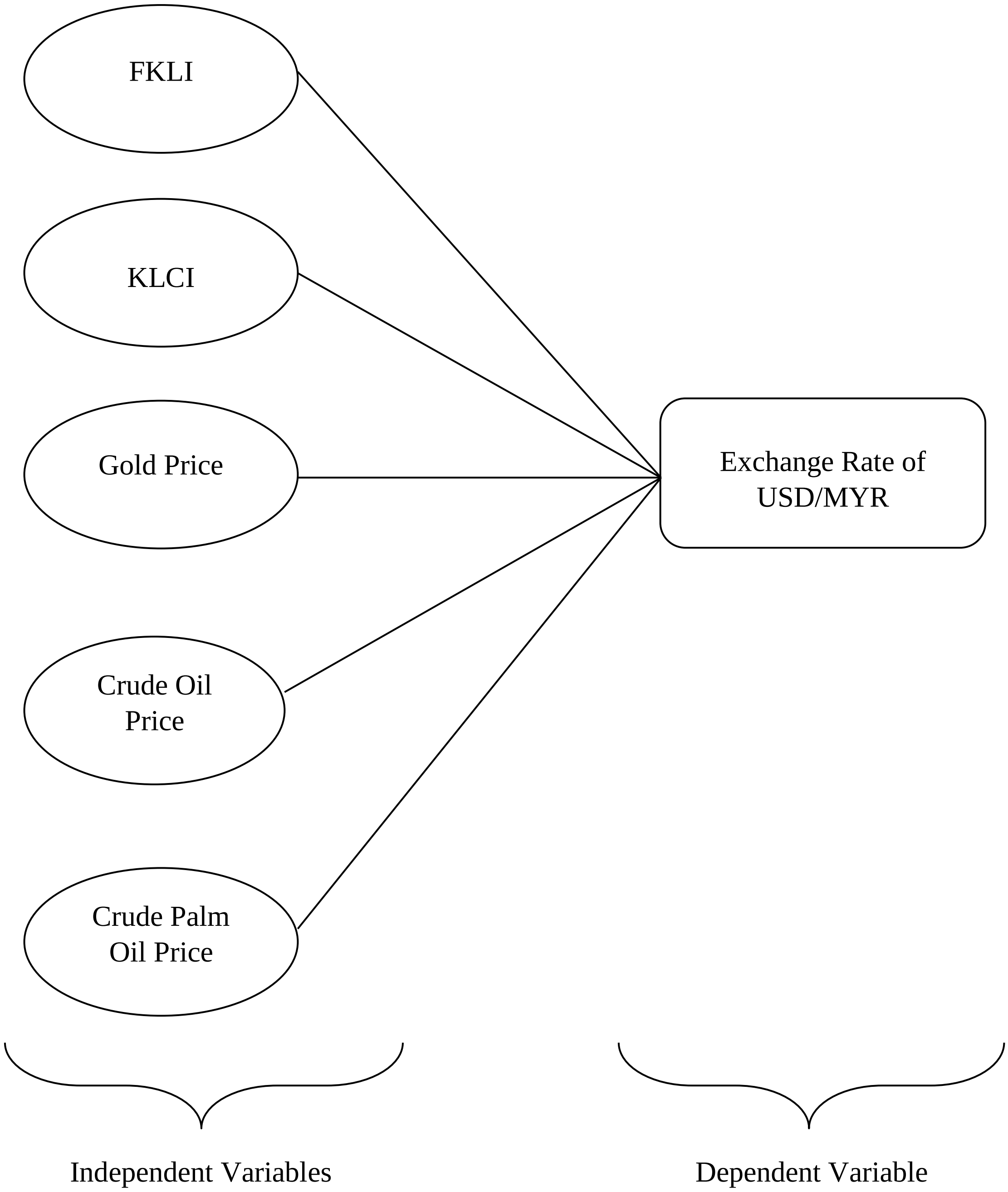
A several of empirical studies had enough of evidences to conclude that most of the assessments of firms or projects incorporate with the asset price above the discounted cash flow estimation and the difference being constant with option pricing (refer to Paddock, Siegel & Smith, 1988; Schwartz & Moon, 2000). Discounted cash flow method applicable in calculate the value of stock (Steiger 2008).

Oil prices can influence exchange rate in several ways. According to Basher et al. (2012), oil prices can influence the exchange rates directly by applying future cash flows or indirectly effect on the interest rate used by discount the future cash. Increasing of oil prices can be influence consumers' purchasing power and consumers need consume higher prices for final goods and services. Therefore, the demand of the final goods and services will decrease and the profit will reduce as well and it may leads to the currency depreciation. Raise of oil prices are frequently realized when there is an inflationary by central banks and policy makers who to respond in the inflationary pressures by increasing of interest rates which affects the discount rate when applied on the stock pricing formula.

Kvalevåg (2009) used discounted cash flow analysis and real options in the research to differ as basic of decision making on the gas and oil market developments. From the results, Kvalevåg (2009) had concluded that if the real option valuation results are higher than the expected project value than discounted cash flow analysis, it may lead to a loss existence undertaken. Adversely, if discounted cash flow results are lower than the excepted project values than the real option valuation, it may leads to a profitable which inexistence undertaken. With that, applying in oil prices market, if the oil price is underestimated which is lower than the discounted cash flow analysis, it may bring a profitability, adversely, if the oil prices more than the discounted cash flow analysis, is may face a loss.

In conclusion, discounted cash flow model is one of the important theories that to justify a corporation's cash flow given the influence of oil price changes. Furthermore, changes in price of crude oil fluctuates were relying on the market status and ambiguous incident. Discounted cash flow may capture the important components to estimate the movement of oil prices and exchange rate. Therefore, discounted cash flow model is the important theory to oil price and exchange rate to estimate the fluctuation of the oil price and exchange.

2.3 Proposed Theoretical Framework



2.4 Hypothesis Development

2.4.1 FKLI and Exchange Rate

According to Kim and Choi (n.d.), the researchers suggest that the stock index futures market tend to possesses a positive relationship with the exchange rate since the stock index futures has a high correlation as they fluctuate in the same way and the futures market leads spot market significantly. Min and Nanjand (1999); Pizzi, Economopoulous and O'neill (1998) and Zhong, Darrat and Otero (2004) also discovered the price discovery ability in the futures market.

H_1 = There is a positive relationship between FKLI and exchange rate.

2.4.2 KLCI and Exchange Rate

As stated by Aggarwal (1981), the researcher shows the positive relationship between exchange rates of US Dollar and the changes in the US stock prices. According to Najang and Seifert (1992), fluctuate of exchange rates are positively affected by the changes in stock prices by using Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models to test. According to Ma and Kao (1990), the researchers stated that a currency appreciation positively affects the domestic stock market for an import-dominant country on the degree of macro.

H_2 = There is a positive relationship between KLCI and exchange rate.

2.4.3 Gold Price and Exchange Rate

According to the research from Beckmann, Czudaja and Pilbeam (2015), there is a long-established relationship between gold prices and dollar depreciations is based on the lawof one price. Which means if gold is denominated in US dollar, while dollar is under depreciations when there is increasing in goldprices in order to eliminate arbitrage opportunities.

H_3 = There is a negative relationship between gold price and exchange rate.

2.4.4 Crude Oil Price and Exchange Rate

Akram (2009); Wu et al. (2012); Nikbakht (2010) and Ferraro et al. (2012) discovered that there is a significant negative relationship between West Texas Intermediate (WTI) crude oil price and exchange rate. Crude oil prices had been valuable by the changes of the exchange rate at a nominal level and indicate that the exchange rates decline may lead by a significant negative influence on oil prices. Therefore, there is a negative relationship between crude oil price and exchange rate.

H_4: There is negative relationship between West Texas Intermediate (WTI) oil price and exchange rate.

2.4.5 Crude Palm Oil Price and Exchange Rate

According to Otieno et al. (2016), Harron, Shamsudin and Latif (2001), Ashfahany and Priyatna (2015), they did mentioned the price of crude palm oil increase leadings to increase the exchange rate. Based on the case in Columbia implies that there are positively related between price of country's main export, coffee and domestic currency (Edwards & Ahamed, 1986). It is similar with crude palm oil which considered as a main export in Malaysia. This indicated that there is a positive relationship between price of crude palm oil and exchange rate.

H_5: There is a positive relationship between palm oil price and exchange rate.

2.5 Conclusion

This chapter present various studies regarding relationship between the independent variables include FTSE Bursa Malaysia KLCI Futures (FKLI), FTSE Bursa Malaysia Kuala Lumpur Composite Index (KLCI), Gold Price, Crude Oil Price and Crude Palm Oil Price and dependent variable Exchange rate (USD/MYR). Regarding these studies, the expected sign of hypothesis has determined clearly. In the next chapter, it will have a further studies on method for examine those hypothesis stated.

CHAPTER 3: METHODOLOGY

3.0 Introduction

After reviewing the past researcher's finding in Chapter 2, it helps this study to acquire a strong ground to understand better about all the determinants and research area. Next, this chapter is concentrating more on the description of data and methodology that going to be undertaking in this research to attain the research objectives.

This study initially selected total of five variables which are FTSE Bursa Malaysia KLCI Futures (FKLI), FTSE Bursa Malaysia KLCI (KLCI), gold price, crude oil price (WTI) and crude palm oil price against the xxchange rate of Ringgit Malaysia per US Dollar (USD/MYR). Data employed for a period from 2009 to 2015 in monthly basis with 81 sample size. These variables data are in monthly frequency with 81 sample size.

3.1 Research Design

Quantitative research will be implemented to run the objective of the research in this empirical study with time series data. The data for all variables selected comprise 81 of sample size evenly. A software used as an empirical instrument namely E-Views 9 to compute the data chosen into result for this research. Besides, the variables data selected are composed from DATASTREAM Professional. Study of descriptive and causal is designed in this study in order to classify the cointegration relationship between FTSE Bursa Malaysia KLCI Futures (FKLI), FTSE Bursa Malaysia KLCI (KLCI), gold price, crude oil price, crude palm oil price and currency rate.

3.2 Data Collection Method

3.2.1 Data Source

This research study is using secondary data which from 1st January 2009 to 31st December 2015 with monthly basis. All variables which is exchange rate, FKLI, KLCI, gold price, crude oil price and crude palm oil price involve a total of 81 observations. Adoption of secondary data in this thesis as it delivers an estimation accurately which could leads to high dependable results.

Based on the Table 3.1 shows that all the variable's source are adopted from DATASTREAM Professional. The unit measurement and source of FKLI and KLCI variable are same which is in index basis and available from FTSE. Conversely, Malaysia exchange rate, WTI and CPO were took out from Thomson Reuters, while gold price are extracted from ICE Benchmark Administration Ltd. that available in DATASTREAM. Original of unit measurement for variable gold price, WTI and CPO are in USD. In order to standardize the currency that involved, gold price, WTI and CPO had been converted to USD against MYR for regression purpose.

Table 3.1 Variables' Descriptions & Sources

Variable	Proxy	Unit Measurement	From	Source
Exchange Rate of US Dollar/Ringgit Malaysia	EXR	USD against MYR	DATASTREAM Professional	Thomson Reuters
FTSE Bursa Malaysia KLCI Futures	FKLI	Index	DATASTREAM Professional	FTSE
FTSE Bursa Malaysia KLCI	KLCI	Index	DATASTREAM Professional	FTSE
Gold Prices	GOLD	MYR per troy ounce	DATASTREAM Professional	ICE Benchmark Administration Ltd.
Crude Oil Price	WTI	MYR per barrel	DATASTREAM Professional	Thomson Reuters
Crude Palm Oil	CPO	MYR per metric tonne	DATASTREAM Professional	Thomson Reuters

3.2.2 Frequency of Data

In this research, secondary data which consists of historical data is used and leads to more reliable research outcomes since it provides more accurate estimation. Its time-saving and low cost characteristics have made findings to be more effective. The monthly data for every single variable comprise 81 of sample size. Indeed, research by using monthly data is quite attractive which it may capture the way of monthly movement of the variables in influencing the exchange rate of Malaysian Ringgit through various types of econometric testing.

3.2.3 Coverage Period

The research data selected is acquired from 1th January 2009 until 31st December 2015. Since the financial crisis will bring a large impact on exchange rates, so the sample size period is exclude the Financial Crisis 2007-2008. To make the result more accurate, the research is avoided to choose the period during financial crisis. The exchange rates show drastic effect during period of financial crisis (Baba & Packer, 2009; Kohler, 2010; Melvin & Taylor, 2009). Moreover, according to Stosic, Stosic, Ludermir, Oliveira, and Stosic (2016), financial crisis are linked with high entropy values, where bring impact in exchange rates. Malaysian does not face any major political calamities thus the movement and outlook of FBM KLCI is considered positive in the covered period of the beginning of year 2009 until the end of year 2015. In terms of global economic condition, China has begun a V-shaped recovery in year 2009 and the rally the beginning of a new bull market as the global economic is in the cycle of secular boom with cyclical inflation (Business Times, 2009). Bloomberg (2014) stated that the European Debt Crisis (as known as sovereign debt crisis) has been impacting the countries of the euro zone since the beginning of 2009, when a group of 10 central and eastern European banks asked for a bailout. Oil Glut happened in 2014 as oil prices fell more than 50% since the historical high in June 2014, causing a huge wave across the oil and gas (O&G) industry leading to a huge selloff of O&G stocks in Malaysia while dragging down the broader market (Bloomberg, 2014).In that instance, this provides a great opportunity for this paper to study how the exchange rate is affected by other independent variables since the data is free from the affection of financial crisis in order to make the result more accurate.

3.3 Sampling Design

3.3.1 Target Population

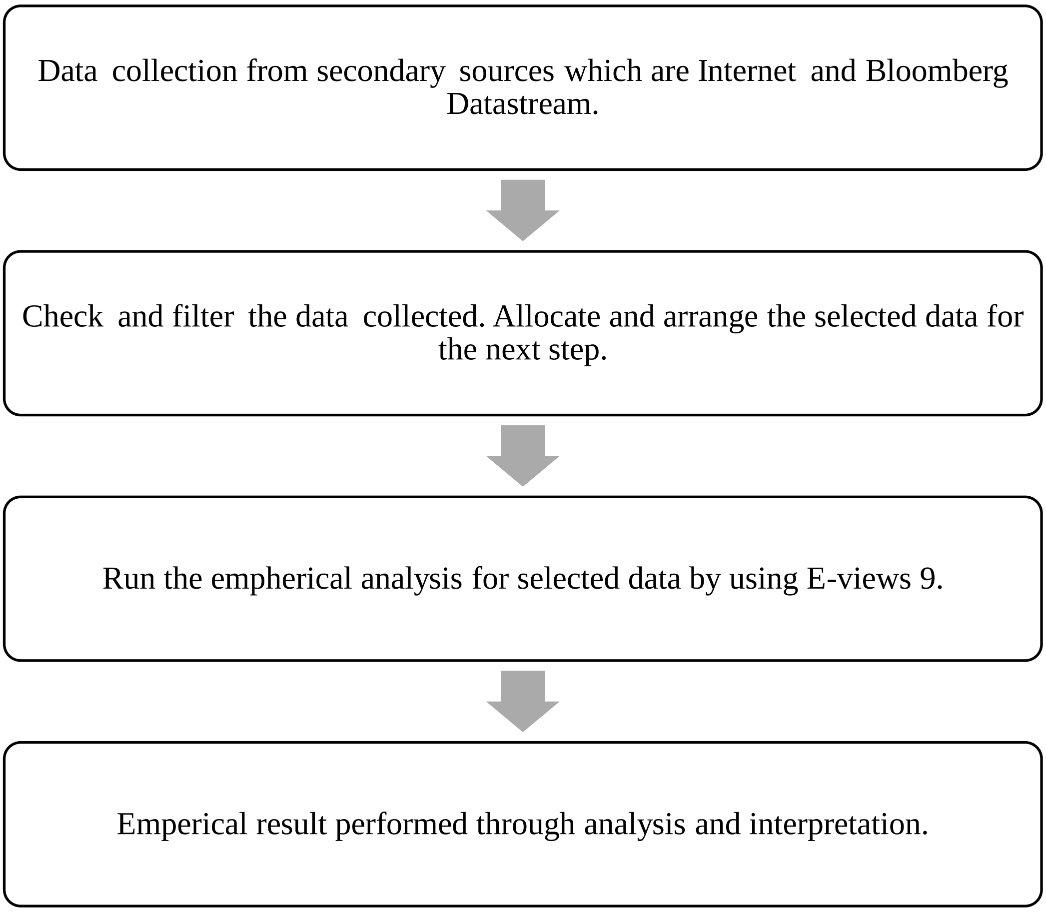
This research is emphasizing on Kuala Lumpur Stock Exchange (KLSE). Purpose of this study is to examine the connection between the independent variables and KLSE which also as known as Bursa Malaysia. Bursa Malaysia is an exchange holding company approved under Section 15 of the Capital Markets and Services Act 2007. Thus, FKLI and KLCI represent Kuala Lumpur Stock Exchange index. The main goal in this research is to aiming the way of independent variables affected the movement of KLSE indexes. Besides, it is the second largest stock exchange market in Southeast Asia region with $0.3 Trillion market capitalization. In addition, since Malaysia is active in export and import commodities product like gold, crude oil, and crude palm oil in the market, it allows the investors to trace performance of the FKLI and KLCI that act as indicator overall economy in Malaysia. Thus, it is necessary to adopt various variables from the stock market, stock futures market as well as commodity market as study samples.

Shortly, this research capture as much affection from different financial markets which giving opportunity for the investors to trace the movement of the Malaysian Ringgit (USD/MYR) and act as an indicative signal for Malaysia overall economic condition.

3.4 Data Processing

The data in this research was collected from DATASTREAM Professional. Data collected consists of six variables which are FKLI, KLCI, gold prices, crude oil prices, crude palm oil prices and exchange rates of USD/MYR. These data will be filtered and rearranged for further empirical analysis. The empirical test for the data allocated will be conducted through E-views 9 and the results will be reported at last.

Figure 3.1: Data Processing



3.5 Econometric Model

This research designed to examine the changes of exchange rate by using United Stated Dollar (USD) against Ringgit Malaysia (MYR) as dependent variable (Y_t) when involving of five independent variables which are FKLI (χ_{t1}), KLCI (χ_{t2}), gold price per ounce in MYR (χ_{t3}), crude oil price per barrel in MYR (χ_{t4}) and crude palm oil per barrel in MYR (χ_{t5}).

The estimated regression model is given as below:

$$\widehat{Y_t} = \widehat{\beta_1} + \widehat{\beta_2 \chi_{1t}} + \widehat{\beta_3 \chi_{2t}} + \widehat{\beta_4 \chi_{3t}} + \widehat{\beta_5 \chi_{4t}} + \widehat{\beta_6 \chi_{5t}} \quad (3.1)$$

$$ln\widehat{Y}_t = \widehat{\beta_0} + \beta_1 \widehat{ln\chi_{1t}} + \beta_2 \widehat{ln\chi_{2t}} + \beta_3 \widehat{ln\chi_{3t}} + \beta_4 \widehat{ln\,\chi_{4t}} + \beta_5 \widehat{ln\chi_{5t}} \quad (3.2)$$

$$\widehat{lnEXR}_t = \widehat{\beta_0} + \beta_1 \widehat{lnFKLI}_t + \beta_2 \widehat{lnKLCI}_t + \beta_3 \widehat{lnGOLD}_t + \beta_4 \widehat{lnWTI}_t + \beta_5 \widehat{lnCPO}_t \quad (3.3)$$

Sample size, N = 81

Where,

$\widehat{lnEXR}_t =$ In of exchange rate of USD against MYR at period t

$\widehat{InFKLI}_t =$ In of FKLI at period t

$\widehat{lnKLCI}_t =$ ln of KLCI at period t

$\widehat{lnGOLD}_t =$ ln of gold price in ounce in MYR at period t

$\widehat{lnWTI}_t =$ ln of crude oil price per barrel in MYR at period t

$\widehat{lnCPO}_t =$ ln of crude palm oil price per metric tonne in MYR at period t

Based on this scenery, the predicted coefficients for the time movement have their theoretically predicted signs.

3.6 Data Analysis

3.6.1 Descriptive Statistics

Descriptive statistics show the summary of the sample and measure. The main purpose of the descriptive statistic was used to summarize the data which contain mean, median, maximum, minimum, standard deviation, skewness and kurtosis for analysis. The mean is measure the centre of distribution. According to Gujarati (2009) implies that the mean is considered as average is compute in mathematical value which represents an average value of a data set. The median is middle number in one group of ordered numbers. Maximum and minimum represent the largest and smallest number in a dataset. Square root of variance is standard deviation.

