AN EMPIRICAL INVESTIGATION OF RINGGIT MALAYSIA

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ABSTRACT

This study investigates factors that influence the Malaysian exchange rate using quarterly data from 1996Q1 to 2015Q2. The Johansen-Juselius cointegration test is used to assess the long run equilibrium relationship between the Malaysian exchange rate, government consumption, trade openness and net foreign assets. The long run VECM results indicate that the government consumption, the trade openness and the net foreign assets are the factors that significantly influence the Malaysian exchange rate. The government consumption and the trade openness have negative relationships with the Malaysian exchange rate, while the net foreign assets is found to have a positive influence on the Malaysian exchange rate. This study provides insights for the policy maker to justify the factors that influence the exchange rate and use the factors as a channel to influence the Malaysian exchange rate. Results of this study enhance existing limited knowledge of the exchange rate study using the BEER model in determining factors that influence the Malaysian exchange rate, and the period of study covers a number of situation where the Malaysian exchange rate had a significant drop in value.

Keywords: Exchange rate, BEER model, cointegration, variance decomposition

ABSTRAK

Kajian ini mengkaji faktor-faktor yang mempengaruhi kadar tukaran Malaysia dengan menggunakan data suku tahunan dari 1996Q1 hingga 2015Q2. Ujian kointegrasi Johansen-Juselius digunakan untuk mengkaji hubungan ekuilibria jangka panjang antara kadar tukaran Malaysia, perbelanjaan kerajaan, keterbukaan dagangan dan aset asing bersih. Dapatan jangka panjang VECM menunjukkan bahawa perbelanjaan kerajaan, keterbukaan dagangan dan aset asing bersih merupakan faktor yang signifikan dalam mempengaruhi kadar tukaran Malaysia. Perbelanjaan kerajaan dan keterbukaan dagangan mempunyai hubungan negatif dengan kadar tukaran Malaysia, manakala aset asing bersih mempunyai hubungan yang positif dengan kadar tukaran Malaysia. Kajian ini membantu pembuat polisi dalam mengenal pasti faktor-faktor yang mempengaruhi kadar tukaran dan menggunakan faktor-faktor tersebut sebagai salah satu kaedah untuk mempengaruhi kadar tukaran Malaysia. Dapatan kajian ini meningkatkan lagi pengetahuan sedia ada berkaitan dengan penggunaan model BEER dalam menentukan faktor-faktor yang mempengaruhi kadar tukaran Malaysia di samping tempoh kajian meliputi keadaan di mana kadar tukaran Malaysia mengalami kejatuhan nilai yang signifikan.

Kata kunci: kadar tukaran, model BEER, kointegrasi, penguraian varians

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
BEER	behavioural equilibrium exchange rate
BNM	Bank Negara Malaysia
B-S effect	Balassa-Samuelson effect
CCR	Canonical Cointegrating Regressions test
CNER	rate of change in nominal exchange rate
DEER	desired equilibrium exchange rate
DR	real interest rate differential
ECM	error correction mechanism approach
ERER	equilibrium real exchange rate
FEER	fundamental equilibrium exchange rate
GDP	Gross Domestic Product
GOV	government consumption
INVGDP	ratio of investment to GDP
LOOP	law of one price
NATREX	natural rate of exchange
NEER	nominal effective exchange rate
NFA	net foreign assets
NFI	net income from foreign countries
NKI	net foreign capital inflow
O	real oil price
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
OPEN	trade openness
PD	productivity differential
PEER	permanent equilibrium exchange rate
PPP	purchasing power parity

PROD	productivity differential
R	real interest rate differential
RCG	ratio of government consumption to GDP deflator
REER	real effective exchange rate
RER	real exchange rate
RES	difference between the changes in reserve
RESBAL	resources balance
RIRD	real interest rate differential between domestic and world real interest rate
RM/MYR	Ringgit Malaysia
SGD	Singapore dollar
TB	trade balance
TOT	terms of trade
UECM	unrestricted error correction model
UIP	uncovered interest rate parity
USD	U.S dollar
VECM	Vector Error Correction Model
RD	reserve differential
DOLS	Dynamic Ordinary Least Square

CHAPTER 1

INTRODUCTION

1.0 Background of the Study

Exchange rates play a significant role in international trade transactions and investment (Doidge, Griffin and Williamson, 2006). An exchange rate is the price of a currency against another currency. Foreign exchange rate can be expressed in direct and indirect quotations. Direct quote is defined as domestic currency per unit of foreign currency while indirect quote is defined as foreign currency per unit of domestic currency. Likewise, an exchange rate can further be divided into nominal effective exchange rate (NEER) and real effective exchange rate (REER). NEER is the exchange rate value against a weighted average of the country's trading partners' currencies while REER is the inflation adjusted NEER by country's trading partners' currency index in international market (Kakkar and Yan, 2014). REER that made up of average real exchange rate (RER) between trading partner's countries according to trade shares can be used to measure the exchange rate misalignment (Cat ão, 2007).

Foreign exchange market is a form of global decentralized made up of supply and demand of currencies (Ickes, 2006; Sharma and Rai, 2014). Foreign exchange market that work twenty-four hours in seven days is the largest financial market in the world (Eun and Resnick, 2014). It facilitates the transfer of purchasing power, finances international trade and minimizes foreign exchange risk. The foreign exchange market is made up of two tiers: the wholesale market and the retail market which can be segregated into international banks,

bank customers, nonbank dealers, central banks and foreign exchange brokers (Eun and Resnick, 2014). Moreover, the foreign exchange market can further be separated into the spot market and the forward market. The spot market involves immediate transaction or spot basis transaction, while, the forward market involves derivative transactions.

Exchange Rate Regime Classifications

There are a number of exchange rate regime classifications. Generally, the exchange rate regimes can be classified as float, fix and intermediate. Specifically, they can also be categorized as regime of exchange arrangements with no separate legal tender (dollarization), currency board arrangements, other conventional fixed peg arrangements, pegged exchange rates within horizontal bands, crawling pegs, exchange rates within crawling bands, managed floating with no predetermined path for the exchange rate and independently floating (IMF, 2004). The pegged exchange rate system is the regime where a country's currency is fixed to another currency; majority countries which adopt pegged exchange rate system pegged the country currency to the U.S Dollar (USD) or a currency index. This regime does not allow a country's exchange rate to fluctuate or the exchange rate can fluctuate within a small range. The free floating currency system is the regime where the currency is allowed to float freely according to the demand and supply of the market. Managed float or "dirty float" exchange rate system is the condition where the currency is allowed to float according to the demand and supply of the market but within a specified range. If the exchange rate is out of the range, the government would directly or indirectly intervene the foreign exchange market to bring the exchange rate back to the desired range. The intervention can be done through buying and selling of foreign exchange

according to the foreign exchange rate policy of the country to influence the money supply thus control or influence the exchange rate (Sercu, 2009). An exchange rate regime adopted by a country is decided by how the central bank intervene in the foreign exchange market.

As the exchange rate regime influences the volume of capital flows, it affects the response of local currency interaction to the global economy situation (Eichengreen and Hausmann, 1999). Since the breakdown of the Bretton Woods system in the early 1970s, the appropriate exchange rate regime that should be adopted by a country is the key debate for a country policy maker (Ghosh and Ostry, 2009; Khouja, 2015).

Malaysian Exchange Rate Regime

Prior to the 1997 Asian financial crisis, the Malaysian ringgit was traded as a free float currency and on average the exchange rate was RM2.50 to USD 1. Due to the 1997 Asian financial crisis, the exchange rate dropped to RM4.06 to USD 1 in the third quarter of 1998. In order to prevent further depreciation of the Malaysian ringgit, the Malaysian government decided to peg RM to US dollar at RM3.80/USD starting 1st September 1998 which was then lifted in July 2005. In addition, Bank Negara Malaysia had also taken other measures and policies to reduce the contagion risk and adverse effect which included limiting the fund transfer of external accounts, allowing the ringgit Malaysia to be transacted only through authorized depository institutions, minimizing the use of ringgit Malaysia for trade settlement and limiting the currency held by travelers (BNM Press Statement, 1st September 1998).

On July 22, 2005, the Malaysian government had decided to adopt managed float exchange rate regime. The Malaysian ringgit value will be determined by economic fundamentals and monitored by Bank Negara Malaysia against a basket of currencies which made up of Malaysia's major trading partners. The changes of exchange rate regime was encouraged by the changes in the international and regional financial and economic environment as well as the important to have a stable exchange rate for Malaysia (BNM Press Statement, 22nd July 2005). Malaysia continues to adopt managed float exchange rate regime until today.

1.1 Problem Statement

Since Malaysia lifted the pegged exchange rate regime on July 2005, ringgit Malaysia started to appreciate from 2005 Q3 to 2008 Q2 and started to depreciate again during the 2008 Global Financial Crisis. After the 2008 Global Financial Crisis, the ringgit Malaysia slowly appreciated and reached the peak on 2011 Q3 with RM3.05/USD. Yet, the ringgit Malaysia has been fluctuating along the period.

Ringgit started to depreciate against USD on 22nd May 2013 as the Federal Reserve's (Fed) began the indication to scale-back its asset purchase program. For the year 2013, the ringgit depreciated 6.8 percent against the USD, while the NEER of ringgit against the major trading partners depreciated by 2.2 percent (Monetary and Financial Conditions, 2013). As per OPEC's decision to maintain its target supply of oil on 28th November 2014, the prices of oil and other commodities fall further as the supply exceeded the demand. Ringgit appreciated from February to August 2014 due to the strength of the Malaysian economy,

but started to depreciate as investors unwind their position as prediction for US monetary policy and the slowdown of the global economic growth. In 2014, ringgit's NEER depreciated 0.6 percent against the major trading partners (Monetary and Financial Conditions, 2014). In summary, ringgit has been experiencing volatility according to the macroeconomic performance after adopting the managed floating exchange rate regime.

Past studies indicate that different regime has different effect on the country's inflation, growth and the probability of facing currency crisis. Besides, different exchange rate regime has differently affected the equilibrium and misalignment of exchange rate. Therefore, it is important to estimate and analyze the costs and benefit before adopting any exchange rate regime (Siregar, 2011). Emerging markets have the "fear of floating" or fear for large currency fluctuates, hence choose to adopt the managed float exchange rate regime (Calvo and Reinhart, 2002). On the other hand, the financial developed countries choose to adopt the floating exchange rate regime (Khouja, 2015). Different exchange rate regime has different monetary policy framework and direct impact on the general price level in a country. The fixed exchange rate regime can be used to sustain the inflation rate while strong financial performance encourage countries to adopt the float exchange rate regime (Ghosh and Ostry, 2009; Khouja, 2015).

