THE IMPACT OF MONETARY VARIABLES ON EXCHANGE RATE IN MALAYSIA FROM 2013 UNTIL 2015

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ABSTRACT

This research aims to study the relationship between exchange rate and this study's independent variables which are, inflation rate, interest rate and foreign exchange reserve in Malaysia. Secondary data from period of 2013 M1 until 2015 M12, which was retrieved from Bloomberg Data. This study uses empirical tools which is E-Views 11 to compute the variables data into empirical result. The results obtained showed that there is a positive insignificant relationship between inflation rate and exchange rate. However, for interest rate, this study found that there is a negative insignificant relationship between interest rate and exchange rate which implies that interest rate has a negative correlation with exchange rate. Further, based on the result of this study, negative relationship is obtained between foreign reserve money and exchange rate which means when there are trends of increase export and remittance will have positive effect on exchange rate while when there is a trend of increase import and foreign reserve money gave a negative impact on exchange rate. As predicted by the literature review, inflation rate and interest rate should have a negative relationship between exchange rate and foreign exchange reserve should have a positive relationship between exchange rate. Yet, this study found an inverse and slightly different compared with the pasted researches done by many researchers. As this study have its limitations, thus recommendations are suggested for researches that will be done in future.

INTRODUCTION

Definition of exchange rate by Wan Mohd Yaseer et. al (2016) the number of units of domestic currency, the need to buy one unit of another different currency. Exchange rate is very crucial because it enables national currency to convert into another currency, which allows countries to transfer fund to another different country as well as comparing the differences in prices of the same goods. However, the economic condition in the market of foreign exchange may influence the currency value.

F. Allen and D. Gale (2004) states that, "exchange rate inconsistency and steadiness is one of the major concerns which determines the direction of foreign trade and commerce". Exchange rate play major role in international trade not only in terms of pricing but as well as avoiding exchange rate risks by arranging and planning it well. The fluctuation of exchange rate and how the fluctuation affects the amount of trade that a country does is one of the most discussed topics worldwide.

Via different regimes, each nation controls its currency and therefore their foreign exchange rate is dictated by this. All four forms of exchange rate system are fixed system, free floating system, regulated float system and also pegged system.

In a system of fixed exchange rates, the flexibility of the exchange rate is tolerated only within narrow boundaries. The government will interfere to retain it underneath the limits if the exchange rate continues to move. For example, from 1944 until 1971, exchange rates were usually set according to a scheme planned by conference members from various countries across the globe in the conference at Bretton Woods.

Exchange rate values are influenced by market forces in the free-floating exchange rate structure. There is no need for government interference in the freely floating exchange rate schemes, since the value of exchange rate is decided by market powers. The central bank in the country is not necessary in this framework to sustain exchange rates continuously at clear parameters.

Managed-floating exchange rate system is quite identical with fixed system. To keep their currency from shifting so fast, the regulated float exchange rate mechanism helps the government to control. This system demonstrates that there are no explicit borders for currencies, but it would be related to demand and supply variables. If there is an over-supply of a certain currency in comparison to its demand, the exchange rate of that currency would be affected. The government would try to control or manipulates the exchange rate by using the float system to generate profit to its own country and looking to expense of others.

When the value of the bone currency is pegged to a foreign currency, some countries may use pegged exchange rate systems. When the exchange rate is pegged, the official exchange rate will be sent as well as maintained to the central bank of the country or an equivalent institution. In order to retain the domestic exchange rate tied to the pegged currency, the bank must purchase and sell its own currency on the foreign exchange market to match supply and demand. It may be of particular advantage to a smaller economy, which relies more heavily on foreign trade.

Exchange rates play crucial role in the degree of exchange in a region, which in turn very important in an economy of a free market country. Transitions from monetary policy to the real economy, which may take place across networks such as the money system, the credit channel, the exchange rate channel and the interest rate channel, is the monetary transmission stream.

IS-LM model relates money to the aggregate requirements will clarify the money channel. The view of money suggests that as the supply of money increases, the desire of

the investor to keep a portfolio is greater than the desire to hold currency. The rise in demand for financial assets would also increase the price of goods, which would have a positive effect on income. At the same time, though, buyers will prefer less volatile financial assets that will have a negative substitution impact.

The credit channel illustrates how important money is in the production of credit that can impact the stock market. According to Bernanke and Gertler (1995), the credit channel principle has two potential linkages. The balance-sheet channel is one, and the bank loan channel is another. The balance sheet channel is based on the theoretical prediction that a borrower's "external finance premium" can depend on the financial status of the borrower.

The phase of transmission starts in the asset market. For certain assets, the cost of information and transactions is smaller than the cost of changing output, modifying consumption, or investing in durable goods. That's why the equity market reacts more rapidly when there is confusion about whether the external shock is lasting or transitory. Therefore, any rise in the supply of capital would lower the interest rate, contributing to an increase in the price of assets. And the demand for security will fall, creating a new position of portfolio balance. These movements can be further explained using the Figure 1.1 below.
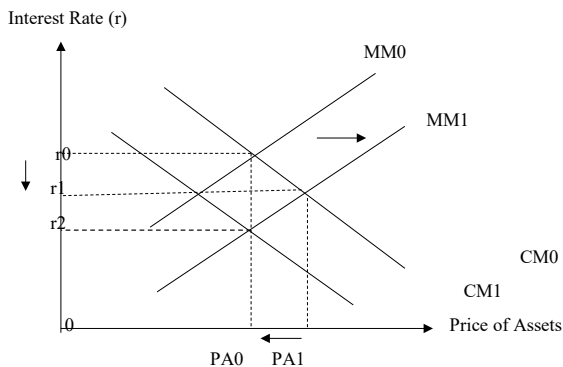

Figure 1 Asset Market Equilibrium

Changes in the relative price of capital market assets can have a spillover impact on the export market. The positions of capital market, money market, aggregate demand and aggregate supply shifts according to anticipation and changes in relative price through the transmission process. The system will reach a consistent equilibrium. The speed of the convergence depends on the efficiency of the lending channel and the substitutability of the money market and the capital market. Exchange rate channel becomes a major variable affecting the firm's investment and decision making as the world's financial market becomes more integrated. Since firms generate multiple cash flows that are sensitive to exchange rates, the firm's value is affected by the exchange rates. Research carried out by Taylor (1975), Obstfeld and Rogoff (1995) and Rim (2002) stressed the importance of the monetary transmission system in controlling stock prices via the exchange rate channel.

According to Keynesian IS-LM model, both fiscal and monetary policy actions have implications on domestic income and interest rates. Fiscal and monetary policy makers might decide to push the level of income towards the long run. To make that happen, they would be trying to help the nation's economy achieve internal balance. Policy makers also care about how their actions influence the nation's internal payment flow which is they want to achieve external balance which would entail the attainment of dome objective for the private international flows of goods, services, income and assets. Achieving external balance means different things to policy makers in various countries. In some nations, it may mean a goal of consistently running a trade surplus or in some countries, it may mean to maintain a surplus on the current account. The payment balance is the amount of the balance of the current account, the balance of the private capital account and the balance of the official settlement. The results of the balance of payment schedule are that there is a small range of variations of real income and nominal interest rates at the period along which a country will reach a

zero private payment balance. Actual income equilibrium prices and nominal interest rates are calculated by the intersection of the IS and LM schedules. Assuming that the balance of payment is located above the internal equilibrium, it means the internal balance is achieved but the external balance is not achieved. When this situation happens in a country, the policy makers might need to implement a contractionary monetary policy or expansionary fiscal policy. The LM curve will be moved to the left by a contractionary monetary policy, which will raise the interest rate but decrease actual sales. Both the interest rate and wages will be boosted with an expansionary monetary policy. This will change a surplus private payment to a zero-private payment. While it suggests that the external balance is reached if the balance of payment is below internal balance, but the internal balance is not achieved, a deficit is assumed to be faced by the private individual. This is when, in order to attain both internal and external balance, the government should implement an expansionary monetary policy and a contractionary fiscal policy. An expansionary monetary policy action results in a private payment deficit that leads to a depreciation on a nation's currency, therefore will stimulate export expenditures while inhibiting import spending. Consequently, expansionary monetary policy actions on a nation's real income to rise in the short run. Consequences of monetary policy decisions on private balance of payments of a country and the value of its currency depend on the degree of mobility of capital. An expansionary policy intervention, in most conditions, triggers at least a small short-term increase in the real income level of a country. If the degree of capital mobility grows, the size of the growth in real income decreases.