Skewness and kurtosis are giving an insight into the shape of probability distribution. Skewness is measurement of the symmetry in distribution. A symmetrical data is preferable, so the skewness will have a positive value. While kurtosis is measure the combination of two tails sizes such as tallness or flatness of shape. If the value of kurtosis less than 3 is implies that the shape is fat or short-tailed, so called platykurtic. However, if the value of kurtosis more than 3 indicates that is a slim or long-tailed shape, so called leptokurtic. A normal distribution has a kurtosis of 3, it also known as mesokurtic.

3.6.2 Diagnostic Checking

3.6.2.1 Jarque-Bera (JB) Test for Normality Test

Normality testing must be run through the test and been fulfilled before the research proceed to the other test like multicollinearity, homoscedasticity ARCH test, autocorrelation LM test and Ramsey reset test. As the normality test is to resolve whether the data set is normally distributed and the degree of fitness of underlying variables within the data set to be normally distributed. Theoretically, there are two methods which is graphical and numerical method to test the normality distribution. For the methods of graphical, it assists in showing the histogram of residuals which illustrate the shape of the Probability Density Function (PDF) of a random variable. However, the statistical result such as skewness and kurtosis are presented in numerical method in order to make the judgment. Thus, Jarque Bera (JB) test is applied to test the normality of the error term. With presenting that the null hypothesis is represent the error terms are normally distributed, whereas for the alternative hypothesis for the normality test is the error terms are not normally distributed in order to examine whether the error term is normally distributed (Gujarrati & Porter, 2009). Besides that, according to Thadewald and Bunning in 2007, they did mention that the normally distributed of error term is very crucial in a model for analysis of economic model. Thus, in this research project will reject the null hypothesis for the normality test when the P-value of the JB test is lower than the critical value. For example, when the probability value is less than 10%, the error terms are not been normally distributed. Otherwise, the error terms are normally distributed.

H_0: *The error term are normally distributed*

H_1 : *The error term are not normally distributed*

Decision Rule: Reject H_0, if the probability value is less than the levels of significance which is 10%. Otherwise, do not reject the H_0.

According to the Central Limit Theorem from Gujarrati and Porter (2009), there are specified assumptions which need to be fulfilled:

i. If there is a huge number of independent variables and equally distributed random variables, it will leads to the distribution of the sum to be normally distributed.
ii. The size of variables is not huge or the variables are not exactly independent, but their results may still be normally distributed.
iii. There are only two parameters which are the mean, the variance and the distribution is a plain distribution.

3.6.2.2 Multicollinearity

The circumstances under multicollinearity may carry out problems in the regressions analysis (Mason & Perreault, 1991). The multicollinearity may leads to an incorrect approximates of coefficients, standard errors and inference errors, while Mason and Perreault (1991) claimed that the problem should not be observed in isolation with the large sample size and the high the R^2 may compensation the problems affected by multicollinearity. There is an assumptions of the classical linear regression model show that there is no multicollinearity among the explanatory variables. Approximately interpreted, multicollinearity model refer to the situation that either an actual linear relationship between the explanatory variables (Gujarati & Porter, 2009).

According to Gujarati and Porter (2009), there are some aftermath of multicollinearity as below:

i. If there is perfect collinearity among the explanatory variables, the regression coefficients are uncertain and the standard errors are undefined.
ii. If collinearity is high but imperfect, approximation of regression coefficients is conceivable however the standard errors have a tendency to be larger while the population values of the coefficients might not accrual.
iii. If the objective of the research is to assess the linear combinations of the coefficients and the admirable purposes might be able to be done although there is a perfect multicollinearity.

Gujarati and Porter (2009) stated that there are some methods of detecting collinearity problem. High R^2 but there is none of the regression coefficients is statically significant on the basis of conventional t-test, this is the clearest indication of multicollinearity problem exist. In model encompassing only two explanatory variables, there is an indication of collinearity that can be attained by investigating the zero-order or simple, correlation coefficient between the two explanatory variables. If the correlation between the variables is high, multicollinearity problem is usually the culprit. Conversely, the zero-order correlation coefficients can be ambiguous in models when involved more than two explanatory variables where it is possible to have lower zero-order correlations but with high multicollinearity. Thus, it may observe the partial correlation coefficients. Multicollinearity exists when R^2 is high but partial correlations are low, one variable or more variables may be superfluous. Thus, if R^2 and partial correlations are high, multicollinearity may be not voluntarily noticeable. Last but not least, Gujarati and Porter (2009) found that a high R^2 would suggest the explanatory variable is highly correlated with others explanatory variables. Hence, one may drop that explanatory variable from the model and it has provided that it does not lead to grave specification bias.

However, multicollinearity problem can be detected but some of the rules need to follow when applied detected methods:

i. Using extraneous or prior statistics
ii. Combining cross-sectional and time series data
iii. Omitting a highly collinear variable
iv. Transforming data
v. Obtaining additional or new data.

Obviously, these rules only work in practice will be contingent on the nature of the data and severity of the collinearity problem. Gujarati and Porter (2009) remarked that the character of multicollinearity in forecast and pointed out the without the collinearity construction remains in the sample it is precarious to use the predicted regression that has been plagued by multicollinearity for the determination of estimating. Variance-inflation Factor (VIF) method is used to testing the correlation between the independent variable to determine whether the independent variables are highly correlated or not.

The speed with which variances and covariances increase can be seen with the Variance-inflation Factor (VIF), which is defined as:

$$VIF = \frac{1}{1 - R^2}$$

According to Gujarati and Porter (2009), a serious multicollinearity problem exist when VIF of the independence variable is more than 10. If result of VIF less than 10, it is considered that there is no multicollinearity problem between the independent variables.

3.6.2.3 Heteroscedasticity

Heteroscedasticity problem happens when the error terms are not constant or the spread are unequal in statistic (Gujarati & Porter, 2009). Heteroscedasticity problem always take place in two exemplars which are conditional and unconditional. Conditional heteroscedasticity is the volatility keep fluctuate, which imply that the future periods of low and high volatility cannot be predicted. Unconditional heteroscedasticity is constant volatility, which implies that the future periods of low and high volatility can be predicted.

On the other hand, when heteroscedasticity problem occurs, the result of T-test statistic and F-test statistic values will be biased. Thus, the P-value and the interval of confidence for the independent variable will be inaccurate. According to Gujarati and Porter (2009), the authors implies that the heteroscedasticity problem normally occur in cross-sectional data rather than time series data.

Moreover, Gujarati and Porter (2009) explained that the two main reasons that lead the problems of heteroscedasticity occur which is the nature of data collected and model specification errors. Problem happen in the nature of data when there is lack of data or outlier data or both cases occur in the same time. Hence, it will leads the problem of not normal distribution in error term happen in the distribution of dependent and independent variables, so the heteroscedasticity will be occurred. On the other hand, the model specification error take place when the equation is omitted independent variable and brings a large error of estimated model; hence, the heteroscedasticity will be occurred.

Furthermore, there are some solutions to detect the heteroscedasticity in order to ensure the coefficient is efficient. Auto-Regressive Conditional Heteroscedasticity (ARCH) test is more suitable in time series data as it can shows the serial periods of fluctuation followed by serial periods of stability (Shazam, n.d.). Thus, for the diagnostic checking purpose in the research is apply ARCH Test to detect the heteroscedasticity problem.

Hypothesis is shown as below:

H_0: *There is no heteroscedasticity problem in the model.*

H_1: *There is heteroscedasticity problem in the model.*

When the p-value is smaller than the significance level, the null hypothesis will be rejected where a conclusion of there is heteroscedasticity problem in the model and vice versa. Increasing the sample size or using White's Heteroscedasticity-consistent Variances and Standard Error will help in solving the heteroscedasticity problem.

According to Gujarati and Porter (2009), to adjust standard error of Ordinary Least Square (OLS) estimators by using White's Heteroscedasticity-consistent Variances and Standard Error; hence, it will carry out statistical inference based on the standard error. In this research, the regression model's results will be adjusted by using White's Heteroscedasticity-consistent Variances and Standard Error to correct the heteroscedasticity bias.

3.6.2.4 Autocorrelation LM Test

Gujarati and Porter (2009) explained serial correlation or correlation between the numbers of observations between the error terms when the random variables ordered over time shows nonzero covariance. The autocorrelation problem is typically happen in a time series data. Omission of significant independent variables, data manipulation or problems in the functional form will caused the econometric model to have autocorrelation problem. It is likely to lead the estimated parameters to be biased, inconsistent and inefficient at the same time. If there is only a problem in the data, the estimated parameters will remain unbiased and consistent but inefficient.

According to Gujarati and Porter (2009), both Durbin-Watson test and Breusch-Godfrey can be used in detecting autocorrelation problem in an econometric model. At this instance, Breusch-Godfrey LM Test created by Breusch and Godfrey in 1978 (Levish & Rizzo, 1998) will be adopted in this paper as its unique effect in capturing the problem of autocorrelation in higher orders of series correlation and lagging dependent variables (Godfrey, 2007). Another justification for adopting the LM test over Durbin-Watson test is because Durbin-Watson test cannot be used in testing higher order autoregressive schemes and not application to use in lagged dependent variable (Levich & Rizzo, 1998). Thus, Breusch-Godfrey LM test can easily accommodate the above problems is applied (Rois, Basak, Rahman & Majumder, 2012).

Hypothesis is stated below:

H_0*: There is no autocorrelation.*

H_1*: There is a problem of autocorrelation.*

When the p-value is smaller than the significance level or greater than the critical value of LM test, the null hypothesis will be rejected where a conclusion of there is an autocorrelation problem can be made and vice versa. Increasing the sample size or using Neway-West test will help in solving the autocorrelation problem.

Newey-west is a test commonly used in regression model to provide estimation of the covariance matrix of the parameters in the regression model whenever there is violation of the assumptions of Classical Linear Regression Model (CLRM) (Newey & West, 1987). The test is used to solve autocorrelation or serial correlation problem lies in the error term in the models.

3.6.2.5 Unit Root Test

Unit Root test or Stationary test is conducted to examine whether the time series data collected is stationary or non-stationary. Stationary time series implies that theirs effects will be eliminated over the time as the series revert to the long run mean values (Brooks, 2008). Outcome of the research maybe different or affected if the series is stationary. Non-stationary data are unpredictable and cannot be forecasted. Non-stationary time series or presence of unit root implies that the series are depends on time and consequences of shock affect over the time. Movement of stationary implies that the mean, variance and covariance of the series are stable across different periods. Thus, the stationary time series are preferred.

Unit root test consist three different types which are Dickey-Fuller (DF) unit root test (1979), Augmented Dickey-Fuller (ADF) unit root test (1981) and Phillips-Perron (PP) unit root test (1988) (Gujarati, 2009). Augmented Dickey-Fuller (ADF) initially introduced by Dickey and Fuller. ADF unit root test is the most common unit root test used by researchers. Function of both tests is to examine the presence of stationary in time series data. ADF test adjusts DF test overcome the possible serial correlation in error terms by adding lagged difference terms of regress and but PP test does not consist the lagged difference terms (Gujarati, 2009). PP test statistics will provide a complicated calculation compare with ADF test.

H_0: ln FKLI/ ln KLCI/ln Gold prices/ ln Crude Oil prices/ ln Crude palm oil prices are non-stationary and presence of unit root.

H_1: ln FKLI/ ln KLCI/ln Gold prices/ ln Crude Oil prices/ ln Crude palm oil prices are stationary or absence of unit root.

Rejection of null hypothesis if the test statistic has more negative than DF critical value at 10% levels of significance. Otherwise, do not reject the null hypothesis. Thus, it has adequate evidence to conclude that there are stationary variables at 10% levels of significance.

ADF and PP test is to test whether the data are stationary in level, first differences or second differences. If the series itself is stationary at I(0), it is not necessary to proceed with first and so on, while holding other variables constant (Gujarati, 2009). When the data is stationary in first differences, it's implies that the series is integrated in order 1 I(1). The integration higher as the times to convert into stationary is larger.

Below are the explanations of integration order for unit root test.

I(0) series is a stationary series.
I(1) series is stationary at first difference.
I(2) series is stationary at second difference.

3.6.2.6 Ramsey RESET Test

Regression Equation Specification Error Test (RESET) is proposed by Ramsey (1969). It is generally a specification test for the linear regression model. The purpose of this test is to detect the model specification errors in the linear equation. According to Gujarati (2009), stated that if the model is exclude specification errors stated is considered as a correctly specified model. Once the misspecification found, it may lead to different conclusions about the empirical relationships between the variables. There are several types of specification errors:

i. Omitted of relevant variable(s)
ii. Adopting incorrect functional form
iii. Inclusive of unnecessary variable(s)
iv. Errors in measurement
v. Incorrect specification of the stochastic error term.

Hypothesis is shown as below:

H_0: Model specification is correct.
H_1: The model specification is not correct.

Given the level of significant, α is 10 %. If the probability value is lower than 5% of significant level, the null hypothesis (H_0) will be rejected. Otherwise, do not reject H_0. If the null hypothesis has been rejected, it implies that the model has specification errors. In other hands, the Ramsey's RESET test can be computed by using formula of test statistic as below:

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

The above test statistic was computed by using the outcome from the E-views results. The R^2 for unrestricted model is developed from a retrieve model where the R^2 for restricted model developed from original model. It is then computed in order to contrast with the critical value in F table, where $F_{\alpha,2,n-3}$ $(F_{\alpha,\, df_{unrestricted},\, df_{restriceted}})$. Reject the null hypothesis (H_0), if the test statistic is more than critical value, otherwise do not reject. The objective of applying the Ramsey RESET test in this study is to prevent the misleading of hypothesis test. Model misspecification will leads to the outcome of research inconsistent with the theoretical assumption (Jarvis, Mackenzie & Podsakoff, 2003). A proper adjustment for inclusive and exclusive of any variables is needed to consistent with the expectation. Thus, it will avoid the misleading results. This specification error test is the last diagnostic checking in order to ensure the model is specified correctly.

3.6.3 Ordinary Least Square (OLS) Model

Ordinary Least Square (OLS) model is a famous statistical model that is uncomplicated to understand, analyse and interpret which is widely used by various researchers. It is generalized linear modeling technique applied in examining the response of variables that has been recorded on an interval scale (Hutcheson, 2011). Furthermore, OLS is to offer the way on average change in dependent variables in response to average change in independent variables.

In OLS model, it comprises seven fundamental assumptions. First, a linear in regression model, the number of observations is greater than independent variable, a constant value of independent variable and a zero mean value in residual. Moreover, there must a constant variance and no autocorrelation in error term. Lastly, there must no negative number for variance of independent variable and no outlier (Gujarati & Porter, 2009).

In addition, OLS model consist of two approaches which are the t-test approach and F-test approach.

H_0: *ln(FKLI, KLCI, Gold Price, Crude Oil Price, Crude Palm Oil) have no relationship with Exchange Rate.*

H_1: *ln(FKLI, KLCI, Gold Price, Crude Oil Price, Crude Palm Oil) have relationship with Exchange Rate.*

Decision Rule: Reject H_0 if the probability value is less than the significant level which is 1%, 5% or 10% otherwise do not reject the H_0.

The t-Test Approach

H_0 : $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 = 0$ *(insignificant)*

H_1: $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 \neq 0$ *(significant)*

Where, β_1 = lnFKLI

β_2 = lnKLCI

β_3 = lnGOLD

β_4 = lnWTI

β_5 = lnCPO

T-test for each independent variable is conducted in this paper to study whether there are happened significance relationship between the explanatory variables and explained variable. The null hypothesis of t test is no significant effect of the explanatory variables on the explained variable while the alternative hypothesis is has significant effect of the explanatory variables on the explained variable. The null hypothesis is rejected when the p- value of the t-test statistic is less than significance level which is 1%, 5% or 10%, otherwise do not reject the null hypothesis.

3.6.4 Optimum Lag Length

As the research needed to be examined the Johansen-Juselius (JJ) Cointegration Test, thus the number of optimum lag should be determined for further tests. The main reason to identify the number of optimum lag is to make sure the reliability and accuracy of the model.

In this study, it will only focus on two criterions which are Akaike Information Criterion (AIC) and Schwarz InformationaCriterion (SIC). These two criterions are mostly used by past researchers to determine the number of optimum lag. According to Kitagawa (2008), to select the number of optimum lag is based on the minimum of AIC which is proposed by HirotuguAkaike in 1973. On the other hand, Cavanaugh and Neath (1999) explained that to choose the number of optimum lag is based on the minimum of SIC which is introduced by Schwarz in 1978.

According to Acquah (2010), the researcher showed that the AIC is created to get best approximating model without relying the sample size. Therefore, SIC is created to get the actual model while adopting into account of sample size and has the characteristics of asymptotic consistency. To contrast between AIC and SIC, SIC does offer easy and better model than AIC does (Acquah, 2010). In addition, Johnson and Omland (2004) proved that the SIC result is better than AIC model which is more simple and accurate. In short, the outcome can retain a high degree of freedom with the best lag length by using SIC in the regression model.

3.6.5 Johansen-Juselius (JJ) Cointegration Test

According to Gujarati and Porter (2009), when more than one time series variables are integrated and non-stationary in the same order will be occurred cointegrated. The one of the purpose of the Cointegration Test is to determine the number of cointegration that allows for more than one cointegration relationship. This implied that the Cointegration Test can identify the relationship between significant of variables in time series data among all of the variables.

H_0: There is no long run relationship between the variables.
H_1: There is long run relationship between the variables.

Moreover, the application of Cointegration Test to determine which variables has an effect on influencing other variables to change either in short run or long run. There are two types of Cointegration Test to estimate the cointegration ranking which are Trace Test and Maximum Eigenvalue Test. For Trace Test, it is a joint test based on log-likelihood ratio in which the null hypothesis is *r* (the numbers of cointegrating relationships) more than or equal to the number of cointegrating vectors (Hjalmarsson & Osterholm, 2007). On the other hand, for Maximum Eigenvalue Test, it is a single test on individual Eigen value in which the null hypothesis is the amount of cointegrating vectors is equivalent to *r* against the alternative hypothesis of (*r*+1). Trace Test and Maximum Eigenvalue Test can help this study to determine the presence of long run connection and the numbers of cointegrating vector.

Moreover, there is an advantage of JJ Cointegration test compare to older methods to determine the long run relationship between variables (Johansen & Juselius, 2009). Older methods obtained only one long run relationship between variables, while JJ Cointegration test can detect all cointegration relations existed in the system. Moreover, there is no need to separate variables into two groups of exogenous and endogenous variables when using JJ Cointegration test.

3.6.6 Granger Causality Test

Abu-Libdeh and Harasheh (2011) stated Clive Granger has proposed a test to examine causality between two time series in year 1969. Gujarati and Porter (2009) implied that although regression analysis variable may have effects on other variables, but it is non-evitable denotes causation. In other words, it was proposed as the relationship between variables does not syndicate causality or the direction of influence or the impact towards the other variables. Past researchers used Granger Causality test to access the dynamic effect of variables and the short run relationship between two or more variables. If the Chi-square test is greater than the critical value at 1%, 5% or 10% level of significance, the null hypothesis will be rejected.

H_0: *X does not Granger cause on Y.*
H_1: *X does Granger cause on Y.*

and

H_0: *Y does not Granger cause on X.*
H_1: *Y does Granger cause on X.*

Lin (2008) concluded that Granger causality test can be applied in three different circumstances:

i. Simple Granger causality test: there are two variables and their lags
ii. Multivariate Granger causality test: more than 2 variables are included (more than one variable can influence the results
iii. VAR Framework: Multivariate model is extended in order to test for the simultaneity of all included variables

3.7 Conclusion

In conclusion, this research has included FTSE Bursa Malaysia KLCI Futures (FKLI), FTSE Bursa Malaysia KLCI (KLCI), Prices of Gold (MYR per ounce), Crude Oil Prices (WTI) – (MYR per barrel) and Price of Crude Palm Oil against the Exchange Rate of US Dollar per Ringgit Malaysia (USD/MYR) in examining the relationship between of them. All the data are obtained from Datastream Professional with authorized sourced. There are 81 total number of observation from year 2009 to 2015 that to be tested, analyzed and interpreted through Normality Test, Multicollinearity Test, Heteroscedasticity Test, Autocorrelation Test, Ramsey Rest Test, Unit Root Test, Cointegration Test and Granger Causality Test for model specification. All these test will be carried out by E-Views Version 9 software and the empirical result will be ascertained and discuss furthermore in subsequent Chapter 4.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

The following chapter is fully focusing on analysis, explaining and reviewing the empirical results which generated through E-views 9 software. The test applied in this research consists diagnostic checking which includes Normality Test (Jarque-Bera), Multicollinearity, Heteroscedasticity, Autocorrelation, Unit Root Test and Model Specification. The following tests consist of Ordinary Least Square (OLS) Test, Johansen-Juselius (JJ) Cointegration Test and Granger Causality Test. A through detail of explanation will be provided for each result presented.