Historical data indicates that the Malaysian ringgit fluctuate, generally depending on the Malaysian economic condition. The fluctuation can be in terms of appreciation or depreciation of the responsive currency. The appreciation of the exchange rate may hamper the economic growth while the depreciation of the exchange rate may encourage the

economy to grow (Razin and Collins, 1997). Meanwhile, the exchange rate fluctuation can weaken the exports, thus reduces the competitiveness of the country's export (Sidek, Yusoff, Duasa and Ghani, 2010). Either way, fluctuation especially extreme fluctuations are not favoured. The 1997 Asian financial crisis showed how a severe depreciation of ringgit brought a negative impacts to the Malaysian economy. Hence, the Malaysian Government decided to take various actions to manage the condition including pegging RM to USD at RM3.80 which took effect on Sept 1998. China had adopted the managed floating regime with reference to a basket of currencies on 21st July 2005 (Cui, 2014). The currencies' basket made up of USD, EUR, JPY, KRW, GBP, MYR, AUD, CAD, RUB, SGD and THB. Before this, China adopted the managed float exchange rate regime by pegging the RMB to USD with 0.3 percent daily fluctuation limit since 1994 (Goldstein and Lardy, 2006). On the same day, the Malaysia Government took a similar action by lifting its pegging regime and followed the action by China (BNM press statement, 22nd July 2005). In summary, Malaysia has been adopting a number of exchange rate regimes which it believes would be able to solve its economic condition.

The exchange rate risk can be divided into two types which are exchange rate misalignment and volatility of exchange rate (Sidek, Yusoff, Duasa and Ghani, 2010). Exchange rate misalignment is a situation which the actual real exchange rate (RER) is different from the ideal RER in a country (Aguirre and Calderon, 2008). The difference can be in terms of overvalued or appreciated from the ideal RER or undervalued or depreciated from the ideal RER. The equilibrium or ideal exchange rate can be estimated via six different approaches which are the purchasing power parity approach, the macroeconomic balance framework,

the purchasing power parity adjusted for the Balassa-Samuelson and Penn effects, the assessments of the competitiveness of the tradable goods sector, the assessment based on estimated exchange rate equations and the assessments based on general equilibrium models (Isard, 2007). On the other hand, the exchange rate volatility is defined as the risk related to the unexpected movement in the exchange rate (Ozturk, 2006).

There are several factors that determine the foreign exchange fluctuations. Past studies show that the level of output or productivity (Sidek and Yusoff, 2009; Jongwanich, 2009; Sharma and Rai, 2014), government consumption (Sidek and Yusoff, 2009), interest rate (Sharma and Rai, 2014), money supply (Sharma and Rai, 2014), terms of trade (Jongwanich, 2009), the openness of an economy (Jongwanich, 2009; Sharma and Rai, 2014) and net foreign assets (AbuDalu and Ahmed, 2013) have a significant impact on the foreign exchange volatility.

Prominent Balassa-Samuelson provides some explanation about the relationship between RER and productivity performance of traded and nontraded goods (Choudhri and Khan, 2004). Level of output or productivity can be represented by the GDP per capita, the GDP per worker and the labour productivity. According to the Balassa-Samuelson effect that is based on the Law of One Price, there is a significant relationship between RER and productivity. The productivity increase of the domestic country with respect to the foreign country strengthens the domestic exchange rate (Choudhri and Khan, 2004; MacDonald and Ricci, 1998). Meanwhile, other studies indicate that the effect of productivity on RER

is not uniformed across countries, the effect depends on stages of economic development (Mohamad, Jusoff, Nair and Zaghlol, 2007).

The government consumption or the government expenditure that can be divided into physical and monetary policy is a tool for the government to influence the economic activities of a country (Phua, 2014). Since the government consumption focuses on non-tradable goods and services, the increase in the government consumption increases the relative price of non-tradable goods and services, hence causes the exchange rate to appreciate (Balvers and Bergstrand, 2002). Besides the government consumption, the government investment also has impact on the RER, depending on the sector (Galstyan and Lane, 2009). Past study shows that the government consumption plays an important role in determining the RER in Singapore, Korea and Malaysia (Jongwanich, 2009). On the contrary, the positive shock from the government expenditure is also found to increase the output productivity which then encourages consumption, consequently deteriorates the trade balance and causes a depreciation on the RER (Ravn, Schmitt-Grobe and Uribe, 2012). In addition, the exchange rate may also depreciate given an increase in the government investment if the productivity expansion is concentrated in the non-tradable sector (Galstyan and Lane, 2009).

The interest rate can be divided into interest rate differential between countries and domestic interest rate. Interest rate differential indicates factors of aggregate demand, productivity, and insistent monetary strategy. The increase of interest rate may increase the demand for tradable and non-tradable goods, then encourage increase of the price of non-

tradable goods; which appreciate the exchange rate (MacDonald and Ricci, 2003). The condition in the domestic money market determines the domestic interest rate (Dornbusch, 1976). Higher domestic interest rate encourages the inflow of foreign capital and leads to the appreciation of currency (Sharma and Rai, 2014). There was a strong relationship between the interest rate and the real exchange rate in Australia after Australia chose to adopt the floating exchange rate regime (Gruen and Wilkinson, 1994).

Changes in the money supply create shocks on the exchange rate. According to Dornbusch overshooting theory, an increase in the money supply or monetary expansion would not affect the exchange rate in the short run, but the exchange rate would depreciate in the long run (Tu and Feng, 2009; Dornbusch, 1976). Previous study shows that Malaysian REER has been affected by the domestic money supply in the short run and long run (Abudalu and Ahmed, 2014).

Terms of trade or the commodity price movement is the ratio between export to import prices of a country (Sharma and Rai, 2014; Eita and Sichei, 2014; Jongwanich, 2009; Reinsdorf, 2009; MacDonald and Ricci, 2003; Broda, 2002). A country's term of trade can be improved when the export price exceeds the import price. Improvement in the terms of trade increases the country's income thus increases the demand for domestic currency, hence, the real exchange rate appreciates (Coudert, Couharde and Mignon, 2008). There was a strong relationship between the terms of trade and foreign exchange rate in Australia (Choudhri and Khan, 2004; Gruen and Wilkinson, 1994). Shock of terms of trade has

greater (smaller) impact on the exchange rate volatility in a more flexible (rigid) exchange rate regimes (Broda, 2002).

Trade openness of an economy relates to the trade policy and financial policy of a country. Greater trade liberalization provided for foreign investors encourages demand for goods and services (Jongwanich, 2009). On the contrary, greater trade liberalization decreases the demand for domestic tradable goods thus lowers the price of domestic tradable goods, then causes the exchange rate to depreciate (MacDonald and Ricci, 2003). The Malaysian foreign exchange is influenced by portfolio and trade flows of domestic and international transactions (Monetary and Financial Condition, 2013). Previous studies show that trade openness reduces the influence of nominal and real shocks on the volatility of RER (Calderon and Kubota, 2009; Hau, 1999). In contrast, there are studies also that indicate that the financial openness can increase the volatility of RER (Calderon and Kubota, 2009).

The net foreign assets is the total foreign asset owned by a country minus the domestic asset owned by foreigners. Another definition for net foreign assets are the sum of foreign assets hold by the banking system minus the foreign liabilities of the banking system (The World Bank, n.d). The net foreign assets decreases when the current account deficits. On the contrary, the surplus of current account increases the net foreign assets. In order to balance the current account, the real exchange rate depreciates to encourage the trade surplus. So, the increase of the net foreign assets leads to the appreciation of real exchange rate in the medium run and long run (Cahyono, 2008; MacDonald and Ricci, 2003).

Another view on the net foreign assets is about the flow of capital. The increase of the capital inflow causes the exchange rate to appreciate and vice versa (Sidek, 2011).

The foreign exchange volatility measures the dispersion of the foreign exchange price. The understanding of volatility enables a policy maker to adjust monetary policy while traders and investors have better risk management on investment (Erdemlioglu, Laurent and Neely, 2012). Practically, the understanding about the determinants of foreign exchange rates helps manage the foreign exchange misalignment and foreign exchange volatility.

1.2 Research Questions

Fluctuations of the exchange rate have a significant impact on certain economic variables and these fluctuations raise a number of questions to be answered. Among them include:

1. What are the factors that influence the volatility of the Malaysian bilateral exchange rate of RM against US dollar?
2. How these factors affect the exchange rate performance in the short run and in the long run?

1.3 Research Objectives

This study highlights the following research objectives which are:

1. To identify the factors that influence the Malaysian bilateral exchange rate of RM against USD.
2. To describe how the factors affect the Malaysian exchange rate performance in the short run and in the long run.

3. To provide insight for the policy makers regarding the factors that have influence on the Malaysian exchange rate.

1.4 Significance of the Study

Foreign exchange rate plays a crucial role in the economy. It affects import, export, inflation rate and balance of payment of a country. Since the exchange rate fluctuates, the impact can be positive or negative. The capability to identify the factors that affect the Malaysian exchange rate provides a channel for the policy maker to revise existing policy or may be examining the suitability of the existing regime. In addition, this study should be able to expand existing knowledge regarding the factors that affect the Malaysian exchange rate. Furthermore, the period of study covers until the period of 2015 Q2 which is not yet being studied.

1.5 Scope of the Study

This study examines the factors that affect the foreign exchange rate of Malaysia using the bilateral exchange rate of MYR against USD from 1996 Q1 to 2014 Q4. The data is collected from the Thomson Reuter DataStream.

1.6 Organization of the Study

This study is arranged as follows. Chapter one contains background of the study, problem statement, research questions, research objectives, significance of the study, scope of the study and organization of the study. Chapter two reviews theoretical and empirical literature regarding the study. Chapter three discusses the research methodology adopted

for this study. Chapter four and chapter five explain and discuss the results, and conclude and provide recommendation for future study respectively.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

As the exchange rate plays a significant role in the economy, it is important for us to discuss the theoretical and empirical literature of the exchange rate. For the theoretical literature part, it is made up of theories on exchange rate which can be divided into real exchange rate, purchasing power parity, uncovered interest rate parity model, monetary approach and model based theories. As the real exchange rate theory, the purchasing power parity model, the uncovered interest rate parity model and the monetary approach are unable to capture all economic variables, the model based theories has been developed to estimate the equilibrium exchange rate based on time horizon. The model based theories are developed based on macroeconomic variables. Meanwhile, the model based theories can be categorized as the fundamental equilibrium exchange rate (FEER), the desired equilibrium exchange rate (DEER), the behavioural equilibrium exchange rate (BEER), the permanent equilibrium exchange rate (PEER) and the natural rate of exchange (NATREX). All these models will be discussed in details as these models provide insight for the factors that influence the exchange rate. The following sub-topic discusses empirical literature of previous studies.