Back in the old days, Malaysian currency was known as the Malaysian Dollar (M$) back in June 1967 and was distributed by Bank Negara Malaysia (Aziz, n.d.). In August 1975, according to the Malaysian Currency (Ringgit) Act 1975 (BNM, 2015), the Malaysian currency was confirmed to be called "ringgit". However, although the term "ringgit" was adopted, the currency of Malaysia was always known as the dollar. According to Nathesan (2015), this continued until 1993 when the Malaysian Dollar was going to be replaced, then the government introduced the Ringgit Malaysia (RM or MYR).

The floating exchange rate mechanism for Malaysia was launched on 21 June 1973. "A floating exchange rate structure can be described as the action of the exchange rate is influenced by the market power," according to Bunjaku (2015). According to King (1977), for example, "The floating exchange rate mechanism made both exchanges and financial transactions dependent on actual factors rather than nominal factors," the floating exchange rate had its own advantages. This means the international inflation rate will not affect the international trade. A nation is able to withstand the shock of the foreign exchange market and the floating exchange rate mechanism will make changes on its own by demand and supply in the market.

Back in 1997, when the Asian financial crisis is still on going, the pegged exchange rate policy was introduced in Malaysia where, according to a report by Goh & McNown (2015), during that period, the foreign exchange rate against the USD was being set or in other word the exchange rate was fixed. In addition, some capital restrictions are implemented to discourage speculative assaults on the currency. Protecting the Malaysian economy from foreign exposure and restoring financial stability are the factors behind this regime. "The key advantage of this regime is that it will serve as a monetary tool capable of ensuring inflation stabilisation," according to Aizenman and Glick (2008).

As the Asian financial crisis came to an end in the 2000s, Bank Negara Malaysia maintained the system of fixed exchange rates and expanded capital controls significantly in May 2011. In order to cope with huge current

account surpluses and massive capital inflows, the fixed exchange rate system existed until late July 2005 when it was adjusted back to the regulated floating regime (Goh et al, 2016; Goh & McNown. 2015).

Due to the fixed-exchange-rate regime, an open capital market and autonomy of monetary policy cannot be accomplished at the same time, Malaysia has adjusted its fixed-exchange-rate system to a floating-exchange-rate regime. If the nation wishes to have its own long run monetary policy, the government needs to encourage the foreign exchange rate to float freely through an open account system. "The regulated floating exchange rate structure is a combination of fixed and floating exchange rate schemes", according to Bunjaku (2015). The system of regulated exchange rates is a regime of international exchange rates where the exchange rate is permitted to travel freely, but only on a regular basis, according to market powers. Until now, Malaysia has also implemented a regulated floating exchange rate structure, as the regime will help the country respond to currency valuation adjustments where rates and demand can be changed if the exchange rate does not adjust.

PROBLEM STATEMENT

The foreign exchange rate has always been an important subject to research because it affects not only the economy, but also firms, merchants and all individuals in an economic environment. The inconsistency in foreign exchange rates can have a greater effect on society as more clients continue to enter the foreign exchange market. Knowing what defines the exchange rate fluctuation is very important in order to minimise personal losses. In addition, the foreign exchange rate plays an important role in international commerce and would also influence businesses and businesses engaged in imports and exports. "The depreciation of MYR would make manufactured products pricey because it takes more MYR to buy foreign goods or

services," according to Pettinger (2013). This would also make imported commodities cheaper as there is appreciation in the MYR, so it now takes fewer MYR to buy international goods and services.

In general, significant exchange-rate shifts are correlated with varying inflation rates in the countries involved. For the assumption that a change in the stock of money would, ceteris paribus, be correlated with a subsequent increase in all nominal prices, including the nominal price of foreign exchange, a complete model of the foreign exchange market is not needed. The zero-degree homogeneity of demands and suppliers with respect to all nominal prices guaranteed this consequence. The theory of purchasing power parity claims that there is a relative relationship between the exchange rate and the ratio of global and domestic markets or price indices, which can be taken to mean that all items are almost the same. The consistency of this theory is independent of the accuracy of all specific exchange rate calculation hypotheses.

One of the earliest and best-known models of exchange rate determination is the purchasing power parity (PPP) theory. It has been advocated in its own right as a satisfactory model and also provides a point of reference in many of the modern exchange rate theories for the long-run exchange rate. Purchasing power relies heavily on the concept that once the price of goods is measured in the same currency, the prices of goods are equalised.

Many researchers use various kinds of variables year after year to examine exchange rate determinants, for example, debts, balance of trade or import and export values, the supply of money, taxes, as well as many other variables (Ahmed et al., 2012; Hassan & Gharleghi, 2015; Udousung et al., 2012). It is common to argue that macroeconomic variables have an impact on the exchange rate and that macroeconomic variables are sufficiently significant to determine the foreign exchange rate.

Therefore, in order for Malaysia to stabilise the value of its Ringgit Malaysia currency, policymakers need to be sure and understand what significantly affects the currency and how policymakers can strengthen economic policies to maximise a country's welfare. This is because the health of a nation's economy depends on the exchange rate. This is the reason why a country's exchange rate in certain countries is often monitored, analysed and sometimes politically manipulated. Malaysia's development is closely linked to its foreign exchange system, because more than 55% of Malaysia's economy is dependent on exports. Therefore, to justify the behaviour of exchange rate fluctuations, steps need to be taken to consider the effect of monetary variables.

RESEARCH QUESTIONS

The overall question of this study is as follow:-

"What is the impact of monetary variables on exchange rate in Malaysia?"

The specific research questions are as follow:-

i. What is the relationship between inflation rate and exchange rate in Malaysia?
ii. What is the relationship between interest rate and exchange rate in Malaysia?
iii. What is the relationship between foreign reserve money and exchange rate in Malaysia?

RESEARCH OBJECTIVES

The overall objective of this study is as follow:-

"To analyse the impact of monetary variable on exchange rate in Malaysia?"

The specific objective of study is as follow:-

i. To study the relationship between inflation rate and exchange rate in Malaysia.
ii. To study the relationship between interest rate and exchange rate in Malaysia.

iii. To study the relationship between foreign reserve money and exchange rate in Malaysia

LITERATURE REVIEW

INFLATION RATE (INF)

Svensson notes that "the relationship between inflation and exchange rates has always been an important issue for different economists." Inflation may be one of the determinants influencing the exchange rate, although it can also be a factor affecting the exchange rate at the same time. Particularly in countries with developing economies, the relationship between exchange rate and inflation hate has a critical significance. According to Dornbuch (1976), exchange rate instability has a surprising effect on the level of prices in these kinds of economies. It can be assumed that the exchange rate is very similar to inflation because, according to Dornbuch, the average price level has an effect on appreciation and depreciation. As well as how the production costs will be affected when there are changes in exchange rates, the rate of imported and exported commodities as well as exchange rates will change. In developed countries, in particular, it is therefore necessary to introduce policies that take national inflation into account in order to preserve trade stability.

The relationship between exchange rate and inflation volatility was tested by Albuquerque and Portugal (2005), and the analysis used a bivariate GARCH model for research and found a relationship between exchange rate and inflation variance. Her analysis showed that there is an indirect correlation between inflation and exchange rate fluctuations in India, according to Anita Mirchandani (2013). As a consequence of her research, the inflation rate and the exchange rate are mildly linked, and the statistical interpretation of the study indicates that there is an indirect correlation between the inflation rate and the exchange rate, because

the value of r is -0.934, where the correlation at the level of 0.01 is important. An analysis by Simon (1997) showed that the main variables that have a bad effect on small economies are the exchange rate and the current account. While the analysis conducted by Kashif (2000) reported in the economic indicator that exchange rate effect revealed a negative and negligible relationship between the inflation rate and the exchange rate between the US dollar and the Pakistani rupee. The results of this analysis revealed that the coefficient between the inflation rate and the exchange rate showed a negative, indicating that while the exchange rate adjustments showed a rise and the inflation rate resulted in a decline, the variance of these two factors shows that they do not shift together or, in other terms, that it is a negative relationship.

The interdependence between inflation rates and the action of exchange rates in Nigeria is studied by Ezirim et al (2012). Using the autoregressive distributed lag empirical method, the analysis showed that exchange rate fluctuations and the inflation spiral are co-integrated in the short and long term. It therefore suggests that strategies aimed at manipulating exchange rates are becoming sufficient monetary action under an inflation-targeting system, and vice versa. According to Achsani (2010), "in the case of inflation rates in countries that are far higher than in other countries, inflation rates often offer the right indication of a negative relationship between exchange rate relationships." A analysis by Sanam and Fetullah (2017) also showed that a significant correlation exists between the exchange rate and the rate of inflation.