4.1 Descriptive Analysis

Descriptive statistics summarizing the explanation of basic features, general pattern and trend for data set collected. It is consists of the mean, median, maximum, minimum, standard deviation, skewness and kurtosis. The details of summary for descriptive statistic of dependent variable and independent variables from year 2009 to 2015 are showed in Table 4.1.

Table 4.1 Summary of Descriptive Statistic of All Variables

No. of Obs. = 81	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis
LNEXR	1.1838	1.1661	1.4267	1.0779	0.0709	0.9111	3.4755
LNFKLI	7.3231	7.3614	7.5406	6.7534	0.1941	- 1.2812	4.1823
LNKLCI	7.3255	7.3670	7.5386	6.7760	0.1942	- 1.2776	4.1392
LNGOLD	8.3598	8.3499	8.6088	7.0008	0.1456	- 0.1933	2.4493
LNWIT	5.5760	5.6184	5.8680	5.0065	0.2061	- 1.0698	3.5648
LNCPO	7.8537	7.8134	8.2615	7.4281	0.1780	0.2671	2.6225

Notes: 1. No. of observation for seven years = 81. 2. LNEXR = ln of exchange rate of USD against MYR; LNFKLI = ln of FKLI; LNKLCI = ln of KLCI; LNGOLD = ln of gold price in MYR per troy ounce; LNWTI = ln of crude oil price per barrel in MYR; LNCPO = ln of crude palm oil price per metric tonne in MYR.

Source: Developed for the research

From Table 4.1, it present that the highest mean is gold price (8.3598) whereas the lowest mean is exchange rate (1.1838). The result implies that gold price in Malaysia at highest level and the exchange rate is at lowest level compare to the other variables. Next, gold price has a highest median (8.3499) level, while exchange rate has lowest median (1.1661) level in all variables. In the meanwhile, gold price has the highest rate in maximum point which is 8.6088, while exchange rate has lowest rate in maximum point which is only 1.4267. When reach the level of minimum point, CPO prices own the highest level in minimum point (7.4281) whereas the exchange rate has the lowest level in minimum point (1.0779).

Regarding to the standard deviation, WTI prices has highest level of standard deviation which is 0.2061, while exchange rate has lowest level in standard deviation (0.0709). Among all the variables, most of them showed negative skewness level, except exchange rate and CPO prices which are 0.9111 and 0.2671 respectively. Thus, it indicates that only the dataset of exchange rate and CPO prices are symmetrical. Here comes to the level of kurtosis, FKLI has a highest kurtosis (4.1823) which is more than 3, so called leptokurtic. Meanwhile, gold price has the lowest kurtosis (2.4493) which is less than 3, known as platykurtic.

4.2 Diagnostic Checking

4.2.1 Normality Test: Jarque-Bera Test

This test is to study the error terms in the model whether are normality distributed or non-normality distributed and it names as Jarque-Bera Test.

Table 4.2 Summary of Jarque-Bera Test

Jarque-Bera Test	Probability	Decision
0.3336	0.8464	Normality

*Notes: ***, **,* indicates rejection null hypothesis at 1%, 5% and 10% levels of significance.*

Source: Developed for the research

In the hypothesis for this test, the null hypothesis will be rejected if the p-value is less than 10% levels of significance. Based on the Jarque-Bera Test's result showed 0.3336 which is insignificant at 10% levels of significance. This expressed that the standard errors of this model are normally distributed. Thus, the null hypothesis is failed to be rejected.

4.2.2 Multicollinearity

The speed with which variances and covariances increase can be seen with the Variance-inflating Factor (VIF), which is defined as:

$$VIF = \frac{1}{1 - R^2}$$

Table 4.3 Summary Table of Variance-inflating Factor (VIF)

Variables	R-squared	VIF	Result
*ln*FKLI	0.9986	726.7442	Serious multicollinearity problem
*ln*KLCI	0.9987	791.7656	Serious multicollinearity problem
*ln*GOLD	0.4804	1.9246	No serious multicollinearity problem
*ln*WTI	0.5002	2.0010	No serious multicollinearity problem
*ln*CPO	0.4043	1.6787	No serious multicollinearity problem

Source: Developed for the research

Standing on the summary Table 4.3, result of Variance-inflating Factor (VIF) for *ln*GOLD, *ln*WTI and *ln*CPO are less than 10 that indicate that there is no serious multicollinearity problem. However, VIF result for *ln*FKLI and *ln*KLCI variables found that there is high correlated between each other which is 726.7442 and 791.7656. According to Gujarati and Porter (2009), there is a serious multicollinearity problem exist when VIF of the independence variable is more than 10.

Any multiple regressions that undergoes from multicollinearity without the independent variables are not correlated which is hardly realistic (Dougherty, 2001). Gujarati and Porter (2009) stated that "*as long as multicollinearity is not perfect, estimation of the* *regression coefficients is possible...*" Therefore, multicollinearity is the matter of degree and it happens to be a problem when the degree becomes high or nearly perfect (= 1). In fact, the presence of multicollinearity does not affect the BLUE property of OLS, but it increases the standard errors and variance of the estimates.

Since there is a serious multicollinearity problem which high correlated between *ln*FKLCI and *ln*KLCI. Therefore, two models will be created to solve the multicollinearity problem.

Model 1:

$$\widehat{lnEXR_t} = \widehat{\beta_0} + \beta_1 \widehat{lnFKLI_t} + \beta_3 \widehat{ln\mathrm{GOLD}}_t + \beta_4 \widehat{ln\mathrm{WTI}}_t + \beta_5 \widehat{ln\mathrm{CPO}}_t \quad (4.1)$$

Model 2:

$$\widehat{lnEXR_t} = \widehat{\beta_0} + \beta_2 \widehat{ln\mathrm{KLCI}}_t + \beta_3 \widehat{ln\mathrm{GOLD}}_t + \beta_4 \widehat{ln\mathrm{WTI}}_t + \beta_5 \widehat{ln\mathrm{CPO}}_t \quad (4.2)$$

Where,

$\widehat{lnEXR_t} =$ In of exchange rate of USD against MYR at period t

$\widehat{In\mathrm{FKLI}}_t = In$ of FKLI at period t

$\widehat{ln\mathrm{KLCI}}_t = ln$ of KLCI at period t

$\widehat{ln\mathrm{GOLD}}_t = ln$ of gold price in MYR per troy ounce at period t

$\widehat{ln\mathrm{WTI}}_t = ln$ of crude oil price per barrel in MYR at period t

$\widehat{ln\mathrm{CPO}}_t = ln$ of crude palm oil price in MYR metric tonne at period t

Hypothesis Development (Revised)

FKLI and Exchange rate

According to Kim and Choi (n.d.), the researchers suggest that the stock index futures market tend to possesses a positive relationship with the exchange rate since the stock index futures has a high correlation as they fluctuate in the same way and the futures market leads spot market significantly. Min and Nanjand (1999); Pizzi, Economopoulous and O'neill (1998) and Zhong, Darrat and Otero (2004) also discovered the price discovery ability in the futures market.

H_{1a} = *There is a positive relationship between FKLI and exchange rate.*
(Model 1)

Notes: a refers to Model 1; b refers to Model 2.

KLCI and Exchange Rate

According to Aggarwal (1981), the researcher shows the positive relationship between exchange rates of US Dollar and the changes in the US stock prices. According to Najang and Seifert (1992), fluctuate of exchange rates are positively affected by the changes in stock prices by using Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models to test. According to Ma and Kao (1990), the researchers stated that a currency appreciation positively affects by domestic stock market for an import-dominant country on the macro level.

H_{2b} = *There is a positive relationship between KLCI and exchange rate.*
(Model 2)

Notes: a refers to Model 1; b refers to Model 2.

Gold Price and Exchange Rate

According to the research from Beckmann, Czudaja and Pilbeam (2015), there is a long-established relationship between gold prices and dollar depreciation is based on the lawof one price. Which means if gold is denominated in US dollar, while dollar is under depreciations when there is increasing in goldprices in order to eliminate arbitrage opportunities.

H_{3a} = There is a negative relationship between gold price and exchange rate. *(Model 1)*

H_{3b} =There is a negative relationship between gold price and exchange rate.

(Model 2)

Notes: a refers to Model 1; b refers to Model 2.

Crude Oil and Exchange Rate

Akram (2009); Wu et al. (2012); Nikbakht (2010) and Ferraro et al. (2012) discovered that there is a significant negative relationship between West Texas Intermediate (WTI) crude oil price and exchange rate. Crude oil prices had been valuable by the changes of the exchange rate at a nominal level and indicate that the exchange rates decline may lead by a significant negative influence on oil prices. Therefore, there is a negative relationship between crude oil price and exchange rate.

H_{4a}: There is negative relationship between West Texas Intermediate (WTI) oil prices and exchange rate. (Model 1)

H_{4b}: There is negative relationship between West Texas Intermediate (WTI) oil prices and exchange rate. (Model 2)

Notes: a refers to Model 1; b refers to Model 2.

Crude Palm Oil and Exchange Rate

According to Otieno et al. (2016), Harron, Shamsudin and Latif (2001), Ashfahany and Priyatna (2015), they did mentioned the price of crude palm oil increase leadings to increase the exchange rate. Based on the case in Columbia implies that there are positively related between price of country's main export, coffee and domestic currency (Edwards & Ahamed, 1986). It is similar with crude palm oil which considered as a main export in Malaysia. This indicated that the connection between the price of crude palm oil and exchange rate is positive.

H_{5a}: There is a positive relationship between crude palm oil price (CPO) and exchange rate. (Model 1)
H_{5b}: There is a positive relationship between crude palm oil price (CPO) and exchange rate. (Model 2)

Notes: a refers to Model 1; b refers to Model 2.

4.2.3 Heteroscedasticity

Heteroscedasticity problem occurs when the error terms are not constant or the spread are unequal in statistic.On the other hand, when heteroscedasticity problem occurs, the result of T-test statistic and F-test statistic values will unefficient. Thus, the P-value and the confidence interval for the independent variable will be inaccurate. The two main reasons leads to problem of heteroscedasticity occur are the nature of data collected and model specification errors. There are some solutions to detect heteroscedasticity problem, but this paper is using the Autoregressive Conditional Heteroscedasticity test (ARCH) to detect the heteroscedasticity problem.

4.2.3.1 Heteroscedasticity Test: ARCH

Table 4.4 Summary result of Heteroscedasticity Test: ARCH

	Model 1	Model 2
F-statistic	3.4611*	2.9039*
Obs. R-squared	3.3991	2.8714
Prob. Chi-Squared (1)	0.0652	0.0902

*Notes: ***, **,* indicates rejection null hypothesis at 1%, 5% and 10% levels of significance.*

Source: Developed for the research

By using the Autoregressive Conditional Heteroscedasticity (ARCH) test in Model 1 and Model 2, in the hypothesis testing, the null hypothesis will be rejected if p-value is less than 10% levels of significance. The result for both Model 1 and Model 2 show that the F-statistic (3.4611) and (2.9039) respectively which are significant at 10% levels of significance. Therefore, the null hypothesis is rejected for Model 1 and Model 2.Thus there is heteroscedasticity problem at 10% levels of significance. In order to solve the heteroscedasticity problem, White heteroscedasticity - consistent standard errors and covariance (Appendix 4.10 and 4.11) has been used to solve the problem in Model 1 and Model 2. Eventually it is consider that the heteroscedasticity problem is solved.

4.2.4 Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

In the diagnosis checking, the autocorrelation problem is typically happen in a time series data. Omission of significant independent variables, data manipulation or problems in the functional form will caused the econometric model to have autocorrelation problem. In this research paper, in order to detect the autocorrelation problem Breusch-Godfrey Serial Correlation LM Test is been used to detect the problem.

Table 4.5 Summary result of Breusch-Godfrey Serial Correlation LM Test

	Model 1	Model 2
F-statistic	31.9803***	31.4838***
Obs. R-squared	37.5528	37.2379
Prob. Chi-Squared (2)	0.0000	0.0000

*Notes: ***, **,* indicates rejection null hypothesis at 1%, 5% and 10% levels of significance.*

Source: Developed for the research

In the hypothesis for this test, the null hypothesis will be rejected if the p-value is less than 10% levels of significance. As the result showed in the Table 4.5, the F-statistic in Model 1 and Model 2 which are 31.9803 and 31.4838 respectively indicate there are significant at 1% levels of significance. The null hypothesis is rejected for Model 1 and Model 2. Thus, there is adequate evidence to conclude that is autocorrelation problem still exist. After the test run, this research has performed HAC standard errors and covariance (Bartlett kernel, Newey-West fixed bandwidth = 8.0000) test (refer to Appendix 4.12 and Appendix 4.13) to solve the autocorrelation problem.

4.2.5 Unit Root Test

Unit Root test is conducted to test on the stationary of dependent and independent variables. According to Brooks (2008), the data can lead to spurious regressions if the data used is non-stationary or presence of unit root. It is implies that the two variables are tending through the time; the regression of one on the other could have a high R^2 although they are unrelated. If the variables are not stationary in a regression model, then it has sufficient evidence to prove that the standard assumptions for asymptotic analysis will be invalid. Thus, the stationary data are preferable. There are various tests for stationary checking of unit root test such as Dickey-Fuller Test, testing the significance of more than one coefficient, Phillips Perron Test (PP) and Augmented Dickey-Fuller (ADF) test. The test is to identify the null hypothesis that series is non-stationary versus alternative which is the series is stationary (Brooks, 2008). He also stated that the null hypothesis is rejected if the test statistic is higher negative than the critical value.

In this research, the status of stationary for variables is tested by applying Augmented Dickey Fuller (ADF) Test and Phillips Perron (PP) Test.

H_0: *lnFKLI/ lnKLCI/ lnGOLD/ lnWTI/ lnCPO prices are non-stationary and presence of unit root.*

H_1: *lnFKLI/ lnKLCI/ lnGOLD/ lnWTI/ lnCPO prices are stationary or absence of unit root.*

Decision Rule: H_0 will be rejected, if the test statistic is more negative than critical value at 10% levels of significance. Otherwise, do not reject H_0. Table 4.1 and Table 4.2 summarize the results of ADF and PP test at10% levels of significance for each series.

4.2.5.1 Augmented Dickey-Fuller (ADF) Test

Table 4.6: Summary of Augmented Dickey-Fuller (ADF) test on variable

	Level		First Difference	
Variable	**Without Trend**	**With Trend**	**Without Trend**	**With Trend**
lnEXR	0.4859 (0)	0.3942 (0)	-7.7864 (0)***	-8.6827 (0)***
ln FKLI	-3.2575 (0) **	-1.2671 (0)	-7.1473 (0)***	-8.0530 (0)***
lnKLCI	-3.7552 (0) *	-1.7843 (0)	-7.5796 (0)***	-8.5871 (0)***
lnGOLD	-2.5679 (0)	-2.3706 (0)	-10.8128 (0)***	-10.8105 (0)***
lnWTI	-2.4639 (0)	-2.0723 (0)	-7.5824 (0)***	-7.9747 (0)***
lnCPO	-2.5215 (0)	-2.9508 (0)	-9.0741 (0)***	-9.3350 (0)***

*Note: ***,** & * indicates rejection of null hypothesis at 1%, 5% & 10% levels of significance. The figure in (...) represents the bandwidth for the ADF test is based on Schwarz Info Criterion (SIC).*

Source: Developed for the research

Level phases:

Intercept: Based on the Table 4.6, the test statistics for lnFKLI and lnKLCI are higher negative than critical value -2.5864 (refer to Appendix 4.16). The $H_0$for all variables will not be rejected except lnFKLI and lnKLCI. lnFKLI and lnKLCI are significant at 10% levels of significance. Thus, it has sufficient evidence to prove that every variable are not stationary except lnFKLI and lnKLCI.

Trend and Intercept: The H_0 for all variables will not be rejected at 10% of significance level. It is because the test statistics for all variables are less negative than critical value -3.1602 (refer to Appendix 4.17). Thus, it has enough evidence to conclude that all the variables are not stationary at 10% levels of significance.

First Difference:

Intercept: The H_0 for all variables are rejected at 10% levels of significance. The reason is the test statistics of each variable are more negative than critical value -2.5866 (refer to Appendix 4.40). Thus, it has enough evidence to conclude that all the variables are stationary 10% levels of significance.

Trend and Intercept: The H_0 for all variables are rejected at 10% levels of significance. Since, the test statistics of each variable are more negative than critical value -3.1606 (refer to Appendix 4.41). Therefore, it has sufficient evidence to conclude that all the variables are stationary 10% levels of significance.

4.2.5.2 Phillips Perron (PP) Test

Table 4.7 Summary of Phillips Perron (PP) test on variables

	Level		First Difference	
Variable	Without Trend	With Trend	Without Trend	With Trend
lnEXR	0.4859 (0)	1.3119 (6)	-7.7703 (2) ***	-8.8925 (5) ***
ln FKLI	-3.5517 (6) ***	-0.9629 (6)	-7.1436 (1) ***	-7.9603 (5) ***
lnKLCI	-4.2484 (6) ***	-1.6103 (6)	-7.6007 (2) ***	-8.5650 (4) ***
lnGOLD	-2.5094 (4)	-2.2244 (4)	-11.1467 (4) ***	-11.1975 (6) ***
lnWTI	-2.5620 (3)	-2.0115 (6)	-7.5229 (6) ***	-7.9857 (9) ***
lnCPO	-2.5879 (3)	-2.9289 (2)	-9.0751 (1) ***	-9.3350 (0) ***

*Note: ***, ** & * indicates rejection of null hypothesis at 1%, 5% & 10% of significant level. The figure in (...) represents the bandwidth for the PP test is based on Schwarz Info Criterion (SIC).*

Source: Developed for the research

Level phases:

Intercept: Based on Table 4.7, the test statistics for lnFKLI and lnKLCI are more negative than critical value -2.5864 (refer to Appendix 4.18). The $H_0$for all variables will not be rejected except lnFKLI and lnKLCI. lnFKLI and lnKLCI are significant at 10% levels of significance. Thus, there has adequate evidence to prove that all variables are not stationary except lnFKLI and lnKLCI.

Trend and intercept: H0 for all variables are not rejected at 10% levels of significance. It is because the test statistics of each variable is less negative than critical value -3.1602 (refer to Appendix 4.19). Therefore, it has adequate evidence to prove that all the variables are not stationary at 10% levels of significance.

First Difference:

Intercept: Based on Table 4.7, H_0 for all variables are rejected at 10% levels of significance. It is on account of the test statistic for each variable is more negative than critical value -2.5866 (refer to Appendix 4.42). Therefore, it has sufficient evidence to conclude that all the variables are stationary at 10% levels of significance.

Trend and Intercept: H_0 for all variables are rejected at 10% levels of significance. It is on account of the test statistic for each variable is more negative than critical value -3.1606 (refer to Appendix 4.43). Thus, it has sufficient evidence to judge that all the variables are stationary10% levels of significance.

Based on Table 4.6 and Table 4.7, the result of ADF and PP unit root test failed to reject $H_0$for all variables except lnFKLI and lnKLCI at 10% levels of significance in level. When proceeds to the first difference, the $H_0$for all variables from both ADF and PP results are being rejected. This is because the test statistics for each variable is more negative than critical value. Therefore, there has sufficient evidence to conclude that all the variable except lnFKLI and lnKLCI are not stationary or presence of unit root at 10% levels of significance in level. However, comes to first difference, it has enough evidence to prove that all the variables are stationary and absence of unit root at 10% levels of significance.

4.2.6 Model Specification Test: Ramsey RESET Test

This test is generally a specification test for the linear regression model. The purpose of this test is to detect the model specification errors in the linear equation. If the model is exclude specification errors stated is considered as a correctly specified model. Once the misspecification found, it may lead to different conclusions about the empirical relationships between the variables.

Table 4.8 Summary result of Model Specification Test: Ramsey RESET Test

	Model 1		**Model 2**	
	Value	**Probability**	**Value**	**Probability**
t-statistic	0.1770	0.8600	0.4137	0.6803
F-statistic	0.0313	0.8600	0.1712	0.6803

*Notes: ***, **,* indicates rejection null hypothesis at 1%, 5% and 10% levels of significance.*

Source: Developed for the research

The decision rule for this test is to reject the null hypothesis if the p-value is less than the 10% levels of significance. From the results that showed in Table 4.8, the t-statistic for Model 1and Model 2 are obviously more than the 10% which indicates it is insignificant at 10% levels of significance. Same goes to the F-statistic in Model 1 and Model 2 which are 0.0313 and 0.1712 respectively also insignificant at 10% levels of significance. Therefore, this paper does not reject the null hypothesis which represent there are no model specification errors in both models at 10% levels of significance.