2.1 Theoretical Literature on Exchange Rate

The concept of equilibrium exchange rate is developed from different opinion. According to Isard and Faruqee (1998), opinions on equilibrium exchange rate can be divided into three groups. The first group considers the exchange rate is always in equilibrium as the

foreign exchange market and the exchange rate reflect the macroeconomic situation. On the other hand, the second group assumes that the exchange rate misalignment exists but cannot be measured. Lastly, the third view is the one shared by those estimating equilibrium exchange rate which considers the exchange rate misalignment can be measured and the exchange rate misalignment in the medium run is not a source of focus. The third view only considers the exchange rate misalignment under an economic policy (Costa, 2005).

The policy maker is interested to measure the equilibrium levels of exchange rate as misalignment in the exchange rate influences the price for consumers and producers. The real exchange rate misalignment has a negative impact on the export performance of a country and reduces the profit in the tradable goods sector (Oriavwote and Oyovwi, 2012; Sidek, 2011; Jongwanich, 2009). Additionally, misalignment in the exchange rate affects the economic growth of a country and a persistent overvaluation of the exchange rate is a warning for the currency crisis (Mohamad, 2004).

Market equilibrium exchange rate is the equilibrium between supply and demand of currency without intervention (Williamson, 1983). Driver and Westaway (2004) separate the equilibrium exchange rate according to the time horizon. The short-run equilibrium is the exchange rate that occurs when the fundamental determination is at the current economic situation without an unexpected shock. The short-run equilibrium is also called a current equilibrium exchange rate (Williamson, 1983). On the other hand, the medium-run equilibrium is the exchange rate that is based on the internal balance (a situation which

the output is at potential level and with zero inflation rate) and external balance (a situation where the existing capital movement is stable in the sense that the adjustment of capital is towards the long run equilibrium) of the economy. Last but not least, the long-run equilibrium is defined as an equilibrium that occurs when there is no changes in all agents of the economy. Isard (2007) reveals six different approaches to estimate equilibrium exchange rates. The six different approaches are purchasing power parity, purchasing power parity adjusted for Balassa-Samuelson and Penn effects, two variants of the macroeconomic balance framework, assessments of the competitiveness of the tradable goods sector, assessment based on estimated exchange equations and assessments based on general equilibrium models. On the other hand, Driver and Westaway (2004) classify the exchange rate equilibrium approach into purchasing power parity (PPP) model, uncovered interest parity, Balassa-Samuelson model for short-run equilibrium estimation; underlying model that is based on internal and external balance such as FEER for the medium-run equilibrium and PEER and NATREX for the long-run equilibrium model. Since there are numerous approaches to estimate equilibrium exchange rate, the selection method should be based on the scope of issue such as the time horizon and economy situation of a country (Siregar, 2011).

2.1.1 Real Exchange Rate

According to Siregar (2011), the real exchange rate (RER) is defined as the nominal exchange rate multiplied by the foreign price level and divided by the domestic price level. The nominal exchange rate is the unit of domestic currencies per unit of foreign currency. In order to explain the RER using the Purchasing Power Parity (PPP), the price of RER

need to be divided into tradable and non-tradable goods. The PPP explains the fluctuation of exchange rate driven from tradable goods and the ratio of domestic to foreign relative price of tradable and non-tradable goods. Edward (1989) defines RER as the relative price of non-tradable to tradable goods. There are several approaches to explain and estimate the equilibrium exchange rate, different exchange rate determinants create different real equilibrium exchange rate according to time horizon.

2.1.2 Purchasing Power Parity (PPP)

The purchasing power parity (PPP) hypothesis is one of the fundamental topics in international finance. Taylor and Taylor (2004) presents the purchasing power parity (PPP) founded by Cassel (1916) as a theory about the same purchasing power between currencies which can be explained as the nominal exchange rate between two currencies which is equal to the ratio of aggregate price levels between the two countries. The idea behind PPP is the parity in purchasing power and the Law of One Price (LOOP). LOOP indicates that the same goods should have the same price across countries in the world. Under the PPP theory, the equilibrium exchange rate is determined by the price levels, thus the real exchange rate in common currency is always constant and equals to one (Siregar, 2011; Driver and Westaway, 2004; Dornbusch and Krugman, 1976). The PPP can be divided into an absolute PPP and a relative PPP. The absolute PPP is determined by the ratio of domestic to foreign price, while the relative PPP is the percentage change in the exchange rate is equal to the difference in inflation rates of the two countries (Cao and Ong, 1981).

When LOOP fails to hold, the absolute PPP also does not hold. Furthermore, the existence of shipping costs, inadequate information, tariffs and other restraints on trade, duties, tax differences across countries, the presence of non-traded goods and services, relative price changes, resources controls, differential speeds of corrections in the currency exchange and goods markets, pricing rule and nontariff barriers cause the absolute PPP not to hold (Cao and Ong, 1981; Siregar, 2011; Taylor and Taylor, 2004).

Even if the LOOP holds, the absolute PPP may fail to hold when there are differences in relative productivities of tradable versus non-tradable sectors between local and foreign economies, the consumer's preference in different countries, goods that are only traded locally and the country's specialization in producing only one good (Driver and Westaway, 2004). This is referred as Balassa-Samuelson (B-S) effect. The B-S explains the long-run behaviour of real exchange rate in terms of productivity performance of tradable and non-tradable goods, as the productivity of the tradable goods increases relative to the non-tradable goods, the real exchange rate appreciates (Choudhri and Khan, 2004). In contrast, when the productivity in the tradable goods is lower in the domestic country compared to the foreign country, the domestic currency depreciates (Siregar, 2011).

2.1.3 Uncovered Interest Parity Model (UIP)

An uncovered interest parity (UIP) is another price based theory. The UIP assumes the equilibrium exchange rate is based on the interest rate differential between two countries, and it is suitable to estimate the short-run equilibrium. Under the UIP, the RER is based on the expected interest rate differential and risk premium (Driver and Westaway, 2004;

Edison and Melick, n.d.). Driver and Westaway (2004) also argue that the UIP is only able to explain the adjustment of the RER according to the interest rate differential but unable to determine the exchange rate. The exchange rate level needs to be determined by other factors. Problems with the UIP are the risk premium is hard to observe and the interest rate differential is often not in the correct sign (Driver and Westaway, 2004).

2.1.4 Monetary Approach

The estimation of the equilibrium exchange rate using the monetary approach is an extension of the PPP real exchange rate as there are limitations in the PPP hypothesis. The monetary approach explains the movement of the nominal exchange rate as being determined by the money supply, output, income level and nominal interest rate in a domestic country relative to a foreign country (Stavarek, 2013; Siregar, 2011; Driver and Westaway, 2004). Opposite to the PPP approach, the relative prices of goods play a minor role in estimating the equilibrium exchange rate (Boughton, 1988). The monetary approach is based on the assumptions of perfect capital mobility where the PPP and the uncovered interest parity hold (Cao and Ong, 1981). A study by Cao and Ong (1981) shows that the monetary approach is unable to explain the movements of exchange rate between SGD and USD from 1978 to 1993. Because of that, the authors believe that the monetary approach cannot be applied on Singapore as the theory seems to apply for economies that have huge monetary shocks.

2.1.5 Model Based Theory

Non-monetary approaches or model based theory for equilibrium exchange rate refers to the portfolio-balance model (Boughton, 1988). The equilibrium exchange rate estimated by the model based theory is known as the equilibrium real exchange rate (ERER). The model based approaches can be divided into two groups which are the structural approaches and direct approaches. The structural approaches are based on a macroeconomic model, and the ERER is the solution for the model in the situation of internal and external balance. Under direct approaches, the equilibrium exchange rate is estimated by an equation for the real exchange rate as its fundamental factors are composed based on statistical or economic techniques. FEER is under structural approaches while BEER and PEER are under direct approaches (Costa, 2005).The ERER is defined as the value that is consistent with the dual objectives of external and internal balances (Nurkse, 1945). An internal balance is a low inflation environment with full employment productivity whereas an external balance is the stability level of saving minus current account in medium to long term (Driver and Westaway, 2004).

Fundamental Equilibrium Exchange Rate (FEER)

Besides the PPP approach and the monetary approach to estimate the equilibrium exchange rate, there are other factors that affect the equilibrium exchange rate. In order to measure other factors, Williamson (1983) explores the concept of fundamental equilibrium exchange rate (FEER). Wren-Lewis (1992) defines FEER as a method to estimate the RER using the medium-run macroeconomic equilibrium. Basically, the FEER is based on internal and external balances and has been classified as the medium-run exchange rate

model. The external balance under FEER is defined as the sum of the current account and the net inflows of stable capital. The FEER approach identifies that the equilibrium exchange rate is not fixed and varies across time. Similar to the PPP and the monetary approach, the FEER approach has certain limitations in estimating the exchange rate misalignment as it heavily depends on the trade elasticity and the fluctuations on the returns on foreign assets.

Desired Equilibrium Exchange Rate (DEER)

Basically, the desired equilibrium exchange rate (DEER) is nearly similar to the FEER in which they are based on internal and external balances and they are suitable to be used to estimate the medium term horizon exchange rate of four to six years. The DEER estimation method is similar to the FEER method in which they are based on the domestic output, foreign output and real exchange rate. The DEER is useful to estimate different equilibrium exchange rates under different set of current account and external balance hypothesis. (Siregar, 2011).

Behavioural Equilibrium Exchange Rate (BEER)

Apart from the FEER, the behavioural equilibrium exchange rate (BEER) approach is estimated based on the estimation of an equation for the equilibrium exchange rate, as a function of its fundamental factors (Eita and Sichei, 2014; Costa, 2005). Generally, the BEER is estimated using the Johansen's cointegration analysis. The BEER is different from the FEER as it assumes that the economic is not necessarily at full employment productivity, furthermore the BEER is based on the concept of uncovered interest rate

parity (UIP). The underlying assumption of BEER is that it suits to estimate the short term horizon exchange rate in the real UIP condition (Driver and Westaway, 2004). The BEER approach determines the RER based on the long-run economic fundamentals and short-run interest rate differentials. Clark and MacDonald (1999) recognize five variables under the BEER approach which are terms of trade or the ratio of unit value export to unit value of imports, the relative price of tradable to non-tradable goods, net foreign assets as Gross National Product (GNP), the risk premium and the ratio between foreign and domestic debt.

Permanent Equilibrium Exchange Rate (PEER)

The misalignment exchange rate estimate using the BEER is known as the current misalignment rate since the equilibrium exchange rate is estimated based on the prevailing level of economic fundamentals. As economic fundamentals vary from sustainable level, the BEER has been extended into a permanent equilibrium exchange rate (PEER) by estimating the equilibrium exchange rate based on long-run sustainable levels of identified economic fundamentals. The different between RER and estimation exchange rate of PEER is identified as total misalignment. The PEER focuses on understanding the shock of misalignment originated from temporary shocks or permanent shocks (Siregar, 2011).