INTEREST RATE (IR)

The rate of interest relies on a country's financial forces and monetary policy. In the market, price adjustments are part of the mechanism by which interest rates are calculated. High saving interest rates draw more investors to save cash in banks, according to Okoth (2014),

while low interest rates, on the other hand, allow investors to participate in borrowing and bond markets. Normally, interest rates are calculated as a percentage and set by the nation's central bank on a quarterly basis. In order to curb the money supply, if a nation faces inflationary pressure, the central bank would raise interest rates. However, if the country decided not to apply adjustment on interest rate, it can lead to an imbalance in demand and supply for the money market that induces some volatility in exchange rates and there are arbitrage benefits between countries from investing and borrowing (Ramasamy & Abar, 2015). Several studies on the relationship between the interest rate and the exchange rate have been analysed by analysts.

According to Roubini (2000), economic phenomena can be affected by shifts in macroeconomic variables. Changes in the economic environment would also impact exchange rate fluctuations at the domestic level. Changes in the economic environment would also trigger exchange rate fluctuations at the domestic level. The key macroeconomic indicator can allow the exchange rate to fluctuate, such as the interest rate. A research by Jerson B. Patosa et. al (2012) showed that interest rates have a negative trade-off with the actual exchange rate, where the central bank will stabilise the exchange rate in its research, regulating the supply of money and demand for money by adjustments in the interest rate.

Anita Mirchandani (2013) also indicates that the interest rate has a negative relation with the exchange rate and that the outcome is significant in her studies to examine different macroeconomic variables leading to acute currency exchange rate variations. The researcher observed that there is a negative link between interest rate and exchange rate where weakening of the home currency would occur when there is a rise in interest rate. According to Ramasamy and Abar (2015), however, interest rates could, as per theory, have a positive influence on the home currency,

but their analysis came out with the opposite findings. The researchers investigated the reason for finding that where influence is likely to come from the point of view of consumers and the public and not from the effect of the prevailing economic component of the nations, the value of the currency is higher.

According to Wan Mohd Yaseer et al. (2016), who conducted an analysis to evaluate the exchange rate relationship between exports, interest rate and inflation rate , interest rate and inflation rate show statistically negligible results , indicating that there is a very weak relationship between exchange rate and interest rate as well as inflation rate. In their analysis into the effect of macroeconomic fundamentals on exchange rates for emerging Asian countries, Fayyaz Ahmad et al. found that interest rates had a negative impact on exchange rate movements. The rate of interest is not relevant and has a negative relationship, according to Cruz (2013). According to Utami (2009), however, exchange rate movements could be impacted by the exchange rate movements used as a home country by four international countries such as the USA, Japan, Singapore and the UK as well as Indonesia in the years 2003 to 2008.

In addition, a report by Sinha and Kohli (2013) showed that interest rates as well as exchange rates have a direct relationship. The researcher claimed that higher interest rates could encourage international capital because investors would be involved in spending to produce more income at a higher interest rate. This would fuel demand for a rise in the domestic currency. The value of the domestic currency would thereby increase as well. In addition, an interest rate rise would trigger currency appreciation against another currency outlined by Chowdhury and Hossain (2014). Bashar and Kabir (2013) also notes that the long-term relationship between interest rate and exchange rate is important and favourable.

Nevertheless, various influences on the link between inflation and exchange rate were also noticed by researchers. According to Abdoh et al (2016), there is an insignificant relationship between the exchange rate and the interest rate, while other influences, such as export rates, have an important impact on the exchange rate. Their results are the same as those of another scholar, Nwude (2012), who reported that interest rates do not have a statistically significant exchange rate correlation.

FOREIGN RESERVE MONEY (FER)

It is also referred to as a foreign exchange reserve (FOREX) or foreign reserve currency. It applies to reserves and bonds of foreign currency kept by the central bank and a nation's monetary authority. According to Arunachalam (2010), gold, SDRs and IMF reserve positions are included in the concept. Foreign reserve money has a big effect on the exchange rate reported by Olayungbo and Akinbobbola (2011), where to stabilise the exchange rates, the complementary tool that can be used is the rising value of reserve. Abdullateef and Waheed (2010) claim that the retention of reserves has a substantial direct effect on exchange rates, where the foreign exchange rate would rise if there is an increase in foreign reserve income. According to Muhammad Zubair et. al (2014) in his studies found the relationship of exchange rate instability, trade, reserve money and economic growth (GDP) found that, "when the exchange rates of Pakistan depreciated, export value increases, reserves money increases as well and ultimately increases the GDP of Pakistan". The projected values of the study equation indicate that the growth in exports, imports and foreign reserves due to the exchange rate depreciation adjustment is having a good impact on Pakistan's GDP. While according to Farhana Akhter et. al (2015), the total reserve amount has a negative impact on the exchange rate. The researchers observed that the rising trend in exports and remittances

had a positive implication on the exchange rate and the increasing trend in imports and foreign currency reserves had a negative effect on the rate of exchange rate.

There is a direct link between exchange rate and foreign reserve money, illustrated by a report by Bouraoui and Phisuthtiwatcharavong (2015). The study claimed that the international investment role and the economic success of the country are shown by foreign reserve currency. Increased foreign reserve money will then boost the value of domestic currency against foreign currencies. In addition, there is a comparable finding according to Emmanuel (2013) on his analysis on Nigeria where an increase in reserve would contribute to appreciation of domestic currency. Based on the analysis by Prabheesh et al. (2007), he notes that, relative to developed countries, greater demand for foreign reserve money aggregation in well developed nations because of developing countries needing to use reserve stocks to minimise the uncertainty of the exchange rate.

In addition, Calvo and Reinhart (2002) experiments have shown also foreign reserve money is important in evaluating exchange rates. The study was able to figure out that a rise in foreign reserve money would lead to a strong demand on the international market for domestic currencies, so a currency will appreciate and depreciate if foreign reserve money is decreased.

Chia et. al (2014) analysed the co-movements of net foreign asset generation, investment, real exchange rate, and real interest rate in cross section countries. One of the results in the report notes that rising consumption and real exchange rate appreciation are correlated with the accumulation of net foreign assets.

As long as the interest rate approaches the inflation rate, the accumulation of net foreign assets as a proportion of GDP can be

related to an appreciation of the real exchange rate, according to Bleaney and Tian (2014). In his report, Philip R. Lane (2001) noted that a slower market adjustment would lead to a greater accumulation of net foreign assets and this will have a greater long-term effect on the real exchange rate. The Cavallo and Ghironi (2002) study observed that, with sticky rates, the exchange rate relies, along with net foreign reserves, on the past GDP differential.

There are some scholars, however, who do not agree with the above argument. They found that the flow of exchange rates influences international reserve money insignificantly. An analysis performed by Zakaria et al. (2007) reveals that the correlation between foreign reserve money and exchange rates is negligible. He then clarified that this was due to certain external variables that determined the location of reserves. In the meantime, Gokhale and Raju (2013) as well conducting a report investigating the causality between Indian foreign reserve money and exchange rate. The findings obtained indicate that there is no long-term or short-term correlation between foreign reserve money and the exchange rate.

REVIEW OF RELEVANT THEORETICAL MODELS

LAW OF ONE PRICE (LOP)

The law of one price is a theory that states that if the international market is efficient and there is no transaction cost, the same goods or services will be sold at the same currency price in different countries. According to Ardeni (1989), "price equalization is very important if you wish to eliminate the market arbitrage and creating fair prices". Rogoff (1996) said, "prices are different between countries because there are trade barriers and also transportation costs".

The law of one price can be showed below according to Rogoff (1996) :
$$Pi = EPi*$$
Where,

Pi = domestic price of good i,

E = nominal exchange rate (direct quotation)

$Pi*$ = foreign price of good i

A study conducted by Taylor and Taylor (2004) says that once the rule of one market applies, since rates are represented in a single currency, the price of an internationally traded goods should be the same around the globe. After conversion into the same currency, if the rates are different, people would be able to earn riskless arbitrage benefits. In the meantime, Rogoff (1996) notes that tariffs, shipping rates and other types of trade limits in various countries can make the prices of the same goods vary. In addition, Arderni (1989) challenged whether or not the law of one price applies as the researcher claimed that the law of one price is impossible due to it is assumed that arbitrated prices are perfect, whereas empirical facts as well as analysis outcomes presented to back up this are inaccurate furthermore influenced by econometric shortcomings such as non-stationary data and incorrect first differential data used.

PURCHASING POWER PARITY (PPP)

In the 16th century, purchasing power parity was developed from Spain, Salamanca College, according to Dogruel and Dogruel (2013), while its current usage as the principle of exchange rate determination began with Gustav Cassel's work in 1918.