A significant result has obtained in this research for each of the independent variable $\int ln(\text{FKLI}, \text{KLCI}, \text{GOLD}, \text{WTI and CPO})$ in describing the dependent variable (ln EXR) based on OLS model. Apart from that, if this research is success to pass the F-test statistic whereby the dependent variables can jointly explain the dependent variables. Fortunately, the models has passed all the diagnostic checking tests comprising normality test, heteroscedasticity test, autocorrelation test and model specification test. Thus, the result obtained is unbiased and reliable.

4.3 Ordinary Least Square (OLS) Model

Table 4.9 Regression results for Ordinary Least Square Model

Independent Variables	Dependent Variable: Exchange rate of MYR	
	Model includes FKLI	Model includes KLCI
	Model 1	Model 2
Constant	3.6411	3.6289
LNFKLI	0.0800* (0.0427)	--
LNKLCI	--	0.0880* (0.0444)
LNGOLD	-0.1402** (0.0622)	-0.1469** (0.0608)
LNWTI	-0.2073*** (0.0481)	-0.2102*** (0.0479)
LNCPO	-0.0911* (0.0491)	-0.0879* (0.0484)
R-squared	0.6610	0.6660
Adjusted R-squared	0.6432	0.6485
F-statistic	37.0549	37.8923

*Notes: 1. The reported results are adjusted for ordinary least square; 2. The asterisks ***, **, and * denotes significance at 1 percent ($p < 0.01$), 5 percent ($p < 0.05$), and 10 percent ($p < 0.1$) confidence levels, respectively; 3. Figures in parentheses are standard errors; 4. The time series data runs for seven years period, from years 2009 to 2015; 5. Number of observation of seven years = 81; 6. LNEXR = ln of exchange rate of USD against MYR; LNFKLI = ln of FKLI; LNKLCI = ln of KLCI; LNGOLD = ln of gold price in MYR per troy ounce; LNWTI = ln of crude oil price per barrel in MYR; LNCPO = ln of crude palm oil price per metric tonne in MYR.*

Source: Developed for the research

Table 4.10 Summary Result of Ordinary Least Square

Model 1 with FKLI			Model 2 with KLCI		
Hypothesis	**Actual**	**Result**	**Hypothesis**	**Actual**	**Result**
H1a: There is a positive relationship between FKLI and exchange rate.	Positive	Reject H_0	--	--	--
--	--	--	H_{2b}: There is a positive relationship between KLCI and exchange rate.	Positive	Reject H_0
H3a: There is a negative relationship between gold price and exchange rate.	Negative	Reject H_0	H_{3b}: There is a negative relationship between gold price and exchange rate.	Negative	Reject H_0
H4a: There is negative relationship between West Texas Intermediate (WTI) crude oil price and exchange rate.	Negative	Reject H_0	H_{4b}: There is negative relationship between West Texas Intermediate (WTI) crude oil price and exchange rate.	Negative	Reject H_0
H5a: There is a positive relationship between crude palm oil price (CPO) and exchange rate.	Negative	Do not reject H_0	H_{5b}: There is a positive relationship between crude palm oil price (CPO) and exchange rate.	Negative	Do not Reject H_0

Note: a refers to Model 1; b refers to Model 2.

Source: Developed for the research

Ordinary Least Square Model 1:

$$\widehat{lnEXR_t} = \widehat{\beta_0} + \beta_1\widehat{lnFKLI_t} + \beta_3\widehat{ln\text{GOLD}}_t + \beta_4\widehat{ln\text{WTI}}_t + \beta_5\widehat{ln\text{CPO}}_t \qquad (4.3)$$

$$\widehat{lnEXR_t} = 3.6411 + 0.0800\,\widehat{ln}\text{FKLI}_t - 0.1402\,\widehat{ln}\text{GOLD}_t - 0.2073\,\widehat{ln}\text{WTI}_t - 0.0911\,\widehat{ln}\text{CPO}_t \qquad (4.4)$$

Ordinary Least Square Model 2:

$$\widehat{lnEXR_t} = \widehat{\beta_0} + \beta_2\widehat{ln\text{KLCI}}_t + \beta_3\widehat{ln\text{GOLD}}_t + \beta_4\widehat{ln\text{WTI}}_t + \beta_5\widehat{ln\text{CPO}}_t \qquad (4.5)$$

$$\widehat{lnEXR_t} = 3.6289 + 0.0880\,\widehat{ln}\text{KLCI}_t - 0.1469\,\widehat{ln}\text{GOLD}_t - 0.2102\,\widehat{ln}\text{WTI}_t - 0.0879\,\widehat{ln}\text{CPO}_t \qquad (4.6)$$

Where,

$\widehat{lnEXR_t} =$ In of exchange rate of USD against MYR at period t

$\widehat{In\text{FKLI}}_t = In$ of FKLI at period t

$\widehat{ln\text{KLCI}}_t = ln$ of KLCI at period t

$\widehat{ln\text{GOLD}}_t = ln$ of gold price in MYR per troy ounce at period t

$\widehat{ln\text{WTI}}_t = ln$ of crude oil price per barrel in MYR at period t

$\widehat{ln\text{CPO}}_t = ln$ of crude palm oil price in MYR per metric tonne at period t

Referring to the Table 4.9 and equation 4.4 in the Model 1, the FKLI with coefficient of 0.0800 can be explained that appears to be positive and significant on the exchange rate of USD/MYR. This shows the FKLI has a parallel trend with the exchange rate of USD/MYR. Hence, hypothesis H_{1a} is being not rejected.

As the result shows in Table 4.9 and equation 4.6 in the Model 2, the KLCI is positive and significant towards the exchange rate of USD/MYR with coefficient of 0.0880. This indicates that increase 1 index point in KLCI will increase the value of RM0.0880 in exchange rate of USD/MYR. Therefore, the hypothesis H_{2b} is not rejected.

Meanwhile, the gold price (GOLD) in Model 1 and Model 2 show significant negative relationship with exchange rate of USD/MYR; with coefficient -0.1402 and -0.1469 respectively can be explained that RM 1 per troy ounce increase in the gold price, the exchange rate of USD/MYR will decrease by RM0.1402/US$ and RM 0.1469/US$ respectively. This shows that when the gold is increasing in its demand the exchange rate USD/MYR will get influenced and decreased. Thus, this research does not reject the hypothesis H_{3a} and H_{3b}.

On top of that, for the crude oil price (WTI) in Model 1 and Model 2 show there is significant negative relationship towards exchange rate of USD/MYR; with coefficient -0.2073 and -0.2102 respectively. This indicates that RM 1.00/US$ per barrel increase in crude oil price then there will be decrease RM 0.2073/US$ and RM 0.2102/US$ individually in exchange rate of USD/MYR. The existence of crude oil price has an impact on the exchange rate of USD/MYR. Hence, the hypothesis H_{4a} and H_{4b} are failed to be rejected in this research.

Whilst, the crude palm oil price (CPO) determines that is significant negative relationship with exchange rate of USD/MYR. The coefficient level with -0.0911 in Model 1 and -0.0879 in Model 2. This shows that if there RM 1.00/USD per metric tonne to be increase in the crude palm oil price will decrease the exchange rate of USD/MYR with RM 0.0911/US$ and RM 0.0879/US$ respectively. In short, the result of the crude palm oil price is significantly affect exchange rate of USD/MYR. Thus, the hypothesis H_{5a} and H_{5b} will be rejected in this research.

4.4 Determine Optimum Lag Length

Model 1 (FKLI)

Table 4.11 (Refer to Appendix 4.68)

Lag	Log L	LR	FPE	AIC	SC	HQ
0	301.0890	NA	2.06e-10	-8.112028	-7.955147	-8.049508
1	652.4220	644.9126*	2.71e-14*	-17.05266*	-16.11137*	-16.67754*
2	666.0622	23.16966	3.73e-14	-16.74143	-15.01574	-16.05371
3	679.2597	20.60974	5.29e-14	-16.41807	-13.90798	-15.41776
4	697.7165	26.29465	6.63e-14	-16.23881	-12.94431	-14.92590
5	719.4839	28.02917	7.84e-14	-16.15024	-12.07134	-14.52473
6	746.0477	30.56661	8.51e-14	-16.19309	-11.32978	-14.25498
7	768.2387	22.49499	1.10e-13	-16.11613	-10.46842	-13.86542
8	794.0578	22.63592	1.41e-13	-16.13857	-9.706457	-13.57526

*Notes: * indicates lag order selected by the criterion*

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SIC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Based on Table 4.11, the optimum lag length of one is selected based on the result given by Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC). Since the SIC and AIC provided a lowest lag length. Therefore, the highest degree of freedom can be maintained in the model.

The regression model will be as below:

$$Y_{t-1} = \alpha + \beta_1 X_{1t-1} + \beta_2 X_{2t-1} + \beta_3 X_{3t-1} + \beta_4 X_{4t-1} + \varepsilon_t$$

X_{1t-1} = Lagged value for FKLI

X_{2t-1} = Lagged value for GOLD

X_{3t-1} = Lagged value for WTI

X_{4t-1} = Lagged value for CPO

Model 2 (KLCI)

Table 4.12 (Refer to Appendix 4.69)

Lag	Log L	LR	FPE	AIC	SC	HQ
0	301.6505	NA	2.03e-10	-8.127410	-7.970529	-8.064890
1	658.3019	654.6753*	2.30e-14*	-17.21375*	-16.27247*	-16.83863*
2	673.4081	25.65984	3.05e-14	-16.94269	-15.21700	-16.25497
3	684.8583	17.88105	4.53e-14	-16.57146	-14.06137	-15.57114
4	702.6747	25.38237	5.79e-14	-16.37465	-13.08015	-15.06174
5	725.4762	29.36076	6.66e-14	-16.31442	-12.23552	-14.68890
6	751.4268	29.86102	7.34e-14	-16.34046	-11.47716	-14.40235
7	773.1519	22.02268	9.65e-14	-16.25074	-10.60303	-14.00003
8	800.1124	23.63659	1.19e-13	-16.30445	-9.872337	-13.74114

*Notes: * indicates lag order selected by the criterion*

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SIC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Based on Table 4.12, the optimum lag length of one is selected from the result given by Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC). Since the SIC and AIC provided a lowest lag length. Thus, the highest degree of freedom can be retained in the model.

The regression model will be as below:

$Y_{t-1} = \alpha + \beta_1 X_{1t-1} + \beta_2 X_{2t-1} + \beta_3 X_{3t-1} + \beta_4 X_{4t-1} + \varepsilon_t$

X_{1t-1} = Lagged value for KLCI

X_{2t-1} = Lagged value for GOLD

X_{3t-1} = Lagged value for WTI

X_{4t-1} = Lagged value for CPO

4.5 Johansen-Juselius (JJ) Cointegration Test

The data analysis carries on to Johansen-Juselius (JJ) Cointegration Test with the optimum lag length based on Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC). Cointegration test is to identify whether there is long run effect between time series data or not (Johansen & Juselius, 2009).

Model 1 (FKLI)

Table 4.13 (Refer to Appendix 4.70)

Hypothesized No. of CE(s)	Trace			Max-Eigen		
	Statistic	Critical value (5%)	p-value	Statistic	Critical value (5%)	p-value
r = 0	63.4753	69.8189	0.1444	26.9808	33.8769	0.2644
r ≤ 1	36.4945	47.8561	0.3718	19.1183	27.5843	0.4054
r ≤ 2	17.3762	29.7971	0.6122	10.7949	21.1316	0.6678
r ≤ 3	6.5813	15.4947	0.6268	6.2845	14.2646	0.5570
r ≤ 4	0.2968	3.8415	0.5859	0.2968	3.8415	0.5859

*Note:*denotes significant at 5% significant level.*

H_0: There is no long run relationship between the variables.
H_1: There is long run relationship between the variables.

Decision rule: Reject H_0 if probability value less than significant level. Otherwise do not reject H_0.

Conclusion: Do not reject H_0 since the probability value for Trace statistic and Max-Eigen is higher than α =0.05. Hence, the variables are not co-integrated which implies that there is no long run relationship between the variables.

Model 2 (KLCI)

Table 4.14 (Refer to Appendix 4.71)

Hypothesized No. of CE(s)	Trace			Max-Eigen		
	Statistic	Critical value (5%)	p-value	Statistic	Critical value (5%)	p-value
r = 0	65.4905	69.8189	0.1055	28.4122	33.8769	0.1951
r ≤ 1	37.0783	47.8561	0.3438	19.4423	27.5843	0.3811
r ≤ 2	17.6360	29.7971	0.5930	10.6873	21.1316	0.6784
r ≤ 3	6.9488	15.4947	0.5836	6.3228	14.2646	0.5721
r ≤ 4	0.6259	3.8415	0.4289	0.6259	3.8415	0.4289

*Note:*denotes significant at 5% significant level.*

H_0: There is no long run relationship between the variables.

H_1: There is long run relationship between the variables.

Decision rule: Reject H_0 if probability value less than significant level. Otherwise do not reject H_0.

Conclusion: Do not reject H_0 since the probability value for Trace statistic and Max-Eigen is higher than α =0.05. Hence, the variables are not co-integrated which implies that there is no long run relationship between the variables.

For Model 1 and Model 2, the results showed that do not reject null hypothesis. The results can conclude that there is no long run relationship between the exchange rate and gold, WTI, CPO and FKLI (Model 1) or KLCI (Model 2). Unfortunately, the results are different with the previous studies which also had determined the long run relationship between exchange rate and FKLI, KLCI, gold, WTI and CPO. According to Aliyu (2009), a rise in crude oil price will cause the gross domestic product (GDP) to increase and eventually leads to an appreciation of exchange rate in the long run. Moreover, Chen and Chen (2007) showed that an increase in oil prices will lead to an appreciation of the exchange rates in long run. Furthermore, Bashar and Kabir (2013) have confirmed that the exchange rate is influenced by the commodity prices in long run.

On the other hand, there are some studies consistent with the results where there is no long run relationship between the variables. According to Solnik (1987) and Ozair (2006), they proved that there is no evidence could be found to show that there is a relationship between stock prices and exchange rates in the long run.

4.6 Granger Causality Test

Table 4.15: Results of Granger Causality Test for Model 1

Variable X	Variable Y	Significance Level, α	P-value	Decision	Conclusion
lnFKLI	lnEXR	0.10	0.0764	Reject H_0.	Granger cause.
lnEXR	lnFKLI	0.10	0.5768	Do not reject H_0.	No granger cause.
lnKLCI	lnEXR	0.10	0.0819	Reject H_0.	Granger cause.
lnEXR	lnKLCI	0.10	0.7595	Do not reject H_0.	No granger cause.
lnGOLD	lnEXR	0.10	0.6075	Do not reject H_0.	No granger cause.
lnEXR	lnGOLD	0.10	0.2803	Do not reject H_0.	No granger cause.
lnWTI	lnEXR	0.10	0.1769	Do not reject H_0.	No granger cause.
lnEXR	lnWTI	0.10	0.2974	Do not reject H_0.	No granger cause.
lnCPO	lnEXR	0.10	0.0444	Reject H_0.	Granger cause.
lnEXR	lnCPO	0.10	0.3445	Do not reject H_0.	No granger cause.
lnKLCI	lnFKLI	0.10	0.4510	Do not reject H_0.	No granger cause.
lnFKLI	lnKLCI	0.10	0.8238	Do not reject H_0.	No granger cause.

lnGOLD	lnFKLI	0.10	0.5877	Do not reject H_0.	No granger cause.
lnFKLI	lnGOLD	0.10	0.4551	Do not reject H_0.	No granger cause.
lnWTI	lnFKLI	0.10	0.1116	Do not reject H_0.	No granger cause.
lnFKLI	lnWTI	0.10	0.2289	Do not reject H_0.	No granger cause.
lnCPO	lnFKLI	0.10	0.4747	Do not reject H_0.	No granger cause.
lnFKLI	lnCPO	0.10	0.0614	Reject H_0.	Granger cause.
lnGOLD	lnKLCI	0.10	0.7289	Do not reject H_0.	No granger cause.
lnKLCI	lnGOLD	0.10	0.4566	Do not reject H_0.	No granger cause.
lnWTI	lnKLCI	0.10	0.1978	Do not reject H_0.	No granger cause.
lnKLCI	lnWTI	0.10	0.2479	Do not reject H_0.	No granger cause.
lnCPO	lnKLCI	0.10	0.6719	Do not reject H_0.	No granger cause.
lnKLCI	lnCPO	0.10	0.0594	Reject H_0.	Granger cause.
lnWTI	lnGOLD	0.10	0.6839	Do not reject H_0.	No granger cause.
lnGOLD	lnWTI	0.10	0.8983	Do not reject H_0.	No granger cause.
lnCPO	lnGOLD	0.10	0.3587	Do not reject H_0.	No granger cause.
lnGOLD	lnCPO	0.10	0.5252	Do not reject H_0.	No granger cause.
lnCPO	lnWTI	0.10	0.1686	Do not reject H_0.	No granger cause.
lnWTI	lnCPO	0.10	0.6867	Do not reject H_0.	No granger cause.

Figure 4.1 Causality relationships among lnFKLI, lnKLCI, lnCPO and lnEXR

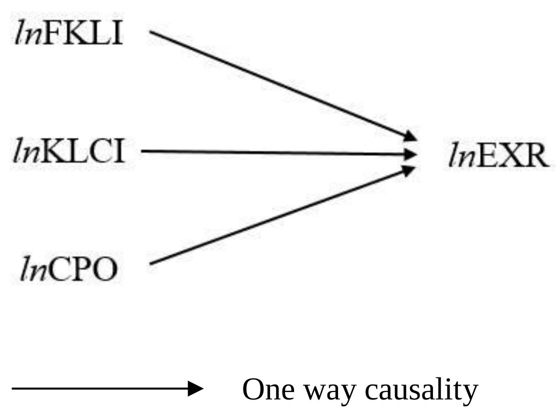


Figure 4.2 Causality relationships among lnFKLI, lnKLCI and lnCPO

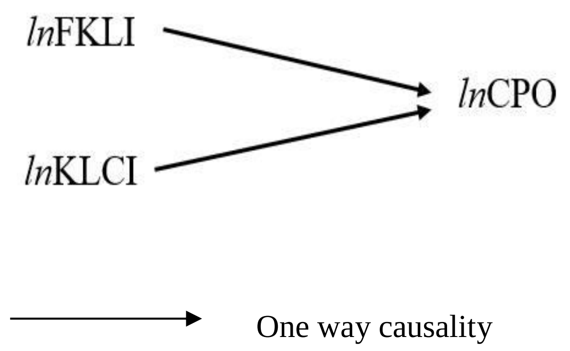


Table 4.7 showed the result of Granger Causality for the research models in this paper. lnEXR are granger caused by lnFKLI, lnKLCI and lnCPO individually as per Figure 4.1 As the result, there is only one way granger causality presented from lnFKLI on lnEXR which is similar with the findings of Kim and Choi (n.d.) where stock futures market might lead the foreign exchange market with certain level of relationship.

There is a unilateral relationship from lnKLCI granger causes the lnEXR. Surprisingly, it has contrasted with the findings of Sevuktekin and Nargelecekenler (2007) whereby the researchers declared that there is bidirectional causality between the stock prices and exchange rates in Turkey for the period 1986 to 2006. Meanwhile, it only exists one way granger causality from lnCPO on lnEXR at 10% level of significance. This result is parallel to Edward and Ahamed (1986) which also supported the finding where the commodity export prices tend to unigranger the exchange rate. This is further supported by Ashfahany and Priyatna (2015) where the price of crude palm oil could affect the Rupiah and Ringgit. Whilst according to Figure 4.2, there is also a link where both lnFKLI and lnKLCI granger causes lnCPO. This finding can be backed by Rossi (2012) where the author found that a country's domestic equity market has a significant predictive ability for the future global commodity price index.

4.8 Conclusion

As a conclusion, this chapter provides the descriptive analysis on variables, diagnostic checking and inferential analysis. All the empirical results have been acquired through E-views 9. In addition, all the analysis and interpretation are being well delivered for each empirical result. Next chapter will be proceeded to summarize the whole research.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

This research is focused on the relationship between exchange rate and gold price, WTI price, crude palm oil price, FKLI or KLCI. In preceding chapters, this paper had conducted an assortment of methodologies to examine the data for this research. The first part will be focusing on the outline of statistical analysis in chapter 4 with further explanations. The second section will discuss the major findings which the results are persistent with antecedent studies. Next section is discussing the implications of study which outline some recommendations to the government. In addition, limitations and recommendations of this study will be presented for the future research. Lastly, this chapter will be end up by conclusion of summarize on this research.

5.1 Summary of Statistical Analysis

This section is discussing the outcome of all empirical tests with some given summary tables. The results summarized are consists of diagnostic checking, OLS, unit root test, Johansen-Juselius Co-integration Test and Granger Causality Test.