Natural Rate of Exchange (NATREX)

Natural rate of exchange rate (NATREX) is defined as the rate that would occur if speculative and cyclical factors can be removed and unemployment rate is at the nature rate (Stein, 1994). The natural rate of unemployment rate is the equilibrium of labour market in the long run (Investopedia, n.d.). The NATREX measures the medium-run

equilibrium under some conditions in which the domestic market is clear where the cyclical and short-run speculative capital flows have been cancelled and the excess flows of long-run securities are represented by the difference between investment and saving. The medium-run equilibrium exchange rate measured by the NATREX is parallel to the targeted balance of payment or the macroeconomic balance (Siregar, 2011). NATREX is suitable to measure the exchange rate misalignment as it does not need the actual and real exchange rate to be stationary and it takes into consideration real economic activities that involve all amendments made by the basic real macroeconomic fundamentals (Ahmad, Yusop and Masron, 2010). The basic independent variables for NATREX is the investment, saving and flows of external debt and capital which can be represented as the government consumption, productivity and terms of trade (Fida, Khan and Sohail, 2012).

2.2 Empirical Literature

Eita and Sichei (2014) examine the real exchange rate (RER) in Namibia (a country in South Africa) using quarterly data from 1998 to 2012. The authors adopt Johansen and Vector Error Correction Model (VECM) to estimate the real exchange rate. Their results suggest that the Namibia's RER that is estimated based on the behavioural equilibrium exchange rate (BEER) model is determined by the terms of trade (TOT), ratio of investment to GDP (INVGDP) and resources balance (RESBAL). The ratio of investment to GDP and resources balance have negative relationship with real exchange rate while terms of trade has a positive relationship with the real exchange rate in Namibia. The increases of the ratio of investment to GDP and the resources balance cause the RER to appreciate, while the increase of terms of trade causes the RER to depreciate.

Likewise, Sidek (2011) studies the Malaysian equilibrium real exchange rate (ERER) using quarterly data from 1991 first quarter to 2008 third quarter. The ERER is estimated by the behavioral equilibrium exchange rate (BEER) model. The author finds that the productivity differentials, government spending, trade openness and net foreign assets determine the Malaysian ERER. The variables are cointegrated in the long run, and the productivity differential and openness have positive influence on the exchange rate, while the government spending and net foreign assets have negative relationships with the exchange rate. The increase of the productivity differential and openness cause the ERER to depreciate, whereas the increase of government spending and net foreign assets cause the ERER to appreciate. Subsequently, another study by Sidek and Yusoff (2009) also concludes that the productivity differential, government consumption, openness and net foreign assets are important determinants of the short term Malaysian REER. The increase in the productivity differential and openness appreciate the exchange rate whereas the increase in the government consumption and the net foreign assets depreciate the exchange rate.

In addition, Cahyono (2008) examines the equilibrium real exchange rate (ERER) in Indonesia using the behavioural equilibrium exchange rate (BEER) model. The study is conducted using quarterly data from 1999 to 2006. By using cointegration approach and error correction mechanism approach (ECM), the author identifies the Balassa-Samuelson effect (TNT) which is proxied by the relative price of non-tradable to tradable goods and net foreign assets (NFA) as the determinants of Indonesia ERER. These two variables have

positive relationships with the ERER in Indonesia. The increase of the Balassa-Samuelson effect and net foreign assets depreciate the Indonesian real exchange rate.

Similarly, MacDonald and Dias (2007) use the behavioural equilibrium exchange rate (BEER) approach to examine the real effective exchange rate (REER) in ten emerging countries. The REER is estimated by the BEER approach found by Clark and MacDonald (1999) using quarterly data from 1988 first quarter to 2006 first quarter. The REER is determined by the trade balance (tb), real interest rate differential (r), terms of trade differential (toft) and productivity differential (prod). The trade balance is found to have a significant negative coefficient among the ten countries. Alternatively, the terms of trade differential, interest rate differential and productivity differential have mixed results among the ten countries. The increase of the trade balance causes the exchange rate to appreciate.

In a different study, Mohamad (2004) examines the real exchange rate (RER) using the equilibrium real exchange rate (ERER) approach for the South East Asian countries. The RER is estimated based on an unrestricted error correction model (UECM) model from 1965 to 1998. Terms of trade (TOT), government consumption (GOV), trade openness (OPEN), productivity differential between tradable and non-tradable goods (PROD), net income from foreign countries (NFI), difference between the change in reserve (RES) and net foreign capital inflow (NKI) (DRNK), rate of change in nominal exchange rate (CNER) and macro indicator of monetary policy are used to estimate the RER for the four countries which is Malaysia, Indonesia, Thailand and Singapore. For Malaysia, the terms of trade, productivity differential, trade openness and net foreign capital inflow are significant

factors for the Malaysian exchange rate. The productivity differential, trade openness and net foreign capital inflow have negative relationships with exchange rate, whereas the terms of trade has a positive relationship with the Malaysian exchange rate. The increase of productivity differential, trade openness and net foreign capital inflow appreciate the real exchange rate, meanwhile the increase of terms of trade depreciate the real exchange rate. Meanwhile, with similar variables as Mohamad (2004), Mohamad, Jusoff, Nair and Zaghlol (2008) examine the real exchange rate (RER) of Indonesia, Malaysia, Singapore and Thailand using the Balassa-Samuelson model. The researchers examine the Balassa-Samuelson model using the terms of trade (TOT), government consumption as a ratio of GDP (GNOV), trade openness (OPEN) and productivity (PROD), the difference between the change in ratio of change in reserve to GDP (RES) and ratio of net foreign capital inflows to GDP (NKI) and macro indicator of monetary policy as independent variables. For Malaysia, the terms of trade, productivity, trade openness and the difference between the RES and NKI are factors that influence the exchange rate. The productivity, trade openness and the difference between RES and NKI have negative relationships with exchange rate whereas the terms of trade has a positive relationship with exchange rate. The authors conclude that these countries' RERs do not comply with the Balassa-Samuelson model as the labour is cheaper in the services sector and the growth development of these countries do not tally with the productivity levels of their trading partners.

Besides the behavioural equilibrium exchange rate (BEER) approach, there are other studies conducted using the Balassa-Samuelson model. For instant, Kakkar and Yan (2014)

conduct a study on 15 OECD countries and China for the period of 1970 to 2006 to estimate the RER using the Canonical Cointegrating Regressions (CCR) test. The Balassa-Samuelson model shows that the productivity differential, long term interest rate differential and the real gold price have positive relationships with the RER. The authors suggest that the Balassa-Samuelson model is appropriate to capture the long-run relationship between the RER and economic fundamentals.

Also, Choudhri and Khan (2004) conduct study about the real exchange rates (RER) in 16 developing countries with panel data from 1976 to 1994. The study aims to measure the Balassa-Samuelson effect under different countries income levels. The terms of trade, the labour differential, the differential between tradable goods and non-tradable productivity differential have been selected as independent variables. Authors conclude that under the Balassa-Samuelson hypothesis, the terms of trade are significant determinant of RER in developing countries, meanwhile the labour differential also plays a significant role in determining the exchange rate as it affects the price on non-tradable goods.

There are some studies examining the equilibrium exchange rate using the natural rate of exchange rate (NATREX) approach. For instant, Ahmad, Yusop and Masron (2010) study the Malaysian real exchange rate (RER) with quarterly data from 1991 first quarter to 2009 fourth quarter. The study period is divided into pre-crisis (1991-1997) and post-crisis (1997-2002). The authors use the natural rate of exchange (NATREX) approach to estimate the RER, and then conclude that the ratio of government consumption to GDP deflator (RGC), the real interest rate differential between domestic and world real interest rate

(RIRD), terms of trade (TOT) and productivity index (PROD) are important determinants of the Malaysian ERER. The ratio of government consumption to GDP deflator and the real interest rate differential between domestic and world real interest rate have positive influence on the exchange rate whereas the terms of trade and productivity index have negative influence on the exchange rate. The increase of the ratio of government consumption to GDP deflator and the real interest rate differential between domestic and world real interest rate depreciate the exchange rate, while the increase of terms of trade and productivity index appreciate the exchange rate.

Besides Ahmad, Yusop and Masron (2010), Naseem, Tan and Hamizah (2009) also investigate the Malaysian real exchange rate (RER) using the natural rate of exchange (NATREX) approach. The study covers period from 1991 first quarter to 2003 fourth quarter using the Johansen multivariate cointegration test. The authors find that the ratio of government consumption to GDP deflator (RGC), real interest rate differential between domestic and world interest rate (RIDR), terms of trade (TOT) and productivity index (PROD) are determinants of the Malaysian RER. The ratio of government consumption to GDP deflator and real interest rate differential between domestic and world interest rate have negative impact on the real exchange rate. On the other hand, terms of trade and productivity index have positive impact on the real exchange rate. The increase of ratio of government consumption to GDP and real interest rate differential between domestic and world interest rate depreciate the exchange rate, whereas the increase of terms of trade and productivity index appreciate the exchange rate.

Instead of the BEER, the Balassa-Samuelson and the NATREX approaches, an ARDL approach has also been used to estimate the equilibrium exchange rate in Malaysia. Namely, Wong (2013) examines the equilibrium real exchange rate (ERER) in Malaysia using an annual data from 1971-2008. The results of the bound test show that the productivity differential (PD), real interest rate differential (DR), real oil price (O) and reserve differential (RD) are important determinants for Malaysian RER. The productivity differential, real interest rate differential, real oil price and reserve differential have negative relationships with the RER, which can be explained as an increment in these determinants may appreciate the RER.

Another study that focuses on Malaysia is performed by AbuDalu and Ahmed (2014). The authors use quarterly data from 1991 first quarter to 2006 second quarter to analyze the determinants of real effective exchange rate (REER) in ASEAN 5 countries. The ARDL approach shows that the foreign interest rate, money supply, inflation rate, net foreign assets, real gross domestic product and terms of trade are the determinants of the Malaysian REER. Foreign interest rate, money supply, inflation rate, real gross domestic product and terms of trade have positive relationships with the REER while the net foreign assets has a negative relationship with the REER. The authors conclude that in the short run, the money supply plays the most significant role in the REER under the Purchasing Power Parity (PPP) model.

Gharleghi and Nor (2012) use the relative price monetary model (RPMN) to examine the determinants of the Malaysian exchange rate with monthly data from 1986 to 2010. By

applying the Johansen multivariate cointegration test and vector error correction model (VECM), authors summarizes that the money supply, real income, interest rate, inflation and relative price differential in productivity of tradable and non-tradable sector have a long-run relationship with the Malaysian exchange rate.