The purchasing power parity and the law of one price are closely connected. According to the one-price rule, if the price is represented in the common currency, the cost of goods and services sold internationally should be equal or at the same rate across the world. Purchasing power parity is a hypothesis that the average foreign exchange rate should be the same with the ratio of the aggregate market levels between two countries, so that a currency unit's purchasing power would be the same in various countries. Absolute buying power parity would hold, according to Taylor and Taylor (2004), if the law of one price holds. According to the report, once the currency is translated to be equal, it is an assumption that arbitration practises would enforce the price levels of different countries to be the same.

a.   *Absolute Purchasing Power Parity*

Absolute purchasing power parity says that if a single currency is used in different countries to price the same goods or services, the overall price index across the consumer price index should be the same across nations. Therefore, absolute purchasing power should be held if the rule of one price applies. A analysis by Taylor and Taylor (2004) reveals that, since being represented in a single currency, different commodity prices and national price levels in different countries appear to shift together, although the connection between the producer prices of the two countries would be greater than the relative market prices (Hakkio, 1992). Many foreign trading goods are differentiated commodities or goods in real life, but not replacement goods, and it will induce fluctuations in consumption buckets worldwide and therefore it is impossible to hold total purchasing power parity. According to Rogoff (1996), the question has been discussed and addressed in the relative purchasing power parity.

b.   *Relative Purchasing Power Parity*

The superior form of purchasing power parity would by the relative purchasing power parity, causing market patterns across nations to deviate. Although demanding an equivalent inflation difference for the nominal depreciation in order not to adjust the actual exchange rate. The relative purchasing power parity is often not empirically supported, however, according to Goyal (2014), thus further inquiries are required.

The model of Relative Purchasing Power is as shown below:

S1 /S0 = (1 + Iy) ÷ (1 + Ix)

S0 = spot exchange rate at the beginning of time period (Currency Y per each unit of currency X)

S1 = spot exchange rate at the end of the time period

Iy = expected annualized inflation rate for country Y

Ix = expected annualized inflation rate for country X

Relative parity of purchasing power assumes that in equilibrium, the true exchange rate will be stable where there is a balance between internal and external. Akram's (2003) study notes that a favourable trade balance would make nominal exchange rate to depreciate, whereas activity with high level would contribute to higher domestic inflation.

Nevertheless, there are arguments that the efficacy of purchasing power parity is influenced by causes other than inflation, such as central banks' currency intervention, trade barriers, transaction rates and other variables (Al-Zyoud, 2015; Frankel, 1981; Rogoff, 1996). In addition, the link between inflation and currency depreciation appears to decline from year to year, according to Taylor and Taylor (2014), and researchers are thus starting to question the efficacy of the quantitative parity of buying power.

Apart from that, Hakkio (1992) notes that the parity of buying power plays a significant role in long-run predicting the dollar value, but it is unaware of its utility in the short term. Koveos and Seifert (1985) argued that in deciding the foreign exchange risk of a company, purchasing power parity is essential. The study notes that in the case of purchasing power parity holds, the business's revenue as well as the expense changes along the general price index, economic exposure of the company would not serve as opposed to purchasing power parity does not hold. In addition, Frankel (1975) and Gaillot (1970) have observed that balance in buying power is preserved and also beneficial.

c.   *INTERNATIONAL FISHER EFFECT (IFE)*

The International Fisher Effect (IFE) is a Fisher Effect (FE) extension that an economist called Irving Fisher (Eun & Resnick, 2010) hypothesised. The principle of the International Fisheries Effect notes that the foreign currency spot rate between two countries can vary by a sum similar to the nominal interest rate difference, but in the opposite direction. If the nominal rate of country A is lower than in country B, the currency of country A should be appreciated at the same degree as the currency of country B.

The formula for International Fisher Effect is as follows:

Where,

e = rate of exchange in foreign exchange rate

= interest rate of country 1

= interest rate of country 2

Different scholars, however, argue that there is generally no international fisher effect as the link between the nominal interest rate and the foreign exchange rate is found not consistent and can be predicted (Alizadeh et al., 2014; Salas-Ortiz & Gomez-Monge, 2015; Shalishali, 2012; Sundqvist, 2002).

INTEREST RATE PARITY (IRP)

According to Zhang and Dou (2010), to forecast and to evaluate the exchange rate the interest rate parity is one of the hypotheses used. The theory notes that due to the interest rate differentials, there is no arbitrage advantage that can set the foreign exchange rate differential, which means that the world economy is money mobilised and a perfect replacement. Interest rate parity, however, does not necessarily hold and arbitrage advantage occurs where interest rate parity does not hold. Theory of interest rate parity contains two general groups, which are uncovered interest rate parity and covered interest rate parity. According to McBradey et al. (2010), forward exchange rates are

correlated with covered interest rate parity (CIRP) while uncovered interest rate parity (UIRP) predicts future sport rates.

a.   *Covered Interest Rate Parity*

According to Eeddin (1988), an investor can, by forward contracts on the foreign exchange market, hedge against foreign exchange risk. Covered interest rate parity is a theory that in various countries defines relationships between forward contracts and interest differentials (Frenkel & Levich, 1975). Between two risk-free securities with different currencies, according to Taylor (1987), the principal notes that the interest rate differentials should be null. Arbitrage benefit prospects are illustrated by the difference in covered interest rate parity (Balke & Wohar, 1998).

Covered interest rate parity can be equated as follows:

and   = domestic and foreign interest rates on similar assets
S = spot exchange rate
F = forward rate of same maturity as the interest rates.

As defined by interest rate parity, the forward and spot markets are typically not at the equilibrium stage, but then the forward discount or premium and interest differential are not the same, there would be riskless arbitrage advantage. Practice of covered interest arbitrage where, then, an arbitrator who accepts the imbalance would invest in a currency promising a better yield on the basis of a forward contract covered.

b.   *Uncovered Interest Rate Parity*

Without the use of the forward contract, no arbitrage condition is achieved is one of the ways to explain Uncovered interest rate parity (UIRP). Uncovered interest rate parity notes that disparity between the interest rates of two different nations should be the same as the projected foreign exchange rate, thus the return on interest differential regression of the foreign exchange rate would have the intercept of a nil and unit slope coefficient that would reduce possible arbitrage benefits. From time to time, the uncovered interest rate parity allows economists to understand the exchange rate determinants, according to Chaboud and Wright (2005), although the hypothesis is generally dismissed in research evidence. Moreover, although all other variables remain constant, the uncovered interest rate parity assumes that a rise in the actual interest rate will appreciate the value of the currency and the other way round (Bekaert et al., 2007).

Uncovered interest rate parity can be presented using the equation below:

Where,
= expected future spot exchange rate at time
= number of periods into the future from time
= current spot exchange rate at time
= interest rate in one country (e.g: Malaysia)
= interest rate in another country with different currency (e.g: US)

Arbitrages will opt to borrow from currencies that have comparatively lower interest rates if exposed interest rate parity does not hold, then lend in another currency that has a relatively higher interest rate that will potentially gain those arbitrage gains. The progress will be replicated, according to Taylor (1987), and thereby affect the foreign exchange rate and interest rates before the exposed interest rate parity holds again. The trade would be "uncovered" when investors do not share in the forward currency, which suggests that any chance of the currency deviating remains uncovered.

The standard uncovered interest rate parity should, however, not be used in the real world, according to Harvey (2006), since the uncovered interest rate parity deviation would still revert to zero as it represents the risk

premium. Furthermore, Chaboud and Wright (2005) also state that owing to the noisiness of the foreign exchange rate, the uncovered interest rate parity forecast on foreign exchange rate movement is never stable. Therefore, there are concerns that if the foreign exchange rate is random walk, the uncovered interest rate parity is invalid because there is a more efficient approximation of the random walk formula (Bakaert et al., 2007). In reality, short-horizon uncovered interest rate parity loss is referred to as a "forward premium puzzle" according to McBrady et al. (2010), and is a well-known international finance condition.

BUFFER-STOCK MONEY

In the early 1960s, buffer stock money was introduced. The theory notes, according to Rangan et al. (2014), to offset the changes of macroeconomic expense, optimal money reserve ratios are used by the central banks. Hiroyuki (2011) reports that pegged exchange rate regimes are governed by buffer stocks in foreign exchange reserves. The buffer stock money principle, capable of allowing the intermediate stages, managed stability in the exchange rate buffered by a wide proportion of foreign reserves.

Different nations have different reserve management policies that rely on the nation's monetary goals. With regard to exchange rate management and monetary policy, common priorities have been formulated. In those situations, international reserves would act as a hedge against the excess of the trade surplus in capital outflows, according to Irefin and Yaaba (2012). Monetary authorities of a country are free to engage at any moment in the foreign exchange market and liquidity has always been the goal. Under the fixed or floating exchange rate system (Irefin & Yaaba, 2012), the development of foreign reserve money serves as a 'shock absorber' during the fluctuation of financial trade. The risk of currency depreciation would also be lower as there is more foreign reserve capital, so

the government is willing to export foreign currency and the surplus supply of the foreign exchange market are induced, thus the foreign currency depreciates against the domestic currency, as well as the other way round.