Table 5.1 Summary of Diagnostic Checking

Problems of Econometric	**Results**
Normally Distribution	Error term is normally distributed.
Multicollinearity	The model has no serious multicollinearity.
Heteroscedasticity	The model has no heteroscedasticity.
Autocorrelation	The model has no autocorrelation.
Unit Root Test	The data series for each variable are stationary.
Model Specification Error	No model specification error.

Table 5.1 indicates the summary of diagnostic checking in this study. Based on results, it shows that both models are considered correctly specified and error terms are normally distributed. Both econometric models demonstrate that there has no perfect multicollinearity problems, autocorrelation problems and heteroscedasticity problem at 10% levels of significance. The results for all series variables are stationary. According to Gujarati (2009), the results are fulfilling the assumptions of classical linear regression model (CLRM). Furthermore, the econometric models of this study are considered as Best Linear Unbiased Estimators (BLUE) and imply that all hypothesis carried are valid.

Table 5.2: Summary of OLS Regression and Consistency Journals

T - Test			
Variables	**Result**	**Consistency**	**Inconsistency**
lnFKLI	Positive significant at 10% levels of significance	-	-
lnKLCI	Positive significant at 10% levels of significance	Aggarwal (1981) Najang and Seifert (1992) Sevuktekin and Nargelecekenler (2007)	Franck and Young (1972) Frenkel (1976) Ajayi and Mougoue (1996) Soenen and Hennigar (1988)

		Ajayi and Mougoue (1996)	
lnGOLD	Negative significant at 5% levels of significance	Beckmann, Czudaj and Pilbeam (2015) O'Connor and Lucey (2012)	Yang and Hamor (2014)
lnWTI	Negative significant at 1% levels of significance	Zhang, Fan, Tsai and Wei (2008) Brahmasrene, Huang and Sissoko (2014) Akram (2009) Turhan, Hacihasanoglu and Soytas (2012) Brayek, Sebai and Naoui (2015) Cifarelli and Paladino (2010) Wu, Chung and Chang (2012)	Bergvall (2004) Chen and Chen (2007) Huang and Guo (2007) Lizardo and Mollick (2010) Amano and Van Norden (1998) Bénassy-Quéré et al., (2007) Narayan, Narayan and Prasad (2008) Nikbakht (2010)
lnCPO	Negative significant at 10% levels of significance	Ashfahany and Priyatna (2015) Edwards and Ahamed (1986)	-

Table 5.2 indicates the relationship between exchange rate and FKLI/ KLCI, Gold, WTI and CPO. Based on the results, KLCI is individually positive related with exchange rate which in line with the studies of Aggarwal (1981); Najang and Seifert (1992); Sevuktekin and Nargelecekenler (2007); Ajayi and Mougoue, (1996). Gold prices tend to have inverse relationship with exchange rate that has been proved by Beckmann, Czudaj and Pilbeam (2015); O'Connor and Lucey (2012). In addition,

Zhang, Fan, Tsai and Wei (2008); Brahmasrene, Huang and Sissoko (2014); Akram (2009); Turhan, Hacihasanoglu and Soytas (2012); Brayek, Sebai and Naoui (2015) are found that the WTI is negatively affect the exchange rate which can prove the result of OLS test in this research. The result of CPO and exchange rate are significant negative relationship. This outcome is supported by studies from Ashfahany and Priyatna (2015) and Edwards and Ahamed (1986) who found CPO is positive related with exchange rate in denominated countries.

Table 5.3: Summary of Johansen Co-integration Test and Consistency Journals

Johansen Co-integration Test				
Dependent Variables	**Independent Variables**	**Results**	**Consistency**	**Inconsistency**
lnExr	lnFKLI	No long-Run relationship	-	Wong et al. (2012) Unlu and Ersoy (2012)
lnExr	lnKLCI	No long-Run relationship	Nieh and Lee (2001) Morley (2002) Mishra (2004) Ibrahim (2000) Ibrahim and Aziz (2003) Bahmani-Oskooe and Sohrabian (1992) Granger, Huang and Yang (2000) Smyth and Nadha (2003)	Bhunia and Pakira (2014) Yau and Nieh (2009)

			Kollias, Mylonidis and Paleologou (2010) Solnik (1987); Ozair (2006) Li and Huang (2008) Zhao (2010).	
lnExr	lnGOLD	No long-Run relationship	Sujit and Kumar (2011)	Bénassy-Quéré et al. (2007) Srinivasan and Karthigai (2014) Eric and Robert (2006)
lnExr	lnWTI	No long-Run relationship	Mukhriz (2009)	Chen and Chen (2007) Aliyu (2009) Oriavwote and Eriemo (2012).
lnExr	lnCPO	No long-Run relationship	-	Sidek, Yusoff, Ghani and Duasa (2011)

Following is the Johansen co-integration test, there has no long run relationship between exchange rate and FKLI/KLCI, Gold prices, WTI prices and CPO prices. Result shows exchange rate and FKLI has no long term relationship. It is contradict with the studies of Unlu and Ersoy (2012) and Wong et al. (2012) who found they are long run related. Furthermore, Nieh and Lee (2001); Morley (2002); Mishra (2004); Ibrahim (2000); Ibrahim and Aziz (2003) found that there has no long run relationship between exchange rate and KLCI. Gold prices are not cointegrated with exchange rate, this result is consistent with research from Sujit and Kumar (2011). In addition, the result of co-integration test has found there has no long run relationship between WTI and exchange rate which can be proved by Mukhriz (2009). Lastly, the outcome for the exchange rate and CPO are not aligning with study of Sidek, Yusoff, Ghani, and Duasa (2011).

Table 5.4: Summary of Granger Causality Test and Consistency Journals

Granger Causality Test				
Variables		**Results**	**Consistency**	**Inconsistency**
lnExr	lnFKLI	No granger cause.	-	Takvor (2010)
lnExr	lnKLCI	No granger cause.	Ibrahim (2000) Chen, Agrusa, Krumwiede and Lu (2012) Lean, Narayan and Smyth (2011)	Ramasamy and Yeung (2002) Lee and Yang (2012) Pan, Fok and Liu (2007)
lnExr	lnGOLD	No granger cause.	-	Meese and Rogoff (1983) Engel and West (2005) Cheung, Chinn and Pascual (2005) Rogoff and Stavrakeva (2008) Chen, Rogoff and Rossi (2010) Rossi (2013)

lnExr	lnWTI	No granger cause.	-	Meese and Rogoff (1983) Engel and West (2005) Cheung, Chinn and Pascual (2005) Rogoff and Stavrakeva (2008) Chen, Rogoff and Rossi (2010) Rossi (2013)
lnExr	lnCPO	No granger cause.	-	Meese and Rogoff (1983) Engel and West (2005) Cheung, Chinn and Pascual (2005) Rogoff and Stavrakeva (2008) Chen, Rogoff and Rossi (2010) Rossi (2013)
lnFKLI	lnExr	Granger cause.	Takvor (2010) Chan, Chan and Karolyi (1991)	-

			Lee and Linn (1994) Crain and Lee (1999)	
lnKLCI	lnExr	Granger cause.	Hatemi-J and Irandoust (2002) Badhani, Chhimwal and Suyal (2009) Agrawal, Srivasta and Srivasta (2010) Govind and Dash (2012)	Chen, Agrusa, Krumwiede and Lu (2012) Lean, Narayan and Smyth (2011)
lnGOLD	lnExr	No granger cause.	-	Chen and Rogoff (2003) Chen (2004)
lnWTI	lnExr	No granger cause.	-	Chen and Rogoff (2003) Chen (2004)
lnCPO	lnExr	Granger cause.	Chen and Rogoff (2003) Chen (2004)	-

Based on the results of Granger causality test, it shows that exchange rate not likely to granger cause all independent variables. These results are on par with the research of Takvor (2010); Ramasamy and Yeung (2002); Meese and Rogoff (1983); Engel and West (2005) and Cheung, Chinn and Pascual (2005). This paper found that gold and WTI do not granger cause exchange rate which is opposite with studies of Chen and Rogoff (2003) and Chen (2004). Nonetheless, the causality relationship exists from FKLI, KLCI and CPO to exchange rate. This result can be proved by research from Takvor (2010); Chan, Chan, and Karolyi (1991); Hatemi-J and

Irandoust (2002); Badhani, Chhimwal, and Suyal (2009) and Chen and Rogoff (2003).

Table 5.5 Consistency of Result with Theories Reviewed

Relevant Theoretical Model				
	Purchasing Power Parity (PPP)	**Efficient Market Hypothesis (EMH)**	**The Gold Price: A Global Required Theory**	**Discounted Cash Flow model**
FKLI	-	Consistent	-	-
KLCI	-	Consistent	-	-
GOLD	-	-	Consistent	-
WTI	Consistent	-	-	Consistent
CPO	-	Consistent	-	-

The functions of PPP theory can be explain in all variables except FKLI and KLCI. It is support by several studies which includes Alba and Papell (2005); Krugman and Obstfeld (2009); Mémoire (2013) and Diebold, Husted & Rush (1991). Theory of EMH can be applied in all variables. The results are consistent with studies of Waud (1970); Scholes (1969); Fama (1970); Roll (1972) and Danthine (1977). According to research of Ghosh, Levin, McMillan, and Wright (2002); and Faugere and Erlach (2005), their studies are proved that Global Required Theory can be used in gold prices. Several studies had found that the discounted cash flow can be applied in exchange rate, FKLI, KLCI and WTI which are Basher et al. (2012) and Kvalevåg (2009).

5.2 Major Findings

5.2.1 FKLI

This study found that FKLI is positive and significant in explaining exchange rate. This is parallel with the finding of Kim and Choi (n.d.) where the authors implied that futures price has a strong explanatory power in forecasting one nation's currency exchange rate. Stock index futures market's price discovery function enables them to have a significant effect on foreign exchange market. Stock index spot and futures market became a sound variable in explaining the exchange rate by receiving foreign investment (Park, 1999). Kim and Choi (n.d.) further supported the results which stating that the authorities could curb imminent shock and stabilize the foreign exchange market with appropriate measures if a drastic change in stock index futures market is observed. In short, this is conclusive to imply that FKLI is a significant in explaining the exchange rate.

FKLI found out to have a positive relationship with the exchange rate of Malaysian Ringgit. This implied that an increment in the FKLI will lead to an appreciation in the value of Ringgit Malaysia. To add, Smith (1992) also found a significant positive relationship between stock prices and exchange rates. Smith (1992) study's findings sided with Solnik (1987) and Aggarwal (1981), in which they found that exchange rate is positively affected by the stock market. As stock index futures are future contracts on a particular stock index, both the stock index futures and stock index will share the same movement (Product services and properties of FKLI, 2015).

By performing Johansen-Juselius Co-integration test, this paper fails to detect long run relationship between FKLI and exchange rate of Malaysia's currency. Nonetheless, Wong et al. (2012) and Unlu and Ersoy (2012) did not face the same problem and obtained a long run relationship between the variables mentioned earlier by using evidence from Turkish Lira/United States Dollar.

Moreover, this research found that FKLI granger causes the exchange rate of USD/MYR in a unilateral causality relationship. It is determined that stock index futures market has an influence on exchange rate. This result is agreed with the study of Takvor (2010) where stock futures is likely to granger cause one nation’s currency. The reason behind is when Malaysia stock market are well performed, either local or foreign funds tend to invest more funds which boost the demand and value of Ringgit Malaysia. With that, the value of Ringgit Malaysia will soar up due to an increasing demand of the currency. Malaysia as a rapid growing country fuelled by the export diversification and increasing foreign and domestic investment (International Monetary Fund, 2006), a massive inflow of capital had led the Kuala Lumpur Composite Index to trade above 1,300 level in year 1994. With such macroeconomic environment, Kim and Choi (n.d.) suggested that the linkage between both domestic spot and futures market and foreign exchange market will be further enhanced.

By referring to the result in this research, the stock price information is explainable in the movement of exchange rate. According to Efficient Market Hypothesis, asset prices in the market should reflect all of the new information merged in market activities and security prices with analysis of present and past data where investors are unable to over perform the market since prediction of future to avoid risk is not applicable (Naseer & Tariq, 2015). This is accordant with the findings of Beechey, Gruen and Vickery (2000) where the EMH is the ultimate and strongest theory in explaining in asset price information in using stock and foreign exchange markets.

5.2.2 KLCI

Referring to the Table 5.2, the result shows that the KLCI has a positive and significant relationship with exchange rate (USD/MYR). The result is consistent with some previous researches which mean that the stock price and exchange rate have a significant relationship (Nieh & Lee, 2001; Morley, 2002; Mishra, 2004). Unfortunately, there is some researchers show that their results are inconsistent with this research. According to Franck and Young (1972), it states that there is no significant relationship between stock price and exchange rate.

Furthermore, Table 5.2 showed that the KLCI has a positive relationship with exchange rate (USD/MYR). This result is consistent with some researchers such as Aggarwal (1981); Najang and Seifert (1992); Ajayi and Mougoue (1996); and Sevuktekin and Nargelecekenler (2007). The boosting of KLCI attracts more investors to invest, thus the demand for the Malaysian Ringgit and domestic assets increase. When the demand for a specified currency increase, the value of the currency will appreciate, hence the value of Malaysian Ringgit appreciates. This shows a positive relationship between the KLCI and the values of Malaysian Ringgit.

Moreover, this research proceeds to Johansen co-integration test to determine whether there is a long run relationship between exchange rate (USD/MYR) and KLCI. The result shows that the exchange rate and KLCI are not co-integrated which mean that there is no long run relationship between exchange rate (USD/MYR) and KLCI. The result of this study is consistent with Nieh and Lee (2001); Morley (2002); Mishra (2004); Ibrahim (2000), Ibrahim and Aziz (2003); and Bahmani-Oskooe and Sohrabian (1992) in which the exchange rate does not has long run relationship with the stock market. On the other hand, there are some researchers showed the different result from this research in which the exchange rate has the long run relationship with stock market performance such as Bhunia and Pakira (2014); and Yau and Nieh (2009).

Furthermore, this research proceeds to Granger causality test to determine the causality effect between the exchange rate and KLCI. The result shows that the KLCI is unilateral cause effect to exchange rate. This result is parallel with Hatemi-J and Irandoust (2002); Badhani, Chhimwal, and Suyal (2009); Agrawal, Srivasta, and Srivasta (2010); and Govind and Dash (2012). This is because when KLCI performs well, it will attract foreign investor to invest in Malaysia stock market; hence, the demand for Malaysian Ringgit will increase, the value of the currency will appreciate and vice versa.

By referring to the result in this research, the stock price information is explainable in the movement of exchange rate. According to Efficient Market Hypothesis, asset prices in the market should reflect all of the new information merged in market activities and security prices with analysis of present and past data where investors are unable to overperform the market since prediction of future to avoid risk is not applicable (Naseer & Tariq, 2015). This is accordant with the findings of Beechey, Gruen and Vickery (2000) where the EMH is the ultimate and strongest theory in explaining in asset price information in using stock and foreign exchange markets.

5.2.3 Gold Price

Through this research, gold price is negative and significant in explaining the exchange rate USD/MYR. This indicates that gold price have relationship or impact on the exchange rate. This result is consistent with Beckmann, Czudaj and Pilbeam (2015); O'Connor and Lucey (2012); and Omag (2012) results. Therefore, the current changes in gold prices and exchange rates in developed and developing countries, gold is to been used as an alternative investments compared to other securities in investments field. In addition, gold is considered one of the commodity that under investment instrument which could protect investors from particular risks (Omag, 2012). In meantime, the major reason behind the relationship of gold and exchange rate is that gold can be used as a hedge against the adverse exchange value of US dollar as suggested by Nair, Choudhary and Purohit (2015). Gold is often considered as a reliable investment avenue for long-term savings or investment portfolio and investors always seek for any protection to their investment, and gold has acted as a reliable asset (Srinivasan & Karthigai, 2014).

On the other hand, gold price presents a negative impact on the exchange rate. According to Omag (2012) research's result, gold prices and particular currencies that including dollar have an inverse relationship in explained by the law of one price. In meantime, The World Gold Council has announced that there is strong negative correlation between a chosen country dollar exchange rate and dollar gold price that proved by weekly data on gold price and some individual country currencies in Europe from 1971 to 2002 (Raja, 2008).This also indicates that if US dollar's exchange value decreases, it take more US dollars to buy gold, which the gold's value has been increased (Nair, Choudhary & Purohit, 2015).

Moreover, Johansen-Juselius Co-integration test (JJ test) is to investigate the long run relationship between the dependent variable and the selected independent variable which are the exchange rate of USD/MYR and gold price respectively. After the test has been run through in this research, the result is parallel with Sujit and Kumar (2011); and Sinton (2014). Further explain in Jakarta, gold price and U.S Dollar exchange rate do not exists a long term association between these two variables said by Sinton (2014).On the contrary, JJ test mainly determined out the result there are more long run relationship between gold price and exchange rate in this research which are consistent with Bénassy-Quéré et al. (2007); Srinivasan and Karthigai (2014); and Eric and Robert (2006). This indicates that, there are possibilities of limitation for JJ Test in the gold price towards the exchange rate in this research.

Moreover, Granger Causality test was conducted to inspect the lead lag relation between the exchange rate of USD/MYR and gold price. The result from this research shown gold does not granger cause the exchange rate of USD/MYR and vice versa. This is inconsistent with the findings of Hsiao, Liang and Ming (2013) that there is unidirectional causality relationship. This indicates that gold price and exchange rate remain considerably independent from one another in short period. In addition, the increasing gold price will cause the exchange rate of USD/MYR to decrease. However, it indicates that, gold price only has impact towards the US Dollar, due to the safe heaven characteristics of gold price against the US Dollar (Yang & Hamori, 2014). In other words, at one instance, a weaker gold price implied a strong US Dollar. Thus, the movement of USD/MYR fluctuates in the market. Nevertheless, the original value of Malaysian Ringgit might not affect by the gold price movement, this is because the value of Malaysian Ringgit remain constant in other currency pair. For example there is a huge change in the gold price in 2011, from 1882.96 to 1623.79 per ounce USD or 13.76% in date of 2nd of September to 30th of September (refer to Appendix 5.1) (Bloomberg Business Platform, n.d.). In contrary, SGD/MYR has a change in 1.25% only from 2nd of September to 30th of September (refer to Appendix 5.2) (Investing.com, 2016). In the end, it is convincing to imply that there is no granger causality between the gold price and the value of Malaysian Ringgit.

On the other hand, results that indicated by Granger Causality test are mainly showing there are granger cause between the exchange rate of USD/MYR to gold price and vice versa which are inconsistency with Meese and Rogoff (1983); Engel and West (2005); Cheung, Chinn and Pascual (2005); Rogoff and Stavrakeva (2008); Chen, Rogoff and Rossi (2010); and Rossi (2013) for exchange rate to gold price and Chen and Rogoff (2003); and Chen (2004) for the gold price to the exchange rate. From the finding of this research, the results implied that the exchange rate of USD/MYR and gold price are causality between each other, due to gold is an alternative investment mechanism during the period of negative market in the exchange rate of USD/MYR in this country. Investors tend to disinvest into exchange rate of USD/MYR due to decline in the value and reinvest into the gold market.

Likewise, the finding of this research is consistent with the Required Yield Theory (RYT) that developed by Faugere (2005) to evaluate gold and discover its return. This theory determines that once the price of gold is directly influenced by the expected yield, it makes the changes in exchange rate movement. Therefore, if the investors tend to invest into alternative investment when the exchange rate of USD/MYR is declined in the market, gold is the one of the safe heaven investment to invest in and hedge the risk compared to other investment (Yang & Hamori, 2014).

5.2.4 Crude oil price

Theoretical framework that developed by Golub (1983) (as cited in Basher, Haug, & Sadorsky, 2012), there is a relationship between crude oil prices (WTI) and exchange rate volatility spread under the circumstance that oil is quoted in USD. Therefore, the fluctuations of the oil prices may influence the exchange rate behavior of the trading countries through USD (Salisu & Mobolaji, 2013).

Majority of the existing researches (Wu, Chung & Chang, 2012; Dawson, 2007; Selmi, Bouoiyour & Ayachi, 2012; Ghosh, 2011) pointed out that there is a significant negative relationship between crude oil prices and exchange rate is consistent with the result of this study which is match with the result. The result shows that an increase in oil prices will lead to a depreciation of the exchange rates. Several factors are explainable in the deprecation of Ringgit Malaysia. Crude oil is one of important exports in Malaysia; a decrease of crude oil prices is affecting the exchange rate of USD against MYR. Crude oil prices fall due to high production of oil and oversupplied situation exist. According to Tang (2015), cheap crude oil prices not a win-win situation for Asian countries. The report stated that a low the crude oil prices will have a negative impact on Malaysia's fiscal balance and trade. Hence, a decrease of crude oil prices will influence an appreciation of exchange rate of USD against MYR.