Galstyan and Lane (2009), in a study conducted in European Union, United State and Japan covering the period of 1980 to 2004 using variables of relative sectoral productivity differential, GDP per capita, government consumption, government investment, trade balance and the fiscal variables, finds that the government consumption has a negative relationship with the real exchange rate (RER). Using a cointegration test and the Dynamic OLS (DOLS) method, they conclude that the increase in the government consumption increases the price of non-tradable goods thus cause the RER to appreciate.

Lee, Faruqee and Bayoumi (2005) study the real equilibrium exchange rate (REER) in ten advanced economy countries from 1980 to 2001 using the two country flexible price model. Using the panel dynamic ordinary least square estimation (panel DOLS) they find that the RYM (difference between real manufacturing output of home and foreign countries), TOT (terms of trade) and NFA (net flow of foreign assets) are the determinants for equilibrium exchange rate in Australia. The supply effect of difference between real manufacturing output of home and foreign countries has a negative relationship with the REER in these countries. While the terms of trade and net flow of foreign assets have positive relationships with the REER.

Balvers and Bergstrand (2002) study the equilibrium real exchange rate and government expenditures for OECD countries with two country equilibrium or intertemporal neoclassical model. The data covers the period from 1953 to 1988. By employing the ordinary least square (OLS) and the two stage least squares (2SLS) techniques, the study concludes that the non-tradable output has a negative relationship with the RER while the government consumption has a positive relationship with the RER.

MacDonald and Ricci (2003), adopting the VECM test, analyze the equilibrium exchange rate for South Africa from 1970 to 2002 using variables of real interest rate, real GDP per capita, real commodity prices, openness, improvement in the fiscal balance and net foreign assets position. The authors discover that the increase of real interest rate, real GDP per capita, real commodity prices and net foreign assets appreciate the exchange rate in the long run. On the other hand, in the long run, the increase in openness and improvement in fiscal balance depreciate the exchange rate.

2.3 Summary

Table 2.1 presents the summary of past studies with the independent variables that have been adopted to examine their influence on the exchange rates. Based on the empirical literature, the information can be summarized into the estimation method, the equilibrium exchange rate model and the factors that affect the exchange rate. For the estimation methods, previous studies use the Johansen vector cointegration test, the Vector Error Correction Mechanism, the unrestricted error correction model (UECM), the Canonical Cointegration Regression (CCR) test, the PSS bound test, the Dynamic OLS test, the Panel

OLS and the 2SLS. In addition, for the equilibrium exchange rate model, past studies have focused on the behavioural equilibrium exchange rate (BEER) model, the B-S model, the NATREX model and the ADRL approach to estimate the exchange rates. There are many factors that influence the exchange rate, but most of the studies have been considering terms of trade, productivity differential (B-S effect), government spending, trade openness, and net foreign assets as the main factors that influence the exchange rate.

Table 2.1
Summary of Literature

Authors	**Variables**
Eita and Sichei (2014)	Terms of Trade (+ve) Ratio of investment to GDP (-ve) Resources balance (-ve)
Kakkar and Yan (2014)	Productivity differential (+ve) Long term interest rate differential (+ve) The real gold price (+ve)
AbuDalu and Ahmed (2014)	Foreign interest rate (+ve) Money supply (+ve) Inflation rate (+ve) Net foreign assets (-ve) Real gross domestic product (+ve) Terms of trade (+ve)
Wong (2013)	Productivity differential (-ve) Real interest rate differential (-ve) Real oil price (-ve) Reserve differential (-ve)
Sidek (2011)	Productivity differentials (+ve) Government spending (-ve) Trade openness (+ve) Net foreign assets (-ve)
Ahmad, Yusop and Masron (2010)	Government consumption (+ve) Real interest rate differential (+ve) Terms of trade (-ve) Productivity index (-ve)

Sidek and Yusff (2009)	Productivity differentials (-ve) Government consumption (+ve) Openness (-ve) Net foreign assets (+ve)
Naseem, Tan and Hamizah (2009)	Government consumption (-ve) Real interest rate differential (-ve) Terms of trade (+ve) Productivity index (+ve)
Galstyan and Lane (2009)	Relative productivity differential GDP per capita Government consumption (-ve) Government investment Trade balance The fiscal variables
Cahyono (2008)	B-S effect (+ve) Net foreign assets (+ve)
Mohamad, Jusoff, Nair and Zaghlol (2008)	Terms of trade (+ve) Government consumption Trade openness (-ve) Productivity (-ve) The difference between change in ratio of change in reserve and ratio of net foreign capital inflow (-ve) Macro indicator of monetary policy
MacDonald and Dias (2007)	Trade balance (-ve) Real interest rate differential (+ve/-ve) Terms of Trade differential (+ve/-ve) Productivity differentials (+ve/-ve)
Lee, Faruqee and Bayoumi (2005)	Differential between productivity of home and foreign countries (-ve) Terms of trade (+ve) Net foreign assets (+ve)
Mohamad (2004)	Terms of trade (+ve) Government consumption Trade openness (-ve) Productivity differential (-ve) Net income from foreign countries (-ve) Difference between the change in reserve and net foreign capital inflow Rate of change in nominal exchange rate Macro indicator of monetary policy

MacDonald and Ricci (2003)	Real interest rate (-ve) Real GDP per capita (-ve) Real commodity price (-ve) Openness (+ve) Improvement in the fiscal balance (+ve) Net foreign assets (-ve)
Balvers and Bergstrand (2002)	Government consumption (+ve) Non-tradable output (-ve)

In summary, there are many different approaches that can be used to determine the factors that influence the exchange rate. This study adopts the behavioural equilibrium exchange rate (BEER) approach to examine the factors that influence the Malaysian exchange rate.

CHAPTER 3
METHODOLOGY

3.0 Introduction

In studying the factors that influence exchange rates in Malaysia, this study employs the Johansen-Juselius cointegration test (Johansen and Juselius, 1990) to assess the long run equilibrium relationship between the underlying variables. In addition, this study also examines long run relationship between the variables and causality to indicate the direction of the impact between variables. Prior to testing the cointegration test, all underlying variables are exposed to a unit root test.

3.1 Theoretical Framework

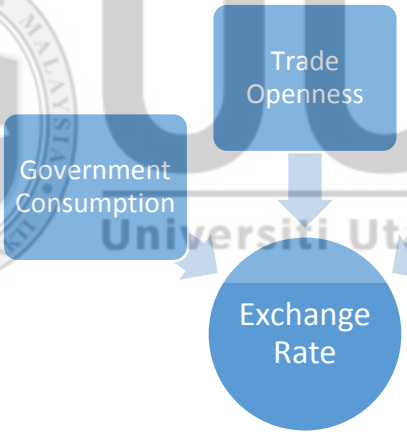
This study evaluates some of the factors that are believed to have an impact on exchange rates in Malaysia and these variables include government consumption, trade openness and net foreign assets based on the BEER model (Clark and MacDonald, 1998). An exchange rate is believed to play a significant role in an economy as it can affect the international trade volume (Sidek et al., 2010; Ozturk, 2006), the volume of capital flows which is the connection between domestic and international credit condition (Eichengreen and Hausmann, 1999), the domestic inflation rate and the economic growth (Sharma and Rai, 2014). Based on theories and past empirical studies, this study considers the government consumption, trade openness and net foreign assets as the potential determinants of the Malaysia foreign exchange rate.

The impact of the government consumption on exchange rate can be evaluated based on the substitution effect and the income effect. When the substitution effect is greater than the income effect, the exchange rate will appreciate (Ahmad, Yusop and Masron, 2010). The development expenditure on non-tradable goods increases the price of non-tradable goods, hence causes the exchange rate to appreciate in the medium run (Galstyan and Lane, 2009; Balvers and Bergstrand, 2002). Sidek (2011) finds that the government consumption increases the income which then increases the demand on non-tradable goods. The increase demand of non-tradable goods increase the price of the non-tradable goods thus in order to restore the equilibrium position, the exchange rate depreciate. Past studies by Jongwanich (2009), Sidek (2011) and Ahmad, Yusop and Masron, (2010) show that the government consumption plays an important role in determining the exchange rates in Singapore, Korea and Malaysia.

Another variable that is chosen as a potential independent variable that may have a significant influence on the exchange rate is trade openness. The trade openness which represents the openness to world markets of goods and assets may diminish or enlarge impact of shocks to exchange rates while financial openness would enlarge the volatility of exchange rate (Calderon and Kubota, 2009). Various studies show that the impact of trade openness on exchange rate is inconclusive. Calderon and Kubota (2009) and Hau (1999) show that the trade openness reduces the influence of nominal and real shocks on the volatility of exchange rate. Jeong and Mazier (2000) and Mohamad (2004) indicate that the trade openness influences the exchange rates.

Another variable of consideration is the net foreign assets. The net foreign assets which can be represented by capital inflows and capital borrowings have been found to have ambiguous influence on the exchange rates. High capital inflow causes the exchange rate to appreciate while high borrowing and capital outflow cause the exchange rate depreciate (Sidek, 2011). Lee, Faruqee and Bayoumi (2005) discover that the net foreign assets is one of the determinants of Australia's exchange rate. AbuDalu and Ahmed (2014) find empirical evidence that the net foreign assets have different effect on exchange rates in Malaysia, Indonesia, Thailand, Philippine and Singapore.

Figure 3.1 Theoretical Framework



3.2 Data

This study uses quarterly data from 1996Q1 to 2015Q2 with a total of 78 observations. Along the period of study, there were 1997 Asian Financial Crisis and 2008 Global Financial Crisis. Furthermore, Malaysia had adopted different exchange rate regimes during the period of study. Before 1998, Malaysia adopted the free floating exchange rate regime then changed to pegged exchange rate regime after the 1997 Asian Financial Crisis.

The pegged exchange rate regime had been changed to the managed float exchange rate regime on 2005 and sustain until now. The data was collected from the Monthly Statistical Bulletin of Bank Negara Malaysia and the Thomas Reuters Data Stream. The variables selection were based on the studies of Sidek and Yusoff (2009) and MacDonald and Ricci (2003).