In his report, Aizenman et al. (2008), however, notes that foreign reserves have shuffled their role in recent research concentrating on their role as a means of self-insurance against exposure to unreliable "hot currency" subject to regular, abrupt stops and reveals, whereas foreign reserves are a buffer stock in the management of pegged exchange rate regimes prior to studies. This argument is endorsed by Hiroyuki (2011), who said that the use of the buffer stock model does not justify the recent accumulation of foreign reserves since the transfer of the Emergency Market Economic (EME) currency system to floating regimes can help in minimising the accumulation over the past 10 years back.

METHODOLOGY

DEFINITION OF VARIABLES

Inflation Rate (INF)

Inflation is the amount of rise in prices over a given period of time, according to Ceyda Oner (2010). Inflation is usually a large indicator, such as an average price increase or an increase in the cost of living in a region. Inflation reflects how much more costly the relevant product or service plan has been for a given period of time, typically a year. Inflation is the term used to describe a increase in average prices across the economy, according to the Reserve Bank of New Zealand. It also suggests that the value of the money is being impaired. The explanation behind this is that there is typically too much cash available to buy few items and services, or production is outpaced by demand in the economy. In general, when an economy is floating, this condition happens where there is a generalised shortage of labour and materials where people may demand unfair prices for the same items or services.
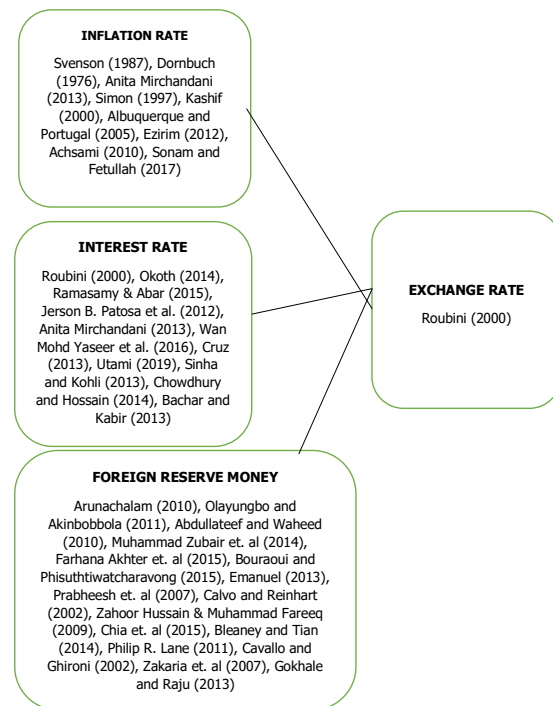
Interest Rate (IR)

Interest can be viewed from an economic point of view as either the reward earned for deferred use, for instance, placing it is a savings account rather than spending it. The cost of consuming while services are not available, for example, using a credit card to make a payment rather than investing the money, will be another example. Interest rates are the reward charged by a borrower to a lender for the use of capital for a time, according to Alexander Pierre Faure (2014), and interest rates are calculated in percentage terms per annum (pa). According to the Central Bank of Nigeria Research Branch, the interest rate is the amount paid on borrowed money, calculated as a percentage of the principal for the use of money from a lender to a borrower. It is generally expressed as a percentage of the amount lent, as negotiated by the lender and the borrower at the time of the loan contract, over some length of time. The interest rate, in particular, is the percentage of the principal charged as a tax for a given period of time.

Foreign Reserve Money (FER)

Foreign reserve money applies to foreign currency savings and bonds owned by a nation's central bank and monetary authority, according to Arunachalam (2010). Foreign exchange reserves, foreign currency reserves or international reserves are other names for foreign reserve money, all with the same meaning. Treasury bills, bonds, bank accounts, bank notes and other government securities may be part of this definition. Apart from these, there are IMF funds and even gold deposits in several countries. Partly to provide government resilience and also versatility, international reserve money exists. Thus, the central bank will absorb the shock if a foreign exchange falls or devalues substantially, since the foreign reserve money usually retains the currencies.

CONCEPTUAL FRAMEWORK

Figure 2 demonstrates the study's conceptual framework. Inflation rate, interest rate and foreign reserve money are the identified monetary variables that can influence the exchange rate movements in Malaysia.

INFLATION RATE

Svenson (1987), Dornbuch (1976), Anita Mirchandani (2013), Simon (1997), Kashif (2000), Albuquerque and Portugal (2005), Ezirim (2012), Achsami (2010), Sonam and Fetullah (2017)

INTEREST RATE

Roubini (2000), Okoth (2014), Ramasamy & Abar (2015), Jerson B. Patosa et al. (2012), Anita Mirchandani (2013), Wan Mohd Yaseer et al. (2016), Cruz (2013), Utami (2019), Sinha and Kohli (2013), Chowdhury and Hossain (2014), Bachar and Kabir (2013)

FOREIGN RESERVE MONEY

Arunachalam (2010), Olayungbo and Akinbobbola (2011), Abdullateef and Waheed (2010), Muhammad Zubair et. al (2014), Farhana Akhter et. al (2015), Bouraoui and Phisuthtiwatcharavong (2015), Emanuel (2013), Prabheesh et. al (2007), Calvo and Reinhart (2002), Zahoor Hussain & Muhammad Fareeq (2009), Chia et. al (2015), Bleaney and Tian (2014), Philip R. Lane (2011), Cavallo and Ghironi (2002), Zakaria et. al (2007), Gokhale and Raju (2013)

EXCHANGE RATE

Roubini (2000)

RESEARCH HYPOTHESIS

First Hypothesis – Inflation Rate (INF)

: There is no significant relationship between inflation and exchange rate.
: There is a significant relationship between inflation and exchange rate.

Second Hypothesis – Interest Rate (IR)

: There is no significant relationship between interest rate and exchange rate.
: There is a significant relationship between interest rate and exchange rate.

Third Hypothesis – Foreign Reserve Money (FER)

: There is no significant relationship between foreign reserve money and exchange rate.
: There is a significant relationship between foreign reserve money and exchange rate.

DESIGN OF RESEARCH

Quantitative data is used in this study to perform the research where the research questions are answered by numerical data. This thesis is performed as the basis of the thesis by using predictive test style. This explanatory research design is useful for the interpretation of possible research and findings to be clarified by the present theory, according to Kowalczyk (n.d). For a topic that has not been well studied before, explanatory analysis design is carried out where it works on describing the aspects of the research in a thorough way. This study explores the relationship between the inflation rate (INF), interest rate (IR) and foreign reserve money (FER) and the dependent variable exchange rate (EXC).

Through applying analytical methods and sample results, the relationship between the independent variables and the exchange rate is calculated. For the purpose of the analysis, analytical methods such as E-views 11 programme are used to enumerate the variables data obtained from Bloomberg into empirical outcome.

DATA COLLECTION METHODS

Secondary Data

All the data is derived from the Bloomberg database, which contains data on a different basis for most of the IMF participants. The data used in this analysis were monthly data for the period from 2013 to 2015. There are 36 observations in total evaluated, as monthly data is used.

Sample distribution would usually be distributed, based on Watkins et al. (2014), Kouritzin and Heunis (1992), if sample size (n) is sufficiently high, which is consistent with Central Limit Theorem (CLT) Principle, where a sample size is considered huge and accepted when the samples reach 30 samples.

SAMPLING TECHNIQUE

Software E-views 11 is the key research method in this report. E-views 11 aims to establish predictive relationships and predict potential values from the results. E-views 11 is an application of econometrics that is advantageous in estimating macroeconomic values, modelling, analysing costs, analysing as well as assessing financial and scientific results, as well as estimating revenue. According to Schwert (2010), E-views 11 includes forecasting instruments, Window-based computers regression and advanced data analysis.

According to Schwert (2010), economists who master the application of economic functions because its effective for economic time series data as well as therefore capable of providing a broad cross-section project have generated e-views. This study will use E-views 11 for estimation purposes, which is a powerful method for editing spreadsheets which enables multiple colums to be modified at once and group comparisons across multiple episodes. Moreover, E-Views 11 also enhances data tables with complete support of the command line, which enhances the view of information of job files.