Johansen Co-integration Test used in this research to indicate relationship between crude oil prices and exchange rate in the long-run. The research by Ghosh (2011) using daily data from year 2007 to 2008 shows that there is negative correlation between oil prices and currency. On top of that, Mukhriz (2009) comment that Pedroni (1998) failed to find an evidence to proof that there is no long-run relationship between crude oil prices and exchange rate in the research.

Moreover, Granger Causality test was carried to determine the causality relation between the exchange rate USD/MYR and crude oil prices. The finding from this research, there is no causality relation between crude oil prices and exchange rate which is consistent with Osuji (2015). Ozturk, Feridun, and Kalyoncu (2008)'s result performed that crude oil prices does not granger cause to exchange rate. Conversely, the result shows that the exchange rate causality by crude oil prices which is inconsistency with the research of this study (Meese & Rogoff, 1983; Engel & West, 2005). No causality between crude oil prices to exchange rate indicates that the past data of crude oil price is unable to predict the movement of Ringgit Malaysia. Reuters (2013) reported that Malaysian stock market soared about 8 percentages to a historical high after the rulling coalition has won the 13rd election. In other words, the upward trend of the exchange rate of USD against MYR is probably explainable by the political stability environment in Malaysia but not crude oil prices.

The results from this research showed that Purchasing Power Parity holds between the crude oil price and exchange rate. Mémoire (2013) studied the relationship between crude oil or energy prices and exchange rate in Canadian during a period from 1999 to 2011. An increase in oil prices leads to an appreciation of CAD/USD exchange rate significantly when outside the parity area. However, once it is in parity area, the increment in oil prices does not have any substantial effect on the movement of CAD/USD exchange rate (Mémoire, 2013). It can also be interpreted in a way of the difference in the inflation rates is always equal with the percentage of appreciation or depreciation of the exchange rate (Alba & Papell, 2005).

This study also found the ability of crude oil price in discovering the exchange rate where Discounted Cash Flow valuation method was applicable. Exchange rates can be affected directly by crude oil price by applying future cash flows or indirectly effect on the interest rate used by discount the future cash. Increasing of oil prices can be influence consumers' purchasing power and consumers need consume higher prices for final goods and services. Therefore, the demand of the final goods and services will decrease and the profit will reduce as well and it may leads to the currency depreciation (Basher et al, 2012).

5.2.5 Crude Palm Oil (CPO) Price

Based on the result, it indicates that exchange rate (USD/MYR) is significant affected by movement of crude palm oil prices. By using samples of 33 developing countries, Bodart, Candelon and Carpantier (2015) implies that real exchange rate and commodities prices are greatly related. Once again has confirmed that CPO price can influence the exchange rate. They also proved that there is positive relationship between real exchange rate and price of exported commodities in exporting countries which consists of Algeria, Ecuador and Venezuela.

The findings is consistent with earlier researches Chen and Rogoff (2003); Broda (2004) and Coudert, Couharde and Mignon (2008), raise in world price of commodities are associated with an appreciation of real exchange rate in exporting countries. The outcome in this study is consistent with these researches.The result of this study shows the relationship between exchange rate and crude palm oil (CPO) price is negative. It implies that when price of CPO increase the exchange rate (USD/MYR) will tend to decrease. Reduction in exchange rate (USD/MYR) implies either the appreciation in RM or depreciation in USD. Thus, an increment in the Malaysia CPO price will lead to an appreciation in Malaysian Ringgit. Higher market price of CPO due to growth of demand and it leads to expand in exports volume. This will generate earnings from foreign currencies and demand of local currencies increase. The more foreign exchange earnings gain, the exporters able to exchange more foreign currencies for local currencies. Furthermore, the result is in par with the findings of Ashfahany and Priyatna (2015); Edwards and Ahamed (1986) and Bashar and Kabir (2013).

By conducting Johansen-Juselius Co-integration test, this study failed to detect whether CPO price has long run relationship with exchange rate. The research found CPO price tend to granger cause to exchange rate but not vice versa (unidirectional). It is align with research form Chen and Rogoff (2003) and Chen (2004) who examined movement of exchange rate can be forecasted by CPO price. Nevertheless, the outcome are contradicted with the studies of Meese and Rogoff (1983); Engel and West (2005) and Cheung, Chinn and Pascual (2005) (as cited in Zhang, Dufour and Galbraith, 2013). They found exchange rate likely to granger cause price of CPO by conducting Granger-causality Test.

The result is consistent with Efficient Market Hypothesis which proposed that the movement of market value reflects to any new available information. In general, the market is consider efficient with respect to some information, if the price of security in not affected by disclosing that information to market participant.

Kohlscheen, Avalos and Schrimpf (2016) found that there is a statistically and economically significant between commodity prices and exchange rates where the commodity prices tend to provide a better prediction than other standard models. In other words, the price information of commodity prices such as crude palm oil will reflect in the movement of the exchange rate.

5.3 Implication of study

There are various implications this research paper would like to suggest to the policy maker, practitioners like Federal Government Malaysia and Bank Negara Malaysia, Multinational Enterprises (MNE), Investors who mainly are the bankers, hedges, arbitrages and speculators, and also the academic researchers. Furthermore, this research paper also served as a direction for Malaysia investors who are interested to invest in foreign exchange market in Malaysia, somehow in meantime have to concern to the risk due to the volatility of the exchange rate movement.

5.3.1 Implication on Policy Maker

Policy maker mainly are the member who from board of directors with the authority to set the policy framework of an organization or in the government or Official Monetary Authorities (OMA) and currency policy maker. This study may provide a proper guideline to these parties to have a wise idea for their decision making towards the policies. Especially for currency policy maker, they have to concern about two interrelated choices which are focus on exchange rate regimes to manage well the exchange rate against others nation's currency and the price level of the exchange rate (Princeton University Press, n.d.). Moreover, the changes in FKLI, KLCI, gold prices, crude oil prices (WTI) and crude palm oil prices (CPO) that can affect the exchange rate which is one of the main concern under the economic factors that might influence the economic in this country. As the result shows that there are positive and significant between the FKLI and KLCI against the exchange rate of USD/MYR. In meantime, the gold price, crude oil price and crude palm oil price which have a negative and significant towards the exchange rate of USD/MYR in this country. This indicates that the Malaysia Price Indexes movements have parallel towards to the exchange rate of USD/MYR which brings that if there is an increase in the FKLI and KLCI, the exchange rate of USD/MYR will increase in the movement. In order to analyze the optimal monetary policy, a small open economy model which focus on whether the exchange rate stability should be part of monetary policy strategy (De Paoli, 2009).Thus, policy makers have to concern on the movement of the indexes and the movement of the commodities prices that might influence the foreign exchange market before make any decision on the policy making procedure in Malaysia.

In this case, the Bank Negara Malaysia (BNM) as well as the Economic Planning Unit (EPU) of the Prime Minister's Department may access the results of this research to revise and alter their monetary policies and budget allocation strategy in achieving economical targets thus attaining the 2020 Vision as a high-income country and financial hub among the third world countries. In this ever-changing global economic environment, it is essential for the policy makers to grasp and have their own set of criterion in setting policies to stabilize their domestic currency rate. The economy of a country is somehow hanging by a thread which is the country's currency.

To be exact, this research may suggest that the policy makers to pay more attention to the price level of crude oil price while formulating any monetary or fiscal policies as well as its government annual budget. Since the crude oil price not only affect the Malaysians' living cost but also give an impact towards the movement of the exchange rate. Therefore, this research might suggest that policy makers to take appropriate measures to maintain the value of Ringgit Malaysia. For example, using both stock and derivatives market to observe and foresee the possible movement of Ringgit Malaysia while monitoring the commodity prices closely. It is advisable to formulate monetary policies that improve the stock market performance by increasing its foreign direct investment thus boosting the value of Ringgit Malaysia. Lastly, precautions are the best tool in fighting potential market downturn.

5.3.2 Implication on Investors

Investors usually are the individual have savour in the investment field , from this research paper, the investors are mainly from bankers, hedges, arbitrages and speculators that have interest in the foreign exchange market. Hence, this research paper may provide investors the important information that might influence their critical financial decision making towards the investment in the foreign exchange market. Somehow, investor is an individual consist of sentiment that might have connection with the exchange rate return as well as to the exchange rate fundamental said by Menkhoff and Rebitzky (as cited in Heiden, Klein & Zwergel, 2013). As the result shows under this research paper, there are significantly relationship between the independent variables towards the dependent variable which is mainly concern by the investors regarding the exchange rate of USD/MYR in this country. The empirical results showed that gold price is negatively related with the movement of USD/MYR. This may show that the investors is suggested to protect their investments or portfolio in Gold as it act as a safe haven theoretically since the fluctuation of gold price is inverse with the movement of the exchange rate.

In Malaysia context, this might be beneficial towards the institutional investors such as Khazanah Nasional Berhad, Employees Provident Fund (EPF), Permodalan Nasional Berhad as well as international hedge funds in placing their position across the market. The capital flow from institutional funds is likely to support and fuel a country’s economic growth. With that, it might bring a bigger concern about the volatility and the risk of this pair of the exchange rate for those investors to forecast the exchange rate level in future. At this instance, the institutional investors may rely on this forecasting model to aid them in their decision making process whether to invest domestically or channel their capital to other financial markets to generate more return and minimizing the portfolio risk. Hence, this research may suggest the investors to look for other hedging mechanism in hedging the unfavourable movements of exchange rate of USD/MYR such as derivative financial or commodity products.

As the both stock index and stock index futures and exchange rate of USD/MYR are significantly positive correlated, this research suggest that investors may adjust their asset allocation strategy by using them as the currency rate tracker.

5.3.3 Implication on Multinational Enterprises (MNE)

MNE mainly are the firms that organize their business activities abroad the country or globally. In short, they might involve themselves into the foreign exchange rates which will further influent their decision making on their business trading. A study has found the movements and volatility in exchange rates that can affect the investments by multinational enterprises (MNEs) across international borders. However, foreign direct investment (FDI) can be determining the respective role of exchange rate levels and volatility in exchange rate (Lee & Min, 2011).The volatility of the exchange rate is biggest concern towards their business trading under cost and profit for them. This research may help MNE have a guideline that shows how's the movement of the indexes and the commodities prices that significantly influence the exchange rate of USD/MYR. Moreover, especially for those MNE have to involve their business trading under this pair of the exchange rate, which might bring much bigger concern on it and take action to hedge the risk of the exchange rate of USD against MYR. In order to avoid the lost in the business trading, MNE need to be concern about the movement of the FKLI and KLCI and the movement of the commodities prices in this country.

As the trading activities hold the lifeline of the country, forecasting the movement of the exchange rate by using sound factors is imminent. This research might provide the MNE another approach in understanding the behavior of the Malaysian Ringgit where they can adjust their business strategy in multinational trading. The entrepreneurs might use the commodity products to safeguard their business transactions such as crude palm oil.

5.3.4 Implication on Academician

In this research paper, academicians are mainly from those individual who have more interest on the foreign exchange market. Thus, this research paper helps those researchers focus on the study of the relationship between the exchange rate of USD against MYR with the FKLI and KLCI which under Malaysia stock index market and the commodities prices like gold, crude oil price and crude palm oil price. Hsing (2010) has found the determination for a pair of exchange rate which is USD/AUD and he discovers the uncovered interest rate parity model reflects the exchange rate is the best tools, and followed by Purchasing Power Parity (PPP), flexible price monetary and Mundell Fleming models (as cited in Macerinskiene & Balciunas, 2013). As the result showed under this research paper, it shows there is positive relationship between the FKLI and KLCI towards the exchange rate of USD/MYR and it is significantly influence this pair of the exchange rate. In meantime, the commodities prices showing there is negative relationship with the exchange rate of USD/MYR which indicates that if there is increase movement in the commodities prices, it will bring down the exchange rate of USD/MYR. Hence, it might bring more interest on the study towards these two types of variables for the academic researchers in order to further enhance the exchange rate forecasting models and understanding the exchange rate behavior, market efficiency and other related topics (Levich, 1983).

5.4 Limitation of the Research

In an imperfection world, a research without limitation does not exist. Thus, every research has its own limitations in order to have a better outcome in the future.

Based on this research, there are several limitations that have to preclude in upcoming research.

First and foremost, the period of the research has been limited due to financial crisis begun in year 2007. In order to avoid unstable data (which will eventually affect the reliability of the model) caused by financial crisis, the study period has been shortened to year 2009 until 2015 instead of beginning from year 2005. Meanwhile, FKLI data is only available from year 1996, even the data set has been extended, and the sample size of the research for yearly data is less than 30 observations. Consequently, monthly data has been adopted from year 2009 to 2015 in this research.

Moreover, the original unit measurement of the commodity prices variables inathis researchasuch as prices ofagold, crudeaoil prices and crude palm oil prices are USD. In order to standardize the currency unit for regression model purpose, all the variable have been converted to USD/MYR excluding FKLI variable and KLCI variable are remain in index point basis. To standardize the unit measurement of the commodity variables, every single data of commodity variable has to multiply with the exchange rate of USD against MYR. At such circumstance, it may inaccuracy data may exist and the result may less accurate as well.

On top of that, in this research only captured the stock market performance by using FKLI and FKCI. Unfortunately, this research has ignored the nature and the type of the stock in stock market Malaysia. In stock market Malaysia, there are many different types of securities and different effect towards the exchange rate of USD against MYR. To sum up, this research paper only applicable for Malaysia since variable FKLI and KLCI only in Malaysia’s stock market. Thus, most of the research are examined US, India and Japan but lack of the research on Malaysia. Hence, this research only provides information to Malaysia’s policy makers, multinational enterprise, investors and academician.

5.5 Recommendations for Future Research

To further extend this research topic, this research has provided some recommendations and suggestions that may help the future researchers. These recommendations could prevent the future researchers avoid to repeat the same problems as occurred in this research. Thus, these recommendations are very useful for the future researchers to get a better result in their study by avoiding the problems mentioned in this research.

Initially, this research is determining the relationship between exchange rate (USD/MYR) and FKLI, KLCI, GOLD, WTI and CPO in one model. Since the result failed in diagnostic checking such as multicollinearity, heteroscedasticity, autocorrelation problems, so the original model is divided into two models whereby the FKLI and KLCI are separated to pass the diagnostic checking. Hence, future researchers are encouraged in applying different data collection methods to find more historical data such as World Bank databases, Yahoo Finance, and other econometric website. Thus, future researchers may increase the number of observations other than monthly data such as daily, weekly and quarterly to get a better result in their research.

Moreover, the movement of exchange rate (USD/MYR) is not only influenced by the five independent variables mentioned in this research. For future researchers may try to add some new independent variables to determine the movement of exchange rate (USD/MYR). Hence, it can obtain a better result to perform the volatility of exchange rate (USD/MYR). There are some examples of new independent variables suggested such as silver, rubber and other variables that may affect the price of Malaysian Ringgit or US Dollar. Additional information can be put in to investigate the relationship between exchange rate (USD/MYR) and other new independent variables with the existing independent variables mentioned in this research.

Furthermore, the result obtained in this research is only focus on the USD against MYR. It is suggested that one should study the current issue on the market condition, market sentiment as well as current monetary policies in order to understand better on the future projection of the exchange rate movement. Hence, future researchers who are interested in study of changes in MYR are encouraged to focus on MYR against these other currencies such as British Pound (GBP) or Euro (EUR). For an example, since the United Kingdom decided to quit European Union which is voted by around 52% majority in United Kingdom (BBC News, 2016), the currencies of GBP and EUR is expected to have a large impact within these few years. Thus, future researchers may focus on other aspects from different currencies' aspect to grasp a better understanding on the forex market.

5.6 Conclusion

As a conclusion, this study shown a significant relationship between exchange rate (USD/MYR) and five variables consist of FKLI, KLCI, gold price, crude oil price and crude palm oil prices. The econometrics approaches includes Unit Root Test, Johansen-Juselius Co-integration Test and Granger Causality Test has enable this research to test the relationship. Limitations and recommendations provided in this study benefit to future researcher in enhancing the futurcontente studies.

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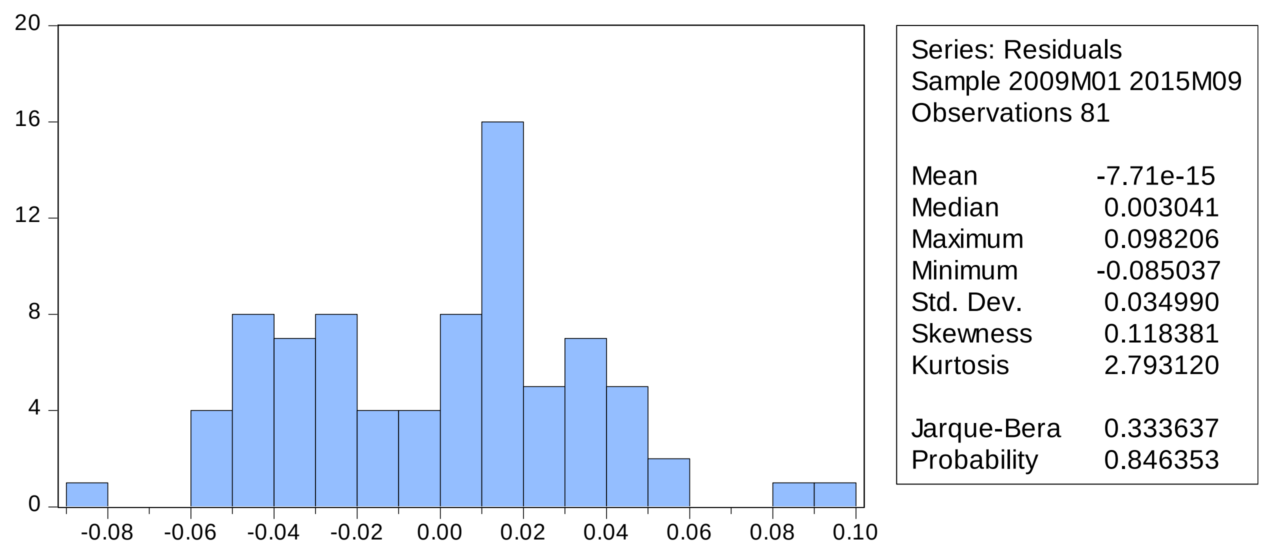
APPENDICES

Appendix 4.1: Descriptive Statistic of Common Sample

	LNEXR	LNFKLI	LNKLCI	LNGOLD	LNWTI	LNCPO
Mean	1.183759	7.323149	7.325481	8.359758	5.575955	7.853707
Median	1.166115	7.361375	7.367039	8.349872	5.618373	7.813439
Maximum	1.426716	7.540622	7.538559	8.608819	5.867959	8.261502
Minimum	1.077899	6.753438	6.776005	8.000756	5.006500	7.428074
Std. Dev.	0.070852	0.194083	0.194165	0.145564	0.206120	0.177979
Skewness	0.911140	-1.281224	-1.277642	-0.193321	-1.069798	0.267066
Kurtosis	3.475462	4.182349	4.139207	2.449259	3.564832	2.622515
Jarque-Bera	11.97034	26.87881	26.41702	1.528226	16.52707	1.443797
Probability	0.002516	0.000001	0.000002	0.465747	0.000258	0.485829
Sum	95.88451	593.1751	593.3639	677.1404	451.6523	636.1503
Sum Sq. Dev.	0.401601	3.013442	3.016000	1.695100	3.398830	2.534110
Observations	81	81	81	81	81	81

Appendix 4.2: Normality Test - Jarque-Bera



Appendix 4.3: Multicollinearity Test for LnFKLI

Dependent Variable: LNFKLI
Method: Least Squares
Date: 06/20/16 Time: 17:58
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNKLCI	0.993252	0.005064	196.1283	0.0000
LNWTI	0.009302	0.005529	1.682286	0.0966
LNCPO	0.002731	0.005490	0.497450	0.6203
C	-0.026211	0.046155	-0.567898	0.5718

R-squared	0.998624	Mean dependent var	7.323149
Adjusted R-squared	0.998571	S.D. dependent var	0.194083
S.E. of regression	0.007338	Akaike info criterion	-6.943466
Sum squared resid	0.004146	Schwarz criterion	-6.825222
Log likelihood	285.2104	Hannan-Quinn criter.	-6.896025
F-statistic	18630.57	Durbin-Watson stat	1.150174
Prob(F-statistic)	0.000000		

Appendix 4.4: Multicollinearity Test for LnKLCI

Dependent Variable: LNKLCI
Method: Least Squares
Date: 06/20/16 Time: 17:59
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	0.996643	0.005729	173.9728	0.0000
LNGOLD	0.019893	0.007191	2.766304	0.0071
LNWTI	-0.007438	0.005365	-1.386321	0.1697
LNCPO	-0.008779	0.005674	-1.547144	0.1260
C	-0.028964	0.050525	-0.573261	0.5682