This study aims to measure the determinants of foreign exchange rate in Malaysia using quarterly data. The chosen variables are the exchange rate, government consumption, trade openness and net foreign assets.

a) Exchange rate (FX) – The exchange rate is the domestic currency per unit of foreign currency. FX is proxied by the nominal exchange rate at the end of the period in RM/USD form. The original data is in the monthly form which then has been interpolated into the quarterly form using Eviews 8. MacDonald and Rias (2007) had used the similar techniques in Eviews 4 to interpolate the annual data into quarterly data. The conversion method is based on converting a high frequency data into low frequency data. The data is collected from the Monthly Statistical Bulletin, Bank Negara Malaysia.
b) Trade openness (OPEN) – The sum of export and import over Gross Domestic Product (GDP) is used as the proxy for trade openness. The data of export, import and GDP are in the current price of MYR. The trade openness has been converted into a logarithm form to normalize the data. The data are collected from the Thomas Reuters Data Stream.

c) Government spending (GOV) – The government spending is represented by the sum of current expenditure and net development expenditure in the federal government consumption sheet in the monthly statistical bulletin, Bank Negara Malaysia. The GOV has been converted into a logarithm form to normalize the data.

d) Net foreign assets (NFA) – The net foreign assets is proxied by the total external asset minus the total external liabilities from the banking system. The total external asset comprises of stocks, investments, loan, amounts due from and other external assets. While the total external liabilities consists of deposits by non-residents, bills payable and other external liabilities from the banking system. The NFA is presented in the ratio form of NFA/GDP. As the data are only available in yearly and monthly frequencies, the monthly data has been interpolated into the quarterly data using Eviews 8 with average observation method. The data are collected from the monthly statistical bulletin, Bank Negara Malaysia. The net foreign assets is not converted into a logarithm form as the data is normally distributed.

Table 3.1
Descriptive Statistics

	FX	LGOV	LOPEN	NFA
Mean	3.4548	24.1789	0.4260	0.0089
Median	3.5665	24.2591	0.4401	0.0075
Maximum	4.5450	25.0832	0.6128	0.3574
Minimum	2.4868	22.9860	0.2103	-0.2159
Std. Dev.	0.4242	0.6011	0.1119	0.1523
Skewness	-0.6183	-0.3608	-0.1028	0.2947
Kurtosis	3.0943	1.9836	1.7127	2.1817
Jarque-bera	4.9982	5.0496	5.5232	3.3052
Probability	0.0822	0.0801	0.0632	0.1915

Table 3.1 provides the descriptive statistics of the data. The Jarque-Bera test indicates that FX, GOV, OPEN and NFA are normally distributed as all the probabilities are greater than 0.05.

Table 3.2
Correlation Matrices

	FX	LGOV	LOPEN	NFA
FX	1			
LGOV	-0.1550	1		
LOPEN	0.6083	-0.6186	1	
NFA	0.0569	-0.6899	0.4226	1

Table 3.2 highlights correlation matrices among the variables. The correlation matrices indicate that the government consumption has a negative relationship with the exchange rate, while the trade openness and the net foreign assets have positive relationships with the exchange rate.

3.3 Model

The model for this study is based on equation 3.1. The dependent variable is FX and the independent variables are the GOV, OPEN and NFA.

The model for this study is as follows:

FX = F(LGOV, LOPEN, NFA)

$$FX_t = \beta_0 + \beta_1 LGOV_t + \beta_2 LOPEN_t + \beta_3 NFA_t + \varepsilon_t \quad (3.1)$$

Where,

FX = exchange rate

LGOV = Logarithm of Government consumption

LOPEN = Logarithm of Trade openness

NFA = Net foreign assets

t = period of study

ε = error term

The government consumption is expected to have a positive influence (negative sign) on the value of the Malaysian exchange rate as the current consumption is greater than the net development consumption. The increase of the government consumption increases the relative price of non-tradable goods and services thus the exchange rate is expected to appreciate to achieve the equilibrium position.

The trade openness is also expected to have a positive influence (negative sign) on the value of the Malaysian exchange rate. Malaysia encourages trade liberalization and this openness in the goods market and the financial market would encourage the inflows of capital which then would cause the exchange rate to appreciate.

The net foreign assets is estimated to have positive influence (negative sign) on the value of the Malaysian exchange rate. The net foreign assets represent total external assets minus the total external liabilities of the banking system. The increase of net foreign assets is expected to appreciate the exchange rate by raising the expenditure on domestic goods which then raise the price of non-tradable (MacDonald and Ricci, 2003).

3.4 Methods of Estimation

To assess the cointegration relationship of the underlying variables, this study applies the Johansen's method of maximum likelihood estimator of the so-called reduced rank model. The Johansen-Juselius (1990) VECM method permits the avoidance of priori assumptions of the variables' endogeneity or exogeneity (Maysami, Lee and Hamzah., 2004) and it offers a more accurate estimate for the parameters of the long run relationship (Tang, 2001 - cited from Lean, 2008; Maysami, Lee and Hamzah, 2004).

The cointegration test begins with a VAR specification for the n x 1 vector of *I(1)* variables:

$$X_t = \mu + A_1 X_{t-1} + \cdots + A_k X_{t-k} + u_t \qquad (3.2)$$

where the error term, u_t, is assumed to be an independent and identically distributed Gaussian process. Rewriting equation (3.2) as a Vector Error Correction Model (VECM) of the short-run and long-run responses to the changes in the variables, the new equation is:

$$\Delta X_t = \mu + \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + u_t \qquad (3.3)$$

where

$$\Gamma_j = -(I - A_1 - \cdots - A_t) \qquad j = 1,..., k$$
$$\Pi = -(I - A_1 - \cdots - A_k)$$

- Δ denotes differenced operator
- X_t is a $p \times 1$ vector of variables integrated of order 1

- μ is $p \times 1$ vector of constants
- k is a lag structure
- u_t is a $p \times 1$ vector of white noise error terms.

Long-run information in X_t is determined by the long-run impact matrix of Π. It is this matrix that decides on the number of cointegrating vectors, and a Π equals to 0 means no cointegration among the underlying variables. Π can be transformed into αβ. α can be interpreted as a "speed of adjustment towards long-run equilibrium" and can be determined from the error correction equations. A larger α shows a faster convergence towards long-run equilibrium which is due to the short run deviations. Meanwhile, β is considered as the asymptotically efficient estimates of the cointegrating vectors. $\acute{\beta}X_{t-1}$ is known as an error correction term (ECT). Meanwhile, Γ_j is a $p \times p$ matrix of short-term changes among variables given p equations and j lags. Equation (3.3) is re-written as:

$$\Delta X_t = \mu + \sum_{i=1}^{k=1} \Gamma_i \Delta X_{t-i} + \alpha\acute{\beta}X_{t-k} + u_t \tag{3.4}$$

To determine the cointegration relationship, the Johansen and Juselius propose two likelihood ratio test of Trace statistics and Max-Eigenvalue statistics as follows:

$$Trace = -T \sum_{i=q+1}^{n} \ln(1 - \hat{\lambda}_i) \tag{3.5}$$

$$\lambda^{max} = -T \ln(1 - \hat{\lambda}_{q+1}) \tag{3.6}$$

Equation 3.5 is Trace statistic equation while equation 3.6 is the Max-Eigen equation. The model is estimated using the ΔX_t equation of 3.4. The number of maximum cointegration relationship is chosen based on Equation 3.5. While equation 3.6 is to test the specific alternative hypotheses. The model with full rank will be rejected as it shows that the X_t is stationary and has no unit root, hence there do not have error correction. Assume that the model have multiple cointegration vectors and not in the full rank, the first eigenvector will be selected based on largest eigenvalue (Maysami and Koh (2000).

Since the VECM requires that all testing variables should be *I*(1), all variables are exposed to a unit root tests of Augmented Dickey-Fuller (ADF) prior to performing the cointegration test. The null hypothesis of the ADF test is the time series has a unit root or non-stationary. The drawback of the ADF test is that the unit root test depends on the chosen lag, and the size of the lag selected affects the robustness of the ADF test. If the lag is too small, the remaining serial correlations in the errors will be biased, on the other hand, if the lag is too large, the power of the test will be biased.

After performing the unit root test, the lag length is decided using the Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ).

3.5 Granger Causality

A regression analysis is to examine the relationship between variables but it is unable show the causality and direction of influence among the variables. The main idea behind Granger

Causality test is if the data involves time series data, the past event will cause today's event. When there are more than two variables, the model will be extended to vector autoregression (VAR). There are some assumptions for Granger Causality test, where the variables are assume to be stationary, the number of lag length need to be determined by the Akaike or Schwarz information criterion, the error terms of the causality test are uncorrelated and the causality result is based on the F-test instead of the estimated coefficient (Gujarati, 2009).

3.6 Variance Decomposition

This study also highlights the variance decomposition of the dependent variable in which it provides information about the relative importance of each random innovation in affecting the exchange rate. The variance decomposition helps to justify whether the variables exhibit exogeneity or endogeneity trait. An exogeneity refers to the variable that does not depend on others to explain its variation. On the other hand, endogeneity is the variable that depends on others to explain its variation. Variance decomposition can examine how other variables contribute shock to another variables. The variance decomposition can examine the source of shock of a variable from the short run to the long run, so it can determine whether there are exogeneity of dependent variable (Gujarati, 2009).

3.7 Summary

In summary, this chapter discusses the theoretical framework of the study, data, model, methods of estimation, Granger Causality and variance decomposition that will be applied in this study for the purpose of achieving the objectives. The following chapter will talk about the results of the analysis.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

In examining the factors that affect Malaysian exchange rates, this study employs the Johansen-Juselius approach and VECM technique. This chapter starts with a discussion on the unit root tests results followed by the Johansen-Juselius cointegration test results, VECM estimations, causality and variance decomposition.

4.1 Unit Root Tests

Before testing whether the variables contain a unit root or not, line graphs are developed to generally observe whether the variables follow the random walk process or not. Based on Figure 4.1, the graphs for all variables roughly show that the variables are not stationary in which their joint probability distribution change when there is a change in time. The variables do not follow a stochastic process. In other words, these graphs roughly indicate that the variables are not stationary. To make the variables stationary, the variables need to be converted into first difference. Figure 4.2 show first differenced variables, and those graphs roughly indicate that the first difference variables follow a random walk process in which the variables are stationary.