STATISTICAL MODEL SPECIFICATION

a. Unit Root Test

A unit root is a process that evolve through time that can cause problems in statistical inference involving time series models. A linear stochastic process has a unit root if 1 is a root of the process' characteristic equation which means the process is non-stationary. If the other roots of the characteristic equation lie inside the unit circle which have a modulus that is less than one, then the first difference of the process will be stationary. If the mean and auto-covariance of the series is not dependent on time, a series is considered to be weak or stationary covariance. It is stated

that every sequence which is not stationary is not stationary or not valid.

Two unit root tests are conducted in this study, which are the Augmented Dickey Fuller unit root test and the Phillips-Perron unit root test to determine the null hypothesis () as the time series has unit root, so the time series is not stationary against the alternate hypothesis () that there is no unit root in the time series, which means it is a stationary time series.

: time series has unit root (non-stationary)
: time series has no unit root (stationary)

b. *Augmented Dickey Fuller (ADF)*

In statistics and econometrics, the Augmented Dickey-Fuller (ADF) test is a time series sample test for a unit root. For a wider and more complex range of time series models, the Augmented Dickey-Fuller test is used to test. A negative number is used throughout the test of the augmented Dickey-Fuller (ADF) statistic. The more negative the number is, the greater the rejection of the hypothesis that at any degree of confidence there is a unit root. Augmented Dickey-Fuller (ADF) test equation is as below:

The ADF formulation allows for a higher-order autoregressive method by having lags in the sequence. That implies that when the measure is applied, the lag length needs to be calculated. Checking down from high orders and examining the t-values on coefficients are the potential method.

Philips-Perron (PP)

In addition, the Phillips-Perron unit root test is used to improve the effects of the Augmented Dickey-Fuller. The Phillips-Perron test is a unit root test in statistics, named after Peter C. B. Philips and Pierre Perron). This is used in the study of time series to evaluate the null hypothesis that order 1 is inserted into a time series.

One benefit that this unit root test has over the ADF test, according to Brooks (2000), is that the Phillips-Perron test is stable with respect to undefined autocorrelation and heteroscedasticity in the test regression disruption phase. The Phillips-Perron measure, thus, fits well for financial time series. The Phillips-Perron test equation is as below:

$$\Delta Yt = \theta 0 + \delta Yt - 1 + at$$

Vector Autoregression

An economic model used to capture the linear interdependencies between several time series of data is vector autoregression. By having more than one changing component, vector autoregression is used to view the univariate autoregressive model. The structural approach to simultaneous simulation of equations employs economic theory to explain the relationships between multiple interest variables. To use Johansen's method, we need to turn the VAR of the form

$$\Delta yt = \beta 1\ yt - 1 + \beta 2\ yt - 2 + \cdots + \beta k\ yt - k + ut$$

into a VECM, which ca be written as

$$\Delta yt = \mathrm{II} yt - k + r1\ \Delta yt - 1 + r2\ \Delta yt - 2 + \cdots + rk - 1\ \Delta yt - (k-1) + ut$$

$$= (\Sigma_{j=1}^{i} \beta_j) - I_g \quad \text{where} \quad \mathrm{II} = (\Sigma_{j=1}^{k} \beta_i) - I_g \quad \text{and} \quad r_i$$

Var Granger Causality/Block Exogeneity Test

The Granger causality test is a statistical hypothesis test to decide whether one time series is practical or functional in forecasting another. Granger causality is a statistical concept of causality that is based on forecast. According to Granger causality test, if a signal X1 "Granger-causes" a signal X2, then past values of X1 should have the information that helps predict X2 above and apart from the information contained in past values of X2 alone. Granger (1969) proposed a time-series data-based approach in order to know

the causality. In the Granger-sense *x* is a cause of y if it is useful in predicting the *y*[1]. In this framework, "useful" means that *x* is able to increase the precision of the prediction of y with respect to a forecast, considering only past values of *y*. The granger causality test for the case of two variables Y_t and X_t involves following steps as the estimation of the following VAR model;

Where, it is assumed that both and are uncorrelated white noise error terms.

Residual Diagnosis

Normality Test

Originally proposed by Jarque and Bera (1987), the Jarque and Bera test is the most widely used test for normality. The normality test is used to assess if the data set is well modelled or not by the distribution of normality. Normality checking also checks whether the error word is naturally distributed, according to studies undertaken by Brys, Hubert and Struyf (2004). The normally distributed data in the graph presentation would display a bell-shaped frequency distribution. Normality test uses skewness and kurtosis measures to compute the statistic by using the formula of:

Where,
= sample size
 = skewness coefficient
 = kurtosis coefficient
The hypothesis of the normality test is:
: The data are sampled from a normal distribution.
: The data are not sampled from a normal distribution.

Decision rule of this test is, reject if the calculated test statistic exceeds a critical value, other wise do not reject . In econometrics, normality checking is conducted using the skewness-kurtosis test. Because of the blunt results and perception of the test, the reason why the test is used is the coefficient of skewness is useful for time series data when combined with kurtosis. The skewness of a standard spread should be equivalent to or equal to zero. If the P-value is greater than the test-significance level in the Jarque-Bera test, it indicates that the data is distributed normally and vice versa.

Multicollinearity

According to Wiley Online Library (2010), when there is a linear relationship among two or more variables, multicollinearity happens. Multicollinearity is a concern because multicollinearity makes it difficult to define or explain which explanatory variables influence the dependent variable in the regression model. To detect any multicollinearity problem which can happen in the model, firstly using high or high F statistic but few signification t-ratio. Secondly, according to Gujarati and Porter (2009), the Variance Inflation Factor (VIF) can also be calculated and the last is a high pair of independent variables that are broadly correlated.

One means of addressing multicollinearity is to remove the independent variable that is strongly correlated with other independent variable, allowing a meaningful coefficient of the model. This approach, however, will contribute to model specification bias because it will lose essential details and thereby mislead the parameters' true values. Below is the formula to test multicollinearity:

Heteroscedasticity

According to Birau (2012), violation of homoscedasticity assumption will cause heteroscedasticity to arise. Homoscedasticity happens when variances are the same around the observations of the error terms. There are some general variables that induce heteroscedasticity, such as mis-specification of the model, incomplete transformation of data or some outliers. Heteroscedasticity makes the regression model no longer BLUE (best, linear,

unbiased coefficient), where the model would remain neutral but would become unreliable and thus invalidate the testing of the theory. In this analysis, ARCH LM tests will be carried out.

The hypothesis of the heteroscedasticity test is:
: The model is homoscedastic.
: The model is heteroscedastic.

Decision rule of this test is, reject if p-value is less than the significance level, otherwise do not reject the . P-value is considered as a method to decide the significance of hypothesis testing. Rejecting the null hypothesis when p-value is less than the significance level means the model is having heteroscedasticity problem and vice versa.

Autocorrelation

The term autocorrelation can be defined according to Gujarati and Porter (2009), the correlation between the disturbance terms in the time series or the cross-sectional details. Pure autocorrelation and impure autocorrelation are two types of autocorrelation. Pure autocorrelation occurs where in a correct-specified equation, the error term is violated in uncorrelated observation. While when there is a serial correlation due to specification error or if there is any incorrect function in the model is found, it is called impure autocorrelation.

The Durbin-Watson, which was developed by Durbin and Watson statisticians, is the most accepted serial correlation measure. It is defined as the ratio of the sum of square differences to the residual sum of squares (RSS) in successive residuals. Breusch and Godfrey created the Breush-Godfrey (BG) test to resolve the constraint of this test, allowing random variable, higher-order autoregressive schemes and simple or higher-order moving averages of white noise error terms. The Breusch-Godfrey Serial Correlation LM test will be used for autocorrelation testing in this report.

The hypothesis of autocorrelation test is:
: There is no autocorrelation among the residuals.
: There is autocorrelation among the residuals.

Decision rule of this test is, reject if test statistic value lies in the critical region, otherwise do not reject the . If the statistical value of the test lies in the critical area, the test may be assumed to be statistically valid where the null hypothesis is denied and vice versa. In comparison, p-value also serves as another tool to assess the significance of the testing of hypotheses. If the p-value is lower than the significant level, denying the null hypothesis implies that there is autocorrelation between the residuals and vice versa.