R-squared	0.998737	Mean dependent var	7.325481
Adjusted R-squared	0.998670	S.D. dependent var	0.194165
S.E. of regression	0.007081	Akaike info criterion	-7.003169
Sum squared resid	0.003810	Schwarz criterion	-6.855364
Log likelihood	288.6284	Hannan-Quinn criter.	-6.943868
F-statistic	15020.34	Durbin-Watson stat	1.158820
Prob(F-statistic)	0.000000		

Appendix 4.5: Multicollinearity Test for LnGOLD

Dependent Variable: LNGOLD
Method: Least Squares
Date: 06/20/16 Time: 18:02
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	-4.211245	1.671930	-2.518792	0.0139
LNKLCI	4.598451	1.662309	2.766304	0.0071
LNWTI	0.000624	0.082598	0.007556	0.9940
LNCPO	0.298011	0.080675	3.693954	0.0004
C	3.169502	0.678567	4.670878	0.0000

R-squared	0.480407	Mean dependent var	8.359758
Adjusted R-squared	0.453060	S.D. dependent var	0.145564
S.E. of regression	0.107652	Akaike info criterion	-1.560084
Sum squared resid	0.880761	Schwarz criterion	-1.412278
Log likelihood	68.18340	Hannan-Quinn criter.	-1.500782
F-statistic	17.56711	Durbin-Watson stat	0.361152
Prob(F-statistic)	0.000000		

Appendix 4.6: Multicollinearity Test for LnWTI

Dependent Variable: LNWTI
Method: Least Squares
Date: 06/20/16 Time: 18:03
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	3.816296	2.376885	1.605587	0.1125
LNKLCI	-3.315954	2.391909	-1.386321	0.1697
LNGOLD	0.001204	0.159300	0.007556	0.9940
LNCPO	0.496160	0.107550	4.613304	0.0000
C	-1.987156	1.044513	-1.902471	0.0609

R-squared	0.500224	Mean dependent var	5.575955
Adjusted R-squared	0.473920	S.D. dependent var	0.206120
S.E. of regression	0.149502	Akaike info criterion	-0.903279
Sum squared resid	1.698654	Schwarz criterion	-0.755474
Log likelihood	41.58280	Hannan-Quinn criter.	-0.843978
F-statistic	19.01702	Durbin-Watson stat	0.343914
Prob(F-statistic)	0.000000		

Appendix 4.7: Multicollinearity Test for LnCPO

Dependent Variable: LNCPO
Method: Least Squares
Date: 06/20/16 Time: 18:04
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	3.145392	2.249619	1.398189	0.1661
LNKLCI	-3.478060	2.248052	-1.547144	0.1260
LNGOLD	0.510768	0.138271	3.693954	0.0004
LNWTI	0.440927	0.095577	4.613304	0.0000
C	3.569504	0.920913	3.876051	0.0002

R-squared	0.404304	Mean dependent var	7.853707
Adjusted R-squared	0.372952	S.D. dependent var	0.177979
S.E. of regression	0.140935	Akaike info criterion	-1.021298
Sum squared resid	1.509559	Schwarz criterion	-0.873493
Log likelihood	46.36257	Hannan-Quinn criter.	-0.961997
F-statistic	12.89547	Durbin-Watson stat	0.435428
Prob(F-statistic)	0.000000		

Appendix 4.8: Heteroscedasticity ARCH Test for Model 1

Heteroskedasticity Test: ARCH

F-statistic	3.461132	Prob. F(1,78)	0.0666
Obs*R-squared	3.399051	Prob. Chi-Square(1)	0.0652

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/20/16 Time: 18:28
Sample (adjusted): 2009M02 2015M09
Included observations: 80 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001071	0.000441	2.429278	0.0174
RESID^2(-1)	0.366551	0.197027	1.860412	0.0666

R-squared	0.042488	Mean dependent var	0.001574
Adjusted R-squared	0.030212	S.D. dependent var	0.003161
S.E. of regression	0.003113	Akaike info criterion	-8.681611
Sum squared resid	0.000756	Schwarz criterion	-8.622060
Log likelihood	349.2644	Hannan-Quinn criter.	-8.657736
F-statistic	3.461132	Durbin-Watson stat	1.196621
Prob(F-statistic)	0.066596		

Appendix 4.9: Heteroscedasticity ARCH Test for Model 2

Heteroskedasticity Test: ARCH

F-statistic	2.903866	Prob. F(1,78)	0.0923
Obs*R-squared	2.871423	Prob. Chi-Square(1)	0.0902

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/20/16 Time: 18:50
Sample (adjusted): 2009M02 2015M09
Included observations: 80 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001101	0.000431	2.554982	0.0126
RESID^2(-1)	0.336228	0.197309	1.704073	0.0923

R-squared	0.035893	Mean dependent var	0.001559
Adjusted R-squared	0.023532	S.D. dependent var	0.003050
S.E. of regression	0.003014	Akaike info criterion	-8.746391
Sum squared resid	0.000709	Schwarz criterion	-8.686840
Log likelihood	351.8556	Hannan-Quinn criter.	-8.722515
F-statistic	2.903866	Durbin-Watson stat	1.215065
Prob(F-statistic)	0.092348		

Appendix 4.10: Heteroskedasticity White Test for Model 1

Dependent Variable: LNEXR
Method: Least Squares
Date: 06/21/16 Time: 02:34
Sample: 2009M01 2015M09
Included observations: 81
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	0.080046	0.028970	2.763032	0.0072
LNGOLD	-0.140168	0.045611	-3.073144	0.0029
LNWTI	-0.207307	0.032105	-6.457199	0.0000
LNCPO	-0.091142	0.035316	-2.580783	0.0118
C	3.641079	0.320375	11.36504	0.0000

R-squared	0.661047	Mean dependent var	1.183759
Adjusted R-squared	0.643207	S.D. dependent var	0.070852
S.E. of regression	0.042321	Akaike info criterion	-3.427305
Sum squared resid	0.136124	Schwarz criterion	-3.279499
Log likelihood	143.8058	Hannan-Quinn criter.	-3.368003
F-statistic	37.05490	Durbin-Watson stat	0.529816
Prob(F-statistic)	0.000000	Wald F-statistic	31.19286
Prob(Wald F-statistic)	0.000000		

Appendix 4.11: Heteroskedasticity White Test for Model 2

Dependent Variable: LNEXR
Method: Least Squares
Date: 06/21/16 Time: 02:37
Sample: 2009M01 2015M09
Included observations: 81
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNKLCI	0.088043	0.030026	2.932253	0.0044
LNGOLD	-0.146886	0.043747	-3.357607	0.0012
LNWTI	-0.210195	0.032447	-6.478027	0.0000
LNCPO	-0.087867	0.034613	-2.538570	0.0132
C	3.628850	0.316678	11.45912	0.0000

R-squared	0.666036	Mean dependent var	1.183759
Adjusted R-squared	0.648459	S.D. dependent var	0.070852
S.E. of regression	0.042009	Akaike info criterion	-3.442134
Sum squared resid	0.134120	Schwarz criterion	-3.294328
Log likelihood	144.4064	Hannan-Quinn criter.	-3.382832
F-statistic	37.89233	Durbin-Watson stat	0.539747
Prob(F-statistic)	0.000000	Wald F-statistic	32.40550
Prob(Wald F-statistic)	0.000000		

Appendix 4.12: Autocorrelation Breusch-Godfrey Serial Correlation LM Test

Model 1

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	31.98031	Prob. F(2,74)	0.0000
Obs*R-squared	37.55282	Prob. Chi-Square(2)	0.0000

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/20/16 Time: 18:33
Sample: 2009M01 2015M09
Included observations: 81
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	-0.012864	0.025477	-0.504931	0.6151
LNGOLD	0.042130	0.032419	1.299556	0.1978
LNWTI	-0.011716	0.023891	-0.490370	0.6253
LNCPO	-0.006322	0.025238	-0.250507	0.8029
C	-0.141434	0.225582	-0.626974	0.5326
RESID(-1)	0.752889	0.130142	5.785122	0.0000
RESID(-2)	0.027083	0.132162	0.204924	0.8382

R-squared	0.463615	Mean dependent var	-5.82E-16
Adjusted R-squared	0.420124	S.D. dependent var	0.041250
S.E. of regression	0.031412	Akaike info criterion	-4.000825
Sum squared resid	0.073015	Schwarz criterion	-3.793897
Log likelihood	169.0334	Hannan-Quinn criter.	-3.917803
F-statistic	10.66010	Durbin-Watson stat	1.643583
Prob(F-statistic)	0.000000		

Appendix 4.13: Autocorrelation Breusch-Godfrey Serial Correlation LM Test

Model 2

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	31.48384	Prob. F(2,74)	0.0000
Obs*R-squared	37.23785	Prob. Chi-Square(2)	0.0000

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/20/16 Time: 18:35
Sample: 2009M01 2015M09
Included observations: 81
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNKLCI	-0.009530	0.025406	-0.375101	0.7087
LNGOLD	0.040076	0.032501	1.233059	0.2215
LNWTI	-0.012794	0.023719	-0.539381	0.5912
LNCPO	-0.005867	0.025217	-0.232671	0.8167
C	-0.146268	0.224650	-0.651091	0.5170
RESID(-1)	0.747677	0.130141	5.745148	0.0000
RESID(-2)	0.025574	0.131943	0.193827	0.8468

R-squared	0.459727	Mean dependent var	1.73E-16
Adjusted R-squared	0.415921	S.D. dependent var	0.040945
S.E. of regression	0.031292	Akaike info criterion	-4.008431
Sum squared resid	0.072462	Schwarz criterion	-3.801503
Log likelihood	169.3415	Hannan-Quinn criter.	-3.925409
F-statistic	10.49461	Durbin-Watson stat	1.659886
Prob(F-statistic)	0.000000		

Appendix 4.14: HAC Standard errors and covariance for Model 1

Dependent Variable: LNEXR
Method: Least Squares
Date: 06/20/16 Time: 18:38
Sample: 2009M01 2015M09
Included observations: 81
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	0.080046	0.042687	1.875208	0.0646
LNGOLD	-0.140168	0.062224	-2.252654	0.0272
LNWTI	-0.207307	0.048102	-4.309775	0.0000
LNCPO	-0.091142	0.049081	-1.856950	0.0672
C	3.641079	0.427483	8.517476	0.0000

R-squared	0.661047	Mean dependent var	1.183759
Adjusted R-squared	0.643207	S.D. dependent var	0.070852
S.E. of regression	0.042321	Akaike info criterion	-3.427305
Sum squared resid	0.136124	Schwarz criterion	-3.279499
Log likelihood	143.8058	Hannan-Quinn criter.	-3.368003
F-statistic	37.05490	Durbin-Watson stat	0.529816
Prob(F-statistic)	0.000000	Wald F-statistic	15.69304
Prob(Wald F-statistic)	0.000000		

Appendix 4.15: HAC standard errors and covariance for Model 2

Dependent Variable: LNEXR
Method: Least Squares
Date: 06/20/16 Time: 18:36
Sample: 2009M01 2015M09
Included observations: 81
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNKLCI	0.088043	0.044419	1.982128	0.0511
LNGOLD	-0.146886	0.060796	-2.416054	0.0181
LNWTI	-0.210195	0.047892	-4.388897	0.0000
LNCPO	-0.087867	0.048408	-1.815152	0.0734
C	3.628850	0.425266	8.533136	0.0000

R-squared	0.666036	Mean dependent var	1.183759
Adjusted R-squared	0.648459	S.D. dependent var	0.070852
S.E. of regression	0.042009	Akaike info criterion	-3.442134
Sum squared resid	0.134120	Schwarz criterion	-3.294328
Log likelihood	144.4064	Hannan-Quinn criter.	-3.382832
F-statistic	37.89233	Durbin-Watson stat	0.539747
Prob(F-statistic)	0.000000	Wald F-statistic	16.16959
Prob(Wald F-statistic)	0.000000		

Appendix 4.16: ADF Test for LnEXR include intercept in level

Null Hypothesis: LNEXR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.485881	0.9853
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.17: ADF Test for LnEXR include intercept and trend in level

Null Hypothesis: LNEXR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.394190	0.9988
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.18: PP Test for LnEXR include intercept in level

Null Hypothesis: LNEXR has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.485881	0.9853
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.19: PP Test for LnEXR include intercept and trend in level

Null Hypothesis: LNEXR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.311944	1.0000
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.20: ADF Test for LnFKLI include intercept in level

Null Hypothesis: LNFKLI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.257476	0.0203
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.21: ADF Test for LnFKLI include intercept and trend in level

Null Hypothesis: LNFKLI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.267137	0.8887
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.22: PP Test for LnFKLI include intercept in level

Null Hypothesis: LNFKLI has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.551668	0.0090
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.23: PP Test for LnFKLI include intercept and trend in level

Null Hypothesis: LNFKLI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.962942	0.9428
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.24: ADF Test for LnKLCI include intercept in level

Null Hypothesis: LNKLCI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.755155	0.0049
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.25: ADF Test for LnKLCI include intercept and trend in level

Null Hypothesis: LNKLCI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.784290	0.7032
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.26: PP Test for LnKLCI include intercept in level

Null Hypothesis: LNKLCI has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.248351	0.0010
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.27: PP Test for LnKLCI include intercept and trend in level

Null Hypothesis: LNKLCI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.610251	0.7804
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.28: ADF Test for LnGOLD include intercept in level

Null Hypothesis: LNGOLD has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.567901	0.1039
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.29: ADF Test for LnGOLD include intercept and trend in level

Null Hypothesis: LNGOLD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.370562	0.3919
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.30: PP Test for LnGOLD include intercept in level

Null Hypothesis: LNGOLD has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.509361	0.1171
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.31: PP Test for LnGOLD include intercept and trend in level

Null Hypothesis: LNGOLD has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.224437	0.4696
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.32: ADF Test for LnWTI include intercept in level

Null Hypothesis: LNWTI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.463830	0.1281
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.33: ADF Test for LnWTI include intercept and trend in level

Null Hypothesis: LNWTI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.072299	0.5529
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.34: PP Test for LnWTI include intercept in level

Null Hypothesis: LNWTI has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.562041	0.1052
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.35: PP Test for LnWTI include intercept and trend in level

Null Hypothesis: LNWTI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.011510	0.5860
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.36: ADF Test for LnCPO include intercept in level

Null Hypothesis: LNCPO has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.521546	0.1142
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.37: ADF Test for LnCPO include intercept and trend in level

Null Hypothesis: LNCPO has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.950788	0.1527
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.38: PP Test for LnCPO include intercept in level

Null Hypothesis: LNCPO has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.587852	0.0997
Test critical values:	1% level	-3.514426	
	5% level	-2.898145	
	10% level	-2.586351	

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

Appendix 4.39: PP Test for LnCPO include intercept and trend in level

Null Hypothesis: LNCPO has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.928881	0.1592
Test critical values:	1% level	-4.076860	
	5% level	-3.466966	
	10% level	-3.160198	

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

Appendix 4.40: ADF Test for LnEXR include intercept in first difference

Null Hypothesis: D(LNEXR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.786445	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.41: ADF Test for LnEXR include intercept and trend in first difference

Null Hypothesis: D(LNEXR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.682664	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.42: PP Test for LnEXR include intercept in first difference

Null Hypothesis: D(LNEXR) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.770347	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.43: PP Test for LnEXR include intercept and trend in first difference

Null Hypothesis: D(LNEXR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.892514	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.44: ADF Test for LnFKLI include intercept in first difference

Null Hypothesis: D(LNFKLI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.147299	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.45: ADF Test for LnFKLI include intercept and trend in first difference

Null Hypothesis: D(LNFKLI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.052943	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.46: PP Test for LnFKLI include intercept in first difference

Null Hypothesis: D(LNFKLI) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.143565	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.47: PP Test for LnFKLI include intercept and trend in first difference

Null Hypothesis: D(LNFKLI) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.960284	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.48: ADF Test for LnKLCI include intercept in first difference

Null Hypothesis: D(LNKLCI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.579562	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.49: ADF Test for LnKLCI include intercept and trend in first difference

Null Hypothesis: D(LNKLCI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.587100	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.50: PP Test for LnKLCI include intercept in first difference

Null Hypothesis: D(LNKLCI) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.600736	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.51: PP Test for LnKLCI include intercept and trend in first difference

Null Hypothesis: D(LNKLCI) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.564982	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.52: ADF Test for LnGOLD include intercept in first difference

Null Hypothesis: D(LNGOLD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.81284	0.0001
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.53: ADF Test for LnGOLD include intercept and trend in first difference

Null Hypothesis: D(LNGOLD) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.81045	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.54: PP Test for LnGOLD include intercept in first difference

Null Hypothesis: D(LNGOLD) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.14671	0.0001
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.55: PP Test for LnGOLD include intercept and trend in first difference

Null Hypothesis: D(LNGOLD) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.19746	0.0001
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.56: ADF Test for LnWTI include intercept in first difference

Null Hypothesis: D(LNWTI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.582355	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.57: ADF Test for LnWTI include intercept and trend in first difference

Null Hypothesis: D(LNWTI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.974684	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.58: PP Test for LnWTI include intercept in first difference

Null Hypothesis: D(LNWTI) has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.522870	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.59: PP Test for LnWTI include intercept and trend in first difference

Null Hypothesis: D(LNWTI) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.985748	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.60: ADF Test for LnCPO include intercept in first difference

Null Hypothesis: D(LNCPO) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.074076	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.61: ADF Test for LnCPO include intercept and trend in first difference

Null Hypothesis: D(LNCPO) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.334980	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.62: PP Test for LnCPO include intercept in first difference

Null Hypothesis: D(LNCPO) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.075121	0.0000
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

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

Appendix 4.63: PP Test for LnCPO include intercept and trend in first difference

Null Hypothesis: D(LNCPO) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.334980	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

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

Appendix 4.64: Ramsey RESET Test for Model 1

Equation: UNTITLED
Specification: LNEXR LNFKLI LNGOLD LNWTI LNCPO C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.177035	75	0.8600
F-statistic	0.031341	(1, 75)	0.8600
Likelihood ratio	0.033842	1	0.8540

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	5.69E-05	1	5.69E-05
Restricted SSR	0.136124	76	0.001791
Unrestricted SSR	0.136067	75	0.001814

LR test summary:

	Value	df
Restricted LogL	143.8058	76
Unrestricted LogL	143.8228	75

Unrestricted Test Equation:
Dependent Variable: LNEXR
Method: Least Squares
Date: 06/20/16 Time: 18:53
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	0.034788	0.257957	0.134860	0.8931
LNGOLD	-0.061080	0.448828	-0.136088	0.8921
LNWTI	-0.084273	0.695719	-0.121131	0.9039
LNCPO	-0.038898	0.297069	-0.130941	0.8962
C	1.873442	9.989287	0.187545	0.8517
FITTED^2	0.243188	1.373667	0.177035	0.8600

R-squared	0.661188	Mean dependent var	1.183759
Adjusted R-squared	0.638601	S.D. dependent var	0.070852
S.E. of regression	0.042594	Akaike info criterion	-3.403031
Sum squared resid	0.136067	Schwarz criterion	-3.225665
Log likelihood	143.8228	Hannan-Quinn criter.	-3.331869
F-statistic	29.27236	Durbin-Watson stat	0.532592
Prob(F-statistic)	0.000000		

Appendix 4.65: Ramsey RESET Test for Model 2

Ramsey RESET Test
Equation: UNTITLED
Specification: LNEXR LNKLCI LNGOLD LNWTI LNCPO C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.413724	75	0.6803
F-statistic	0.171167	(1, 75)	0.6803
Likelihood ratio	0.184650	1	0.6674

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.000305	1	0.000305
Restricted SSR	0.134120	76	0.001765
Unrestricted SSR	0.133815	75	0.001784

LR test summary:

	Value	df
Restricted LogL	144.4064	76
Unrestricted LogL	144.4987	75

Unrestricted Test Equation:
Dependent Variable: LNEXR
Method: Least Squares
Date: 06/20/16 Time: 18:51
Sample: 2009M01 2015M09
Included observations: 81

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNKLCI	-0.029536	0.286254	-0.103182	0.9181
LNGOLD	0.047908	0.472813	0.101326	0.9196
LNWTI	0.083355	0.710246	0.117360	0.9069
LNCPO	0.030521	0.288160	0.105918	0.9159
C	-0.508273	10.00426	-0.050806	0.9596
FITTED^2	0.571990	1.382541	0.413724	0.6803

R-squared	0.666796	Mean dependent var	1.183759
Adjusted R-squared	0.644583	S.D. dependent var	0.070852
S.E. of regression	0.042240	Akaike info criterion	-3.419722
Sum squared resid	0.133815	Schwarz criterion	-3.242355
Log likelihood	144.4987	Hannan-Quinn criter.	-3.348560
F-statistic	30.01751	Durbin-Watson stat	0.547513
Prob(F-statistic)	0.000000		