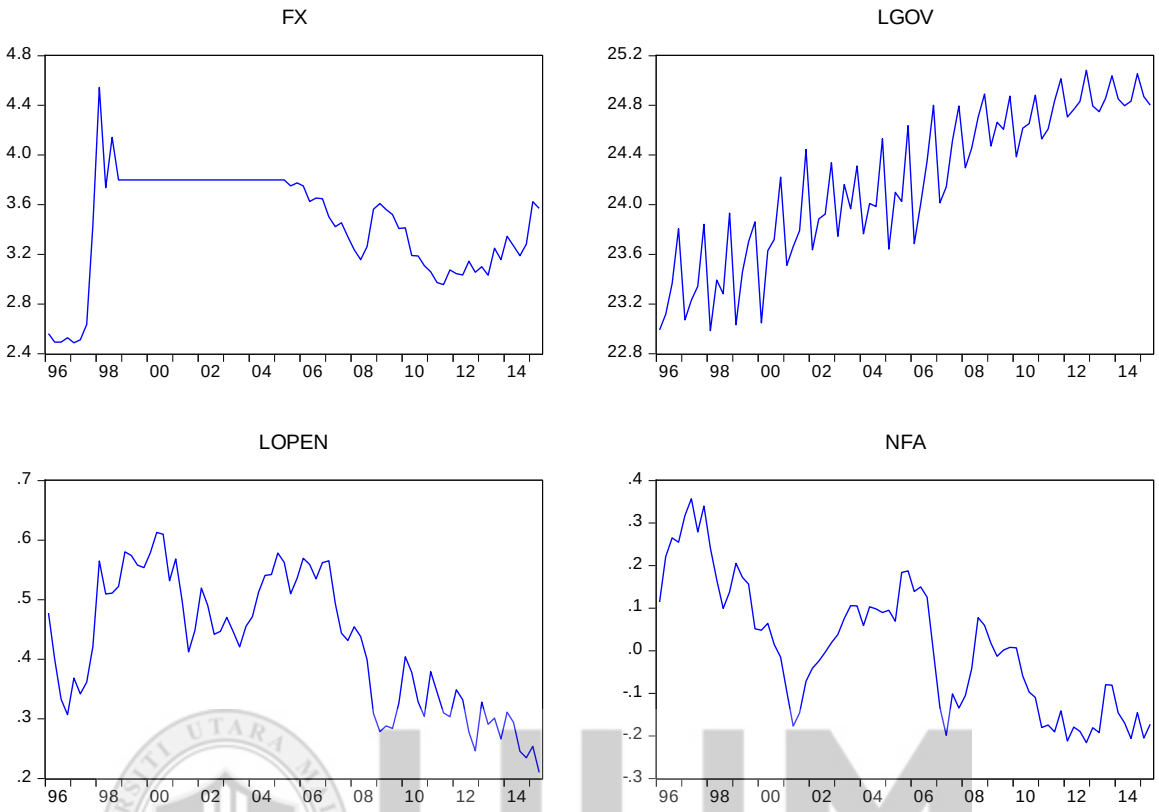


Figure 4.1 Multiple Line Graphs of Level Data

Figure 4.1 shows the multiple line graphs of the level data. From the graphs, we can conclude that the exchange rate, government consumption, net foreign assets and trade openness are generally not stationary. Although the exchange rate has a stable movement during the pegged currency period, but the graph fluctuated before 1998 and after 2005. Besides that, the government consumption has an increasing trend from 1996 to 2014. The trend of government consumption is highly fluctuated in all the period. On the other hand, the net foreign assets in general has been showing a decreasing trend. The trade openness is also showing a decreasing trend.

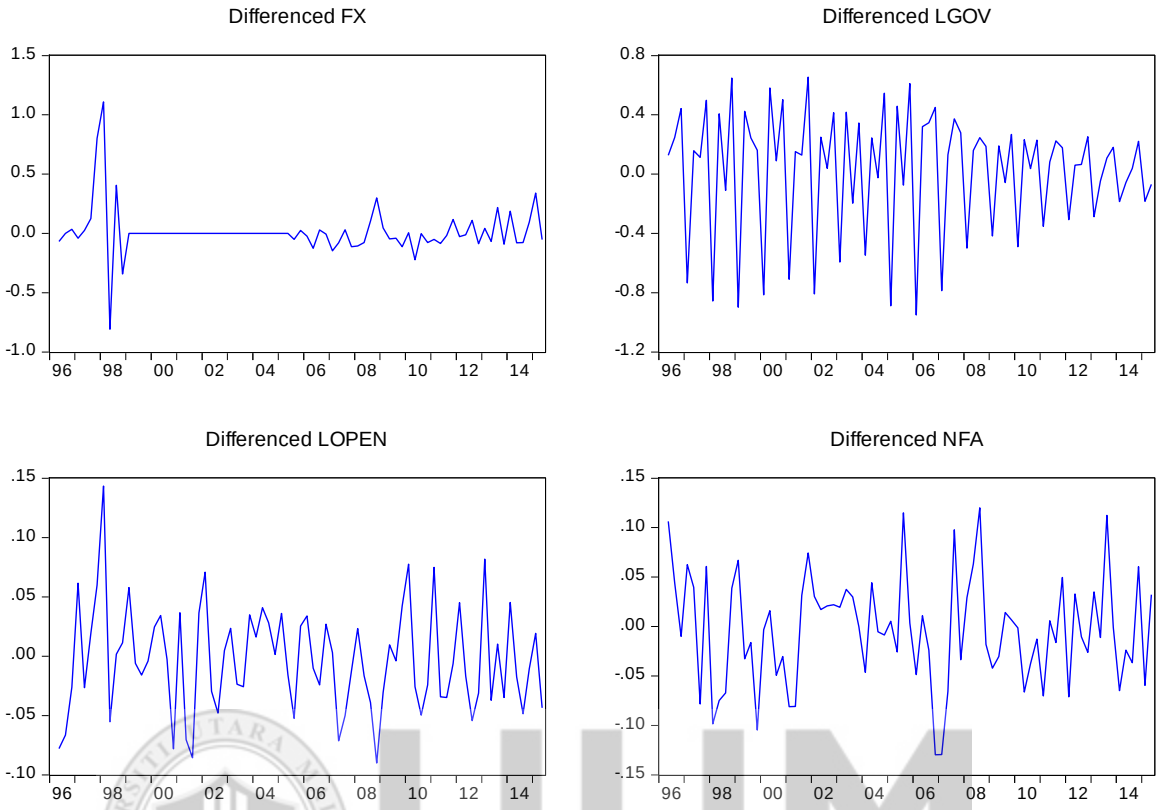


Figure 4.2 Multiple Line Graphs of First Differenced Data

Figure 4.2 shows multiple line graphs of first differenced data. It clearly shows that the exchange rate, the government consumption, the net foreign assets and the trade openness roughly become stationary in the first difference.

To verify the integration order of each underlying variables, this study employs a statistical unit root tests of Augmented Dickey-Fuller (ADF). Table 4.1 highlights the results of unit root tests. Result of the ADF based on intercept only and intercept and trend indicate that all variables are integrated of order 1 ($I(1)$) in which they are not stationary at levels, but stationary at first differenced. Based on the graphs and also the unit root tests results, all

underlying variables are conclusively determined to be *I*(1) and we can proceed with the Johansen-Juselius (1990) cointegration test.

Table 4.1
Unit Root Tests

Augmented Dickey-Fuller (ADF)				
	Intercept only		Trend and intercept	
	Level	First Difference	Level	First Difference
FX	-2.7669	-9.6797*	-2.9565	-9.7105*
LGOV	-1.0804	-33.2725*	-0.9734	-33.2531*
LOPEN	-0.7331	-8.0488*	-2.1942	-8.2857*
NFA	-1.4559	-7.8069*	-2.6639	-7.7389*

Notes: *, ** represent 1% and 5% significance levels respectively.

4.2 Johansen-Juselius Cointegration Test Results

Table 4.2 reports the Johansen-Juselius (1990) cointegration test results. To assess the cointegration relationship among the underlying variables, this study adopts lag 5. The local power of corresponding among the trace statistic and max-eigen value statistic is very similar (Lütkepohl and Saikkonen, 2000). As long as one of the tests indicates the existence of cointegration relationship among the underlying variables, there is a long run equilibrium relationship.

Table 4.2
Cointegration Test Results

Model: FX is the dependent variable				
	Trace Statistic		Max-Eigen Statistic	
	No deterministic trend (restricted constant)	Linear deterministic trend	No deterministic trend (restricted constant)	Linear deterministic trend
None	111.1197**	89.2342**	57.0249**	47.4067**
At Most 1	54.0948**	41.8276**	34.7953**	24.4333**
At Most 2	19.2994	17.3942**	15.3962	13.9586
At Most 3	3.9033	3.4356	3.9032	3.8415

Notes: **denotes rejection of the hypothesis at the 5 percent significance level.

Table 4.2 shows the cointegration test results. The trace statistics indicate that there are at least one cointegration among the underlying variables of foreign exchange, government consumption, trade openness and net foreign assets in no deterministic trend and linear deterministic trend. In addition, the max-eigen statistic also shows at least one cointegration relationship among the underlying variables in no deterministic trend and linear deterministic trend.

4.3 Long Run VECM Estimations

After verifying there is a long run cointegrating relationship among the underlying variables, we proceed with reporting the long run estimations. Table 4.3 highlights the long run estimations. Results of the normalized cointegrating coefficients state that the government consumption and the trade openness have significant long run negative relationships with the exchange rate. The net foreign assets has a significant positive long run relationship with the foreign exchange rate. As the government consumption (GOV)

and the trade openness (OPEN) increase, the exchange rate of MYR/USD appreciates in value. On the other hand, the increase in the net foreign assets (NFA) depreciates the value of exchange rate.

Table 4.3
Normalized Cointegrating Coefficients
(FX is the dependent variable)

Variable	Coefficient	Standard Error	T-Statistic
FX	1.0000		
LGOV	1.3654	0.5670	2.4080**
LOPEN	6.7904	2.4302	2.7942**
NFA	-5.835968	2.0184	-2.8913**

Notes: **denotes rejection of the hypothesis at the 5 percent significance level.

4.4 Causality Test Results and Variance Decomposition

The role of the exchange rate is further assessed using the causality test. The causality test is used to assess the causality direction of the government consumption, net foreign assets and trade openness on the Malaysian exchange rate. As there is a cointegrating relationship among the underlying variables, the error correction term (ECT) of the dependent variable is found to be negative and significant which indicates the existence of short run adjustments towards equilibrium.

Table 4.4
Temporal Causality and Block Exogeneity Test Results

Dependent variables	ΔFX	ΔLGOV	ΔLOPEN	ΔNFA	ECT
ΔFX		5.1193	3.1577	6.7505	-0.1080
		(0.4015)	(0.6757)	(0.2399)	(0.0270)
					[-3.9989]**
ΔLGOV	11.4553		10.3909	8.3151	-0.0086
	(0.0431)**		(0.0649)	(0.1397)	(0.0173)
					[-0.4996]
ΔLOPEN	2.5939	39.5036		7.4704	-0.0202
	(0.7623)	(0.0000)**		(0.1879)	(0.0044)
					[-4.6362]**
ΔNFA	11.5058	5.8666	10.6584		0.0093
	(0.0422)**	(0.3194)	(0.0586)		(0.0072)
					[1.2945]
Diagnostic Tests: $R^2 = 0.4787$					
Normality test: JB, $\chi2(4) = 0.0646$					
LM: $F(4) = 0.1033$					
Heteroscedasticity: $\chi2 = 0.3736$					

Notes: * and ** represent significance levels at 5% and 1% respectively. Standard errors and t-statistics are in parentheses and brackets respectively.