DATA ANALYSIS AND EMPIRICAL FINDINGS

RESEARCH MODEL

There are many variables that affects the exchange rate in Malaysia. Monetary determinants such as inflation rate , interest rate and foreign reserve money are being examined in this study. A multiple linear regression model (MLRM) is this study's model. To examine if there is a relationship between two or more independent variables with one dependent variable, a multiple linear regression model is used. The range of consequence for the independent variables on the dependent variables can be evaluated using this model. Moreover, if there are any changes in the independent variable, this model will forecast the results of changes in the dependent variable. The following represents the multiple linear regressions;

Where,
= Error Term
t = Number of Observations
Where,
Y = EXC = Exchange Rate in Malaysia (MYR/USD)
= INF = Inflation Rate (Consumer Price Index)
= IR = Interest Rate (Percentage Annually)

Table 1: Augmented Dickey Fuller Unit Root Test

	AT LEVEL			AT FIRST DIFFERENCE		
Variable	Lag [Order]	t-stat	Prob*	Lag [Order]	t-stat	Prob*
EXC	(0)[0]	0.6490	0.9891	(0)[1]	-4.7002	0.0006
INF	(0)[0]	-0.4388	0.8908	(0)[1]	-5.7994	0.0000
IR	(0)[0]	-0.9710	0.7527	(0)[1]	-5.8310	0.0000
FER	(0)[0]	-1.8760	0.3393	(0)[1]	-5.4399	0.0001

Table 1 shows the outcomes for Unit Root using Augmented Dickey-Fuller unit root test. According to the ADF test, all variables at level are non-stationery so do not reject H_0 because the probability is higher than 10% of significant level. However, the results showed that at first difference all variables are stationary so reject the H_0 at 1% significance level. Thus, according to ADF tests, exchange rate, inflation rate, interest rate and foreign reserve money is non-stationery at level, I(0) but it is stationery at first difference, I(1).

Table 2: Phillips-Perron Unit Root Test

	AT LEVEL			AT FIRST DIFFERENCE		
Variable	Lag [Order]	t-stat	Prob*	Lag [Order]	t-stat	Prob*
EXC	(0)[0]	0.7505	0.9916	(0)[1]	-4.6595	0.0007
INF	(0)[0]	-0.0270	0.9496	(0)[1]	-5.1070	0.0002
IR	(0)[0]	-0.9710	0.7527	(0)[1]	-5.8315	0.0000
FER	(0)[0]	-1.7262	0.4097	(0)[1]	-9.3510	0.0000

According to the PP test;

<u>At Level</u>

LEXC = accept H_0. The LEXC is non-stationery at level.

LINF = accept H_0. The LINF is non-stationery at level.

LIR = accept H_0. The LIR is non-stationery at level.

LFER = accept H_0. The LFER is non-stationery at level.

<u>At First Difference</u>

LEXC = reject H_0 at 1% significance level.

LINF = reject H_0 at 1% significance level.

LIR = reject H_0 at 1% significance level.

LFER = reject H_0 at 1% significance level.

Thus, according to PP tests, exchange rate, inflation rate, interest rate as well as foreign exchange rate is non-stationery at level, I(0) but it is stationery at first difference, I(1). This will cover the running lag section criterion.

LAG SELECTION CRITERION
Table 3: Lag Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	265.8710	NA	1.50e-12	-15.87097	-15.68958	-15.80994
1	386.4302	204.5852*	2.6e-15*	-22.20789*	-21.30092*	-21.90272*
2	396.0911	14.05223	4.14e-15	-21.82370	-20.19115	-21.27440
3	408.3027	14.80193	5.89e-15	-21.59410	-19.23597	-20.80066

*indicates lag order selected by the criterion

This study uses a limited sample of monthly results, reducing the degree of lack of constraints if further lags are chosen. The principle of Johansen and Juselius (1990) advocates that the optimal lags for well-organized outcomes should be limited to 1 or 2 for small samples. In this model, the optimal lag chosen is 1. In the Johansen Cointegration test, this optimum lag will be used.

VECTOR AUTOREGRESSION
Table 4: Vector Autoregression Estimates

	D(LEXC)	D(LINF)	D(LIR)	D(LFER)
D(LEXC(-1))	0.207007 (0.16210)	0.017267* (0.02747)	0.055568 (0.10451)	-0.427309 (0.23949)
D(LINF(-1))	-0.639780 (1.01896)	0.311400 (0.17267)	-0.189870 (0.65693)	-1.105846 (1.50544)
D(LIR(-1))	0.286474 (0.28770)	-0.002683* (0.04875)	-0.039957 (0.18548)	0.065094 (0.42506)
D(LFER(-1))	0.343871 (0.11745)	0.036345* (0.01990)	-0.016884 (0.07572)	-0.029671 (0.17353)
C	-0.006811 (0.00509)	0.001766 (0.00086)	0.003401 (0.00328)	-0.002882 (0.00752)

Note: Sample (adjusted): 2013M03 2015M12, Included observations: 34 after adjustments and Prob. in ( ). * significant at 5%

The outcome of VAR estimates can be seen in Table 4. Table 4 shows that the first LINF, LIR and LFER lag intervals are statistically influenced by LINF. This indicates that the relationship between inflation rate , exchange rate, interest rate and foreign reserve money exists.

COINTERGRATION TEST
Table 5: Johansen Trace Test for Co-integration

Hypothesized of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**	Max-Eigen Statistic	5% Critical Value	Prob.**
None	0.271403	25.97954	47.85613	0.8899	10.76557	27.58434	0.9711
At most 1	0.227334	15.21398	29.79707	0.7661	8.768887	21.13162	0.8506
At most 2	0.168328	6.445088	15.49471	0.6429	6.266780	14.26460	0.5792
At most 3	0.005231	0.178308	3.841465	0.6728	0.178308	3.841465	0.6728

The outcome for both trace statistics and the maximum Eigen statistics seen in Table 5 reveal that the Johansen co-integration test accepted one co-integrating vector as the maximum rank of one for the scenario chosen at the 5 percent significance stage. The trace test suggests that there is no 0.05 level cointegration and the Max-eigenvalue test also indicates that there is no 0.05 level cointegration. Therefore, it can be concluded that the variables in this model have long run co-integrating relationship.

VAR GRANGER CAUSALITY/BLOCK EXOGENEITY TEST
Table 6: VAR Granger Causality/ Block Exogeneity Wald Tests

	Excluded	Chi-sq	df	Prob.
LEXC as Dependent variable	LINF	0.394230	1	0.5301
	LIR	0.991486	1	0.3194
	LFER	8.571495*	1	0.0034
	Jointly	10.20394**	3	0.0169
LINF as Dependent variable	LEXC	0.395161	1	0.5296
	LIR	0.003030	1	0.9561
	LFER	3.334561***	1	0.0678
	Jointly	3.753187	3	0.2894
LIR as Dependent variable	LEXC	0.282728	1	0.5949
	LINF	0.083537	1	0.7726
	LFER	0.049715	1	0.8236
	Jointly	0.350739	3	0.9502
LFER as Dependent variable	LEXC	3.183565***	1	0.0744
	LINF	0.539586	1	0.4626
	LIR	0.023452	1	0.8783
	Jointly	4.799614	3	0.1871

The findings and the relationship between LEXC, LINF, LIR and LFER are seen in Table 6. The result shows that the variable LFER is relevant at 1 percent while LEXC is the dependent variable, which means that there is a positively significant relationship of 1 percent between LEXC and LFER. Together, the variables have a 5% causal, significant relationship with LEXC. The result shows that the LFER variable is important at 10 percent if LINF is the dependent variable, which means that there is a strong causal relationship of 10 percent between LINF and LFER. The study reveals that there is no major causal relationship between LEXC, LINF and LFER while LIR is the dependent variable. The result shows that LEXC is significant at 10 percent while LFER is the dependent variable, which means that there is a significant causal correlation between LFER and LEXC at 10 percent.

RESIDUAL DIAGNOSIS
NORMALITY TEST (Jarque-Bera)

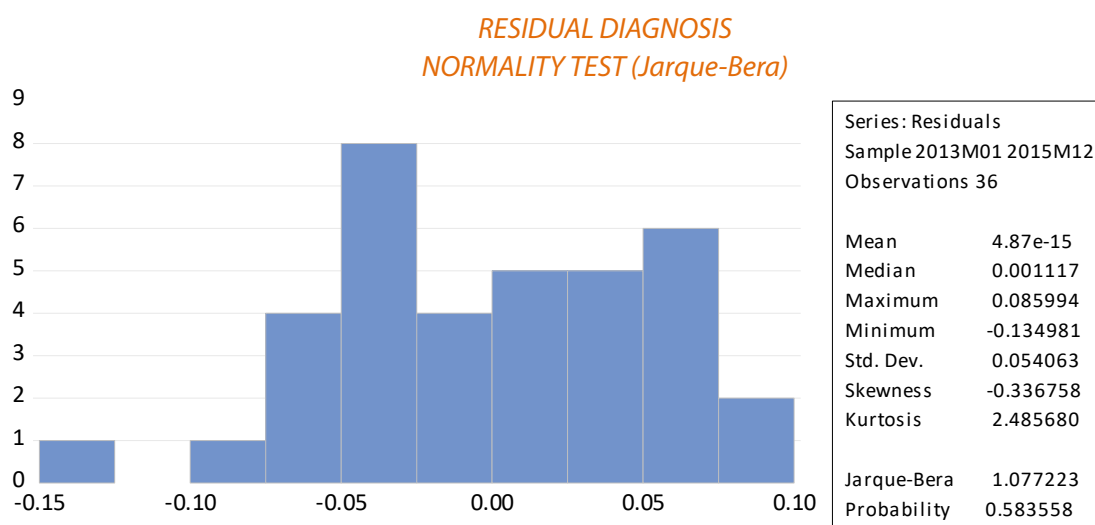| Series: Residuals	
Sample 2013M01 2015M12	
Observations 36	
Mean	4.87e-15
Median	0.001117
Maximum	0.085994
Minimum	-0.134981
Std. Dev.	0.054063
Skewness	-0.336758
Kurtosis	2.485680
Jarque-Bera	1.077223
Probability	0.583558

Figure 4: Results of Normality Test

: The data are sampled from a normal distribution.