Appendix 4.66: Ordinary Least Square for Model 1

Dependent Variable: LNEXR
Method: Least Squares
Date: 06/20/16 Time: 18:38
Sample: 2009M01 2015M09
Included observations: 81
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFKLI	0.080046	0.042687	1.875208	0.0646
LNGOLD	-0.140168	0.062224	-2.252654	0.0272
LNWTI	-0.207307	0.048102	-4.309775	0.0000
LNCPO	-0.091142	0.049081	-1.856950	0.0672
C	3.641079	0.427483	8.517476	0.0000

R-squared	0.661047	Mean dependent var	1.183759
Adjusted R-squared	0.643207	S.D. dependent var	0.070852
S.E. of regression	0.042321	Akaike info criterion	-3.427305
Sum squared resid	0.136124	Schwarz criterion	-3.279499
Log likelihood	143.8058	Hannan-Quinn criter.	-3.368003
F-statistic	37.05490	Durbin-Watson stat	0.529816
Prob(F-statistic)	0.000000	Wald F-statistic	15.69304
Prob(Wald F-statistic)	0.000000		

Appendix 4.67: Ordinary Least Square for Model 2

Dependent Variable: LNEXR
Method: Least Squares
Date: 06/20/16 Time: 18:36
Sample: 2009M01 2015M09
Included observations: 81
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNKLCI	0.088043	0.044419	1.982128	0.0511
LNGOLD	-0.146886	0.060796	-2.416054	0.0181
LNWTI	-0.210195	0.047892	-4.388897	0.0000
LNCPO	-0.087867	0.048408	-1.815152	0.0734
C	3.628850	0.425266	8.533136	0.0000

R-squared	0.666036	Mean dependent var	1.183759
Adjusted R-squared	0.648459	S.D. dependent var	0.070852
S.E. of regression	0.042009	Akaike info criterion	-3.442134
Sum squared resid	0.134120	Schwarz criterion	-3.294328
Log likelihood	144.4064	Hannan-Quinn criter.	-3.382832
F-statistic	37.89233	Durbin-Watson stat	0.539747
Prob(F-statistic)	0.000000	Wald F-statistic	16.16959
Prob(Wald F-statistic)	0.000000		

Appendix 4.68: Optimum Lag Length AIC & SC Result for Model 1

VAR Lag Order Selection Criteria
Endogenous variables: LNEXR LNFKLI LNGOLD LNWTI LNCPO
Exogenous variables: C
Date: 06/20/16 Time: 18:20
Sample: 1 81
Included observations: 73

Lag	LogL	LR	FPE	AIC	SC	HQ
0	301.0890	NA	2.06e-10	-8.112028	-7.955147	-8.049508
1	652.4220	644.9126*	2.71e-14*	-17.05266*	-16.11137*	-16.67754*
2	666.0622	23.16966	3.73e-14	-16.74143	-15.01574	-16.05371
3	679.2597	20.60974	5.29e-14	-16.41807	-13.90798	-15.41776
4	697.7165	26.29465	6.63e-14	-16.23881	-12.94431	-14.92590
5	719.4839	28.02917	7.84e-14	-16.15024	-12.07134	-14.52473
6	746.0477	30.56661	8.51e-14	-16.19309	-11.32978	-14.25498
7	768.2387	22.49499	1.10e-13	-16.11613	-10.46842	-13.86542
8	794.0578	22.63592	1.41e-13	-16.13857	-9.706457	-13.57526

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 4.69: Optimum Lag Length AIC & SC Result for Model 2

VAR Lag Order Selection Criteria
Endogenous variables: LNEXR LNKLCI LNGOLD LNWTI LNCPO
Exogenous variables: C
Date: 06/20/16 Time: 18:18
Sample: 1 81
Included observations: 73

Lag	LogL	LR	FPE	AIC	SC	HQ
0	301.6505	NA	2.03e-10	-8.127410	-7.970529	-8.064890
1	658.3019	654.6753*	2.30e-14*	-17.21375*	-16.27247*	-16.83863*
2	673.4081	25.65984	3.05e-14	-16.94269	-15.21700	-16.25497
3	684.8583	17.88105	4.53e-14	-16.57146	-14.06137	-15.57114
4	702.6747	25.38237	5.79e-14	-16.37465	-13.08015	-15.06174
5	725.4762	29.36076	6.66e-14	-16.31442	-12.23552	-14.68890
6	751.4268	29.86102	7.34e-14	-16.34046	-11.47716	-14.40235
7	773.1519	22.02268	9.65e-14	-16.25074	-10.60303	-14.00003
8	800.1124	23.63659	1.19e-13	-16.30445	-9.872337	-13.74114

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 4.70: Johansen-Juselius (JJ) Cointegration Test Result for Model 1

Date: 06/20/16 Time: 18:26
Sample (adjusted): 3 81
Included observations: 79 after adjustments
Trend assumption: Linear deterministic trend
Series: LNEXR LNFKLI LNGOLD LNWTI LNCPO
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.289317	63.47530	69.81889	0.1444
At most 1	0.214947	36.49450	47.85613	0.3718
At most 2	0.127720	17.37621	29.79707	0.6122
At most 3	0.076468	6.581273	15.49471	0.6268
At most 4	0.003750	0.296793	3.841466	0.5859

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.289317	26.98080	33.87687	0.2644
At most 1	0.214947	19.11829	27.58434	0.4054
At most 2	0.127720	10.79494	21.13162	0.6678
At most 3	0.076468	6.284479	14.26460	0.5770
At most 4	0.003750	0.296793	3.841466	0.5859

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNEXR	LNFKLI	LNGOLD	LNWTI	LNCPO
-6.450394	-3.199956	-3.503253	-2.847363	1.345681
-15.21278	3.330854	-0.409790	-6.458141	-4.378399
-4.226846	6.401084	-6.495408	-5.478508	5.989554
-9.835651	2.115597	-8.434910	1.794909	-2.826821
23.33653	0.111703	1.627362	2.459491	0.439917

Unrestricted Adjustment Coefficients (alpha):

D(LNEXR)	-0.003415	0.006814	0.003089	0.001665	0.000702
D(LNFKLI)	0.011308	-0.004874	-0.008015	-0.001812	0.000486
D(LNGOLD)	0.011155	9.51E-05	0.013597	0.006756	-0.000483
D(LNWTI)	0.025318	0.011595	0.003633	-0.013752	-0.001576
D(LNCPO)	0.015977	0.018377	-0.015296	0.008898	-0.001814

1 Cointegrating Equation(s): Log likelihood 689.2620

Normalized cointegrating coefficients (standard error in parentheses)

LNEXR	LNFKLI	LNGOLD	LNWTI	LNCPO
1.000000	0.496087	0.543107	0.441425	-0.208620
	(0.22313)	(0.27871)	(0.21146)	(0.22122)

Adjustment coefficients (standard error in parentheses)

D(LNEXR)	0.022028
	(0.01678)
D(LNFKLI)	-0.072940
	(0.02444)
D(LNGOLD)	-0.071952
	(0.03734)
D(LNWTI)	-0.163309
	(0.05606)
D(LNCPO)	-0.103061
	(0.05860)

2 Cointegrating Equation(s): Log likelihood 698.8211

Normalized cointegrating coefficients (standard error in parentheses)

LNEXR	LNFKLI	LNGOLD	LNWTI	LNCPO
1.000000	0.000000	0.184993	0.429697	0.135799
		(0.11654)	(0.08624)	(0.09887)
0.000000	1.000000	0.721877	0.023641	-0.694271
		(0.38903)	(0.28789)	(0.33004)

Adjustment coefficients (standard error in parentheses)

D(LNEXR)	-0.081638	0.033625
	(0.04087)	(0.01143)
D(LNFKLI)	0.001213	-0.052420
	(0.06188)	(0.01730)
D(LNGOLD)	-0.073399	-0.035378
	(0.09564)	(0.02674)
D(LNWTI)	-0.339697	-0.042395
	(0.14182)	(0.03964)
D(LNCPO)	-0.382630	0.010085
	(0.14580)	(0.04075)

3 Cointegrating Equation(s): Log likelihood 704.2186

Normalized cointegrating coefficients (standard error in parentheses)

LNEXR	LNFKLI	LNGOLD	LNWTI	LNCPO
1.000000	0.000000	0.000000	0.361430	0.332846
			(0.09459)	(0.10646)
0.000000	1.000000	0.000000	-0.242748	0.074643
			(0.20926)	(0.23552)
0.000000	0.000000	1.000000	0.369022	-1.065160
			(0.24953)	(0.28084)

Adjustment coefficients (standard error in parentheses)

D(LNEXR)	-0.094693	0.053396	-0.010891
	(0.04173)	(0.01931)	(0.01808)
D(LNFKLI)	0.035091	-0.103724	0.014443
	(0.06181)	(0.02860)	(0.02678)
D(LNGOLD)	-0.130872	0.051658	-0.127435
	(0.09487)	(0.04390)	(0.04111)
D(LNWTI)	-0.355051	-0.019143	-0.117040
	(0.14621)	(0.06767)	(0.06336)
D(LNCPO)	-0.317975	-0.087828	0.035852
	(0.14732)	(0.06818)	(0.06384)

4 Cointegrating Equation(s): Log likelihood 707.3608

Normalized cointegrating coefficients (standard error in parentheses)

LNEXR	LNFKLI	LNGOLD	LNWTI	LNCPO
1.000000	0.000000	0.000000	0.000000	0.682980
				(0.16016)
0.000000	1.000000	0.000000	0.000000	-0.160518
				(0.21922)
0.000000	0.000000	1.000000	0.000000	-0.707671
				(0.20974)
0.000000	0.000000	0.000000	1.000000	-0.968747
				(0.34595)

Adjustment coefficients (standard error in parentheses)

D(LNEXR)	-0.111070	0.056919	-0.024936	-0.048218
	(0.04802)	(0.01993)	(0.02735)	(0.02222)
D(LNFKLI)	0.052915	-0.107558	0.029729	0.039939
	(0.07122)	(0.02956)	(0.04057)	(0.03297)
D(LNGOLD)	-0.197318	0.065951	-0.184418	-0.094742
	(0.10838)	(0.04499)	(0.06174)	(0.05017)
D(LNWTI)	-0.219791	-0.048237	-0.001043	-0.191554
	(0.16573)	(0.06879)	(0.09441)	(0.07671)
D(LNCPO)	-0.405492	-0.069004	-0.039202	-0.064404
	(0.16880)	(0.07006)	(0.09615)	(0.07813)

Appendix 4.71: Johansen-Juselius (JJ) Cointegration Test Result for Model 2

Date: 06/20/16 Time: 18:28
Sample (adjusted): 3 81
Included observations: 79 after adjustments
Trend assumption: Linear deterministic trend
Series: LNEXR LNKLCI LNGOLD LNWTI LNCPO
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.302078	65.49049	69.81889	0.1055
At most 1	0.218160	37.07829	47.85613	0.3438
At most 2	0.126530	17.63601	29.79707	0.5930
At most 3	0.076917	6.948757	15.49471	0.5836
At most 4	0.007892	0.625924	3.841466	0.4289

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.302078	28.41219	33.87687	0.1951
At most 1	0.218160	19.44229	27.58434	0.3811
At most 2	0.126530	10.68725	21.13162	0.6784
At most 3	0.076917	6.322833	14.26460	0.5721
At most 4	0.007892	0.625924	3.841466	0.4289

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNEXR	LNKLCI	LNGOLD	LNWTI	LNCPO
-3.369709	-3.803861	-3.070644	-1.962072	1.688838
-16.33644	3.082814	-0.973489	-6.788396	-4.192383
-4.681538	6.129115	-5.995967	-5.758654	6.279188
-10.25178	2.560648	-9.078747	1.322272	-2.218096
23.04846	0.641486	1.444450	2.188203	0.588048

Unrestricted Adjustment Coefficients (alpha):

D(LNEXR)	-0.004109	0.006477	0.002694	0.001760	0.001104
D(LNKLCI)	0.011880	-0.003224	-0.006322	-0.002101	0.000624
D(LNGOLD)	0.009153	0.001313	0.013140	0.007696	-0.000738
D(LNWTI)	0.021984	0.013939	0.005739	-0.013384	-0.002605
D(LNCPO)	0.015183	0.020000	-0.015438	0.008001	-0.002652

1 Cointegrating Equation(s): Log likelihood 696.8586

Normalized cointegrating coefficients (standard error in parentheses)

LNEXR	LNKLCI	LNGOLD	LNWTI	LNCPO
1.000000	1.128840	0.911249	0.582267	-0.501182
	(0.41879)	(0.52080)	(0.39250)	(0.41155)

Adjustment coefficients (standard error in parentheses)

D(LNEXR)	0.013844
	(0.00873)
D(LNKLCI)	-0.040032
	(0.01121)
D(LNGOLD)	-0.030845
	(0.01948)
D(LNWTI)	-0.074080
	(0.02933)
D(LNCPO)	-0.051162
	(0.03069)

2 Cointegrating Equation(s): Log likelihood 706.5798

Normalized cointegrating coefficients (standard error in parentheses)

LNEXR	LNKLCI	LNGOLD	LNWTI	LNCPO
1.000000	0.000000	0.181570	0.439417	0.148089
		(0.12153)	(0.08942)	(0.10233)
0.000000	1.000000	0.646397	0.126546	-0.575167
		(0.36265)	(0.26685)	(0.30537)

Adjustment coefficients (standard error in parentheses)

D(LNEXR)	-0.091960	0.035594
	(0.04130)	(0.01212)
D(LNKLCI)	0.012642	-0.055130
	(0.05512)	(0.01618)
D(LNGOLD)	-0.052299	-0.030770
	(0.09637)	(0.02829)
D(LNWTI)	-0.301794	-0.040653

	(0.14260)	(0.04186)		
D(LNCPO)	-0.377898	0.003904		
	(0.14676)	(0.04308)		

3 Cointegrating Equation(s):		Log likelihood	711.9234	
Normalized cointegrating coefficients (standard error in parentheses)				
LNEXR	LNKLCI	LNGOLD	LNWTI	LNCPO
1.000000	0.000000	0.000000	0.350163	0.357369
			(0.09788)	(0.10945)
0.000000	1.000000	0.000000	-0.191204	0.169878
			(0.20908)	(0.23379)
0.000000	0.000000	1.000000	0.491571	-1.152612
			(0.26878)	(0.30054)
Adjustment coefficients (standard error in parentheses)				
D(LNEXR)	-0.104571	0.052105	-0.009841	
	(0.04254)	(0.01926)	(0.01671)	
D(LNKLCI)	0.042241	-0.093881	0.004569	
	(0.05577)	(0.02525)	(0.02191)	
D(LNGOLD)	-0.113815	0.049768	-0.108174	
	(0.09643)	(0.04367)	(0.03789)	
D(LNWTI)	-0.328663	-0.005477	-0.115487	
	(0.14764)	(0.06685)	(0.05800)	
D(LNCPO)	-0.305623	-0.090720	0.026477	
	(0.14913)	(0.06753)	(0.05859)	

4 Cointegrating Equation(s):		Log likelihood	715.0848	
Normalized cointegrating coefficients (standard error in parentheses)				
LNEXR	LNKLCI	LNGOLD	LNWTI	LNCPO
1.000000	0.000000	0.000000	0.000000	0.692949
				(0.15895)
0.000000	1.000000	0.000000	0.000000	-0.013363
				(0.20849)
0.000000	0.000000	1.000000	0.000000	-0.681513
				(0.21132)
0.000000	0.000000	0.000000	1.000000	-0.958354
				(0.33556)
Adjustment coefficients (standard error in parentheses)				
D(LNEXR)	-0.122616	0.056612	-0.025821	-0.049090
	(0.04925)	(0.02019)	(0.02776)	(0.02254)
D(LNKLCI)	0.063784	-0.099262	0.023647	0.032209
	(0.06461)	(0.02649)	(0.03642)	(0.02956)
D(LNGOLD)	-0.192716	0.069476	-0.178047	-0.092368
	(0.11056)	(0.04532)	(0.06232)	(0.05059)
D(LNWTI)	-0.191457	-0.039748	0.006019	-0.188505
	(0.16859)	(0.06911)	(0.09503)	(0.07714)
D(LNCPO)	-0.387650	-0.070232	-0.046165	-0.066076
	(0.17224)	(0.07061)	(0.09709)	(0.07881)

Appendix 4.72: Granger Causality Test Result

Pairwise Granger Causality Tests
Date: 06/20/16 Time: 21:41
Sample: 1 81
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LNFKLI does not Granger Cause LNEXR	80	3.22563	0.0764
LNEXR does not Granger Cause LNFKLI		0.31418	0.5768
LNKLCI does not Granger Cause LNEXR	80	3.10713	0.0819
LNEXR does not Granger Cause LNKLCI		0.09443	0.7595
LNGOLD does not Granger Cause LNEXR	80	0.26595	0.6075
LNEXR does not Granger Cause LNGOLD		1.18239	0.2803
LNWTI does not Granger Cause LNEXR	80	1.85765	0.1769
LNEXR does not Granger Cause LNWTI		1.10066	0.2974
LNCPO does not Granger Cause LNEXR	80	4.17856	0.0444
LNEXR does not Granger Cause LNCPO		0.90472	0.3445
LNKLCI does not Granger Cause LNFKLI	80	0.57398	0.4510
LNFKLI does not Granger Cause LNKLCI		0.04989	0.8238
LNGOLD does not Granger Cause LNFKLI	80	0.29639	0.5877
LNFKLI does not Granger Cause LNGOLD		0.56356	0.4551
LNWTI does not Granger Cause LNFKLI	80	2.58989	0.1116
LNFKLI does not Granger Cause LNWTI		1.47097	0.2289
LNCPO does not Granger Cause LNFKLI	80	0.51600	0.4747
LNFKLI does not Granger Cause LNCPO		3.60280	0.0614
LNGOLD does not Granger Cause LNKLCI	80	0.12101	0.7289
LNKLCI does not Granger Cause LNGOLD		0.55992	0.4566
LNWTI does not Granger Cause LNKLCI	80	1.68773	0.1978
LNKLCI does not Granger Cause LNWTI		1.35574	0.2479
LNCPO does not Granger Cause LNKLCI	80	0.18076	0.6719
LNKLCI does not Granger Cause LNCPO		3.66134	0.0594
LNWTI does not Granger Cause LNGOLD	80	0.16703	0.6839
LNGOLD does not Granger Cause LNWTI		0.01643	0.8983
LNCPO does not Granger Cause LNGOLD	80	0.85250	0.3587
LNGOLD does not Granger Cause LNCPO		0.40732	0.5252
LNCPO does not Granger Cause LNWTI	80	1.93186	0.1686
LNWTI does not Granger Cause LNCPO		0.16397	0.6867

Appendix 5.1 1-month Changes in Gold Price from 02/09/2011 to 30/09/2011

Appendix 5.2 The movement of SGD/MYR from 02/09/2011 to 30/09/2011

Date	Price	Open	High	Low	Change %
Sep 30, 2011	2.4528	2.4573	2.4574	2.4528	**-0.18%**
Sep 29, 2011	2.4573	2.4522	2.4573	2.4515	**0.21%**
Sep 28, 2011	2.4522	2.4542	2.4554	2.4522	**-0.08%**
Sep 27, 2011	2.4542	2.4584	2.4586	2.4542	**-0.17%**
Sep 26, 2011	2.4584	2.4424	2.4584	2.4423	**0.69%**
Sep 23, 2011	2.4416	2.4104	2.4416	2.4076	**1.29%**
Sep 22, 2011	2.4104	2.4543	2.4581	2.4104	**-1.79%**
Sep 21, 2011	2.4543	2.4740	2.4745	2.4543	**-0.80%**
Sep 20, 2011	2.4740	2.4675	2.4740	2.4578	**0.26%**
Sep 19, 2011	2.4675	2.4968	2.4971	2.4675	**-0.74%**
Sep 16, 2011	2.4860	2.4834	2.4860	2.4830	**0.10%**
Sep 15, 2011	2.4834	2.4714	2.4834	2.4651	**0.49%**
Sep 14, 2011	2.4714	2.4663	2.4714	2.4661	**0.21%**
Sep 13, 2011	2.4663	2.4528	2.4663	2.4510	**0.55%**
Sep 12, 2011	2.4528	2.4601	2.4603	2.4528	**0.11%**
Sep 09, 2011	2.4501	2.4714	2.4718	2.4501	**-0.86%**
Sep 08, 2011	2.4714	2.4653	2.4714	2.4651	**0.25%**
Sep 07, 2011	2.4653	2.4638	2.4653	2.4638	**0.06%**
Sep 06, 2011	2.4638	2.4682	2.4684	2.4638	**-0.18%**
Sep 05, 2011	2.4682	2.4663	2.4682	2.4659	**0.27%**
Sep 02, 2011	2.4616	2.4838	2.4907	2.4616	**-0.89%**