Table 4.4 shows the temporal causality and block exogeneity test results. The results indicate that none of the variables show any causality effect in the short run on the exchange rate. On the other hand, the exchange rate is found to have a unidirectional causality on the government consumption and the net foreign assets. The government consumption also shows a significant unidirectional causality on the trade openness. The diagnostic tests results reported in Table 4.4 specify that the model is adequate. The R^2 indicates that the model is able to explain nearly 50 percent of the variation in the exchange rates.

Table 4.5 highlights the variance decomposition of the Malaysian exchange rate. Results in the table show that the exchange rate depends on the other variables to explain its variation. Most of its variations are explained by the net foreign assets followed by the trade openness. This indicates that the exchange rate exhibits an endogeneity trait as it depends on others to explain its variation.

Table 4.5
Variance Decomposition of Exchange Rates

Variance Decomposition of FX:

Period	S.E.	FX	LGOV	LOPEN	NFA
1	0.186632	100.0000	0.000000	0.000000	0.000000
2	0.247488	97.22603	0.047848	1.109086	1.617037
3	0.282313	96.07925	0.095100	2.581235	1.244417
4	0.324844	89.54448	0.073977	5.304388	5.077156
5	0.344181	86.62987	0.066744	5.849592	7.453790
6	0.375117	80.97630	0.505136	8.865826	9.652740
7	0.402402	78.14157	0.532652	9.205213	12.12057
8	0.436710	76.45310	0.589899	9.861936	13.09506
9	0.471800	75.79150	0.576902	9.679736	13.95186
10	0.501506	74.75920	0.810939	10.03743	14.39243

The stability of the estimates is also warranted via the CUSUM test as showed by Figure 4.3 and CUSUM squares test as showed by Figure 4.4. Figure 4.3 and 4.4 shown that the model is within the 5% significant level.

Figure 4.3 CUSUM Test

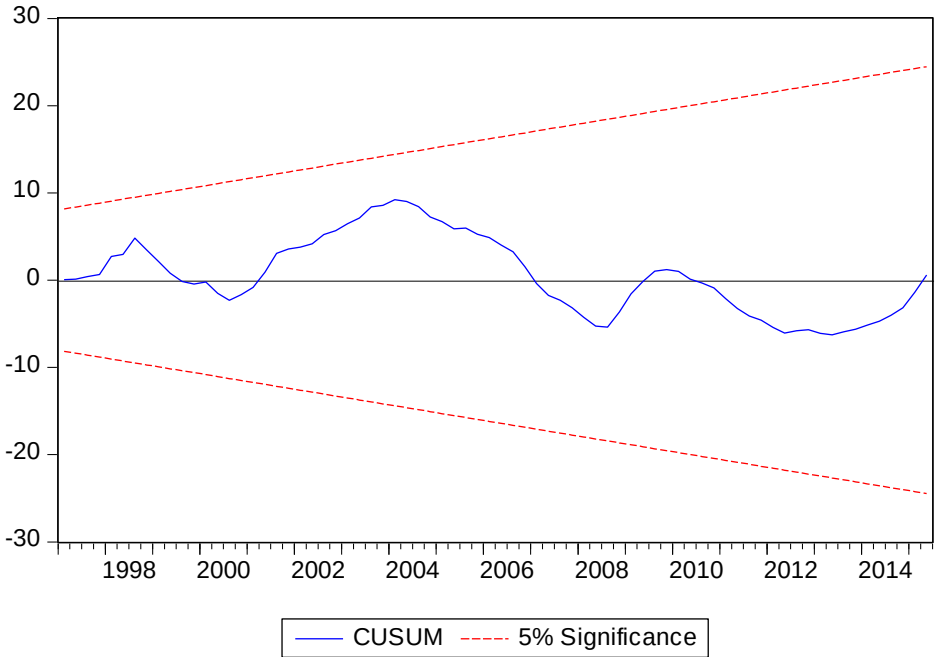
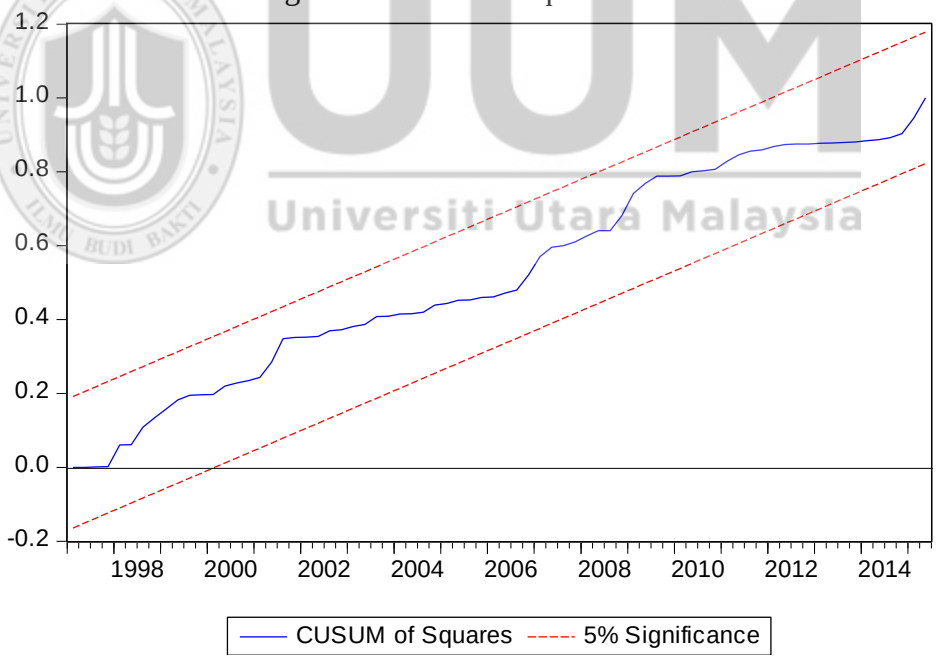


Figure 4.4 CUSUM Squares Test



4.5 Summary

The VECM long run relationship shows that the government consumption and the trade openness have significant long run negative relationships with the exchange rate. An

increase in the government consumption and the trade openness cause the exchange rate to appreciate and vice versa. The significant positive relationship between the net foreign assets and the exchange rate indicates that the increase of the net foreign assets causes the exchange rate to depreciate in value. Past studies indicate that the government consumption, the trade openness and the net foreign assets have inconclusive mixed influence on the exchange rates. Previous studies by Sidek (2011), Naseem, Tan and Hamizah (2009) and Galstyan and Lane (2009) show that the government consumption has negative relationship with the exchange rate, whereas Ahmad, Yusop and Masron (2010), Sidek and Yusoff (2009) and Balvers and Bergsrand (2002) studies show that the government consumption has a positive relationship with the exchange rate. The trade openness is also found to have an inconclusive influence on the exchange rate. For instance, Sidek (2011) and MacDonald and Ricci (2003) discover that the trade openness has a positive influence on the exchange rate, yet Sidek and Yusoff (2009) and Mohamad (2004) discover that the trade openness has a negative relationship with the exchange rate. Similarly, AbuDalu and Ahmed (2014) and MacDonald and Ricci (2003) find that the net foreign assets have a negative relationship with the exchange rate. On the other hand, Cahyono (2008) and Lee, Faruqee and Bayoumi (2005) find that the net foreign assets have a positive relationship with the exchange rate.

The causality test has also been carried out to examine the short run relationship among the variables. The causality test results show that the government consumption, net foreign assets and trade openness do not have any causality effect on the exchange rate

The variance decomposition test indicate that the exchange rate variation is explained by the net foreign assets and trade openness the longer the period which concludes that the impact can be clearly seen in the long run.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter concludes the whole study. This chapter comprises of the summary of findings, recommendations for further study and limitation of the study.

5.1 Summary of Findings

The main objective of this study is to examine the factors that influence the Malaysian exchange rate. The study is constructed on the quarterly data from 1996 first quarter until 2015 second quarter. The data are collected from the monthly bulletin published by Bank Negara Malaysia and the Thomson Reuters Datastream database.

In assessing the impact of the government consumption, trade openness and net foreign assets on exchange rates in Malaysia, this study employs the Johansen-Juselius cointegration test and the VECM technique. The cointegration test reveals that there is a long run equilibrium relationship among the variables. This long run equilibrium relationship informs that these variables do not deviate too far from each other.

The VECM result shows that the government consumption, trade openness and net foreign assets influence the Malaysian exchange rate in the long run. However, these factors do not influence the Malaysian exchange rate in the short run as the result from causality test do not indicate any significant influence. The government consumption and the trade openness have significant negative relationships with the exchange rate in Malaysia. The

result of government consumption is similar with previous studies of Sidek (2011), Naseem, Tan and Hamizah (2009) as well as Galstyan and Lane (2009). Whereas the result of trade openness is sustained by Sidek and Yusoff (2009), Mohamad (2004) and Mohamad et al. (2008) as these studies have similar results. The increase of the government consumption increases the price of tradable and non-tradable goods and services and increases the demand for our currency, hence the exchange rate appreciates. The increase of trade openness increases the trade between Malaysia and foreign countries thus increases the demand for our currency. The increase of demand on MYR appreciates the exchange rate in value. On the contrary, the net foreign assets has a positive relationship with the Malaysian exchange rate. The result of the net foreign assets contradicts past studies (MacDonald and Ricci, 2002). This may due to the Malaysian net external liabilities which exceed the net external asset, so the increase of net foreign assets depreciates the exchange rate. As Malaysian external liabilities exceed the external assets, the withdrawal of external liabilities from Malaysia creates high capital outflow, this causes the exchange rate to depreciate in value. Sidek and Yusoff (2009), Cahyono (2008) and Lee, Faruqee and Bayoumi (2005) discover the net foreign assets to have a positive influence on the exchange rate.

As a summary, the government consumption, trade openness and net foreign assets have significant long run relationships with the exchange rate. The policy maker can focus on these three variables as indicators of the changes in the Malaysian exchange rate.

5.2 Recommendation for Future Study

As for recommendation, this study can be extended by incorporating additional variables. As the BEER model suggests four factors to determine the equilibrium exchange rate, future studies can include the productivity differential or the B-S hypothesis as another variable to better explain the model. The productivity differential is not included in this study as there is limitation in collecting the data to proxy for the productivity differential. Moreover, the period of study can be extended to a longer period before the 1997 Asian Financial Crisis, so that the relationship between independent variables and dependent variable can be further explained. Beside the BEER model, there are also other models that can be used to assess the relationship between exchange rates and other variables in order to test the robustness of the results.

5.3 Limitations of the study

One of the limitations of this study is the data is not available in the same frequency. The net foreign assets data are only available in monthly and yearly whereas the exchange rate data are not available in the quarterly form. The interpolation data for the net foreign assets and the exchange rate may affect the estimation results.

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