: The data are not sampled from a normal distribution.

Significance level   : = 0.05

Decision Rule   : Reject if P-value less than significance level 0.05.

Otherwise do not reject .

P-Value : 0.583558

Decision Making   : Do not reject , since the p-value is (0.583558) is larger than the significant level (0.05).

Conclusion : There is insufficient evidence to conclude that the model is not normally distributed at 5% significance level. Thus, is accepted and the model is normally distributed.

MULTICOLLINEARITY

According to OLS results, it shows that the coefficient of determination () is a little bit high, which is 0.743291. The result shows that the regression model fits into the model results, where 74.32 percent of the exchange rate fluctuations are explained by changes in Malaysia's inflation rate , interest rate and foreign reserve currency. The result shows that the regression model fits into the model data. Also, the analysis calculates the Variance-Inflating Factor (VIF) to measure how many coefficient variances are inflated to further investigate the multicollinearity problem.

By using Variance-Inflating Factor (VIF):

VIF =

VIF =

VIF = 3.895461398

: No multicollinearity among the variables.

: There is multicollinearity among the variables.

Conclusion : Accept as the VIF value is less than 5 and reject .   Thus, the VIF results indicates that there is no multicollinearity problem detected in the model.

Table 7: Heteroscedasticity

F-statistics	Prob. value
9.040382	0.0050

: The variance is homoscedasticity.

: The variance is heteroscedasticity.

Significance level   : = 0.01

Decision Rule   : Reject if P-value less than significance level 0.01.

Otherwise do not reject .

P-Value : 0.0050

Decision Making : Reject , since the p-value is (0.0050) is lower than the significant level (0.01).

Conclusion : There is enough proofs according to the results whichconclude that the model is heteroscedastic. Thus, is rejected and the is accepted and model have heteroscedasticity problem.

AUTOCORRELATION

Table 8: Autocorrelation

-statistics	Prob. value
33.10466	0.0000

: There is no autocorrelation among the residuals.

: There is autocorrelation among the residuals.

Significance level   : = 0.05

Decision Rule   : Reject if P-value less than significance level 0.05.

          If not, do not reject .

P-Value   : 0.0000

Decision Making : Reject , since the p-value is (0.0000) is lower than the significant level (0.05).

Conclusion : There is sufficient evidence to conclude that there is

  autocorrelation problem among the residuals. Thus, is rejected and the is accepted.

DISCUSSION, CONCLUSION AND IMPLICATIONS

STATISTICAL ANALYSES

Table 9: The statistical and expected outcome

Test	Result	Expected Relation	Major Findings
INF and EXER	Positive Significance	Negative	Kashif, S. (2000); Achsani, N. A. (2010); Anita Mirchandani (2013); Sanam and Fetullah (2017)
IR and EXER	Negative Significance	Negative	Anita Mirchandani (2013); Cruz (2013)
FER and EXER	Negative Significance	Positive	Abdullateef, U., & Waheed, I. (2010); Bouraoui, T., & Phisuthtiwatcharavong, A. (2015); Emmanuel, U. C. (2013).

Note: Since EXER represents MYR / USD, a positive relationship is thus expressed by a negative coefficient in the result production of E-views 11, whereas a positive coefficient represents a negative relationship.

DISCUSSION OF MAJOR FINDINGS

INFLATION RATE

This study showed that the inflation rate (INF) and exchange rate (EXER) are positively insignificant. The result obtained is consistent with the Sanam and Fetullah (2017) research report, which also found that there is a direct correlation between the exchange rate and the rate of inflation. However, Anita Mirchandani (2013) found that the inflation rate and the exchange rate are indirectly associated. Her study found that inflation and exchange rates are moderately correlated, and the study's statistical review revealed that inflation and exchange rates are indirectly correlated. In addition, Kashif's (2000) analysis calculated in the economic indicator that exchange rate effect revealed a negative and negligible relationship between the inflation rate and the exchange rate between the US dollar and the Pakistani rupee. Other than that, Achsami (2010) finds that inflation rate is far higher in countries than in other countries in case of inflation rate, inflation rate also gives the right sign between exchange rate relationships, which is a negative relationship

However, having an insignificant effect on the relationship between the inflation rate and the exchange rate does not mean that it should be dismissed, but it should be well handled and regulated. This is because inflation is one of the major variables that can help improve market demand and spending, which stimulates the economy and influences the exchange rate at the same time.

INTEREST RATE

The negative, insignificant relationship between interest rate (IR) and exchange rate (EXER) is based on the empirical results of this study. This finding is consistent with researchers' previous studies where Anita Mirchandani (2013) indicates that in her studies, interest rate has a negative correlation with exchange rate to investigate the different macroeconomic variables that contribute to currency exchange rate fluctuations. The investigator has observed that where there is a rise in interest rate, there is a negative correlation between interest rate and exchange rate and that would lead the home currency to depreciate. The interest rate should ideally be able to have a beneficial effect on the home currency, according to Ramasamy and Abar (2015), but the analysis carried out resulted in the opposite findings. His analysis studied the explanation and concluded that the value of the currency is stronger where the strength possibly came from the viewpoint of consumers and the public, but not from the power of the countries' dominant economic variable. While it is observed that interest rate

and inflation rate show statistically insignificant results, according to a report by Wan Mohd Yaseer et al. (2016), which also suggests a poor relationship between exchange rate and interest rate and inflation rate. In addition, Cruz's (2013) analysis finds that the interest rate is not important and that it has a negative association with the exchange rate. There is an insignificant relationship between the exchange rate and the interest rate, according to Abdoh et al (2016), although other factors such as export prices have a major impact on the exchange rate. Their results are the same as those of another scholar, Nwude (2012), who reported that interest rates do not have a statistically meaningful exchange rate relationship.

According to Wilson (2014), however, even though the outcome indicates an irrelevant relationship, it does not mean that it is overlooked by regulatory bodies, but rather that it should be well handled and controlled. This is because the interest rate is an critical factor that could control other macroeconomic indicators, such as the availability of money and the demand for money, which could have a direct effect on the exchange rate.

FOREIGN RESERVE MONEY

There is a significantly adverse relationship between foreign reserve money and the exchange rate at a 1 percent significance level based on the study outcome. The outcome obtained was consistent with Farhana Akhter et. al (2015), where her analysis revealed that the overall volume of the reserve has a negative effect on the exchange rate. The researchers observed that the upward trend in exports and remittances had a positive impact on the exchange rate and the upward trend in imports and foreign currency reserves had a negative impact on the exchange rate.

There is, however, a positive relationship between foreign reserve money and exchange rate, illustrated by a report by

Bouraoui and Phisuthtiwatcharavong (2015). The finding showed that the international investment role and the economic success of the country are seen by foreign reserve money. The value of the domestic currency against foreign currencies may also be increased by higher foreign reserve money. In addition, he observed a related outcome where a rise in reserve would contribute to domestic currency appreciation, according to Emmanuel (2013) on his research on Nigeria.

Nevertheless, some analysts do not agree with the aforementioned argument, finding that foreign reserve money has an insignificant effect on the flow of exchange rates. An analysis by Zakaria et al. (2007) reveals that the relationship between foreign reserve money and exchange rates is negligible because of certain external variables determined by the location of reserves. In the meantime, Gokhale and Raju (2013) are also conducting an analysis investigating the causality of foreign reserve money and exchange rate in India and the findings obtained indicate that there is no long-term or short-term association between foreign reserve money and exchange rate.

IMPLICATION OF RESEARCH STUDY

The result of this study can contribute to different sectors such as following:

a. *Government and policy makers*
Results from research and studies undertaken would come with an effective policy application. This research will support and therefore make the government invest the right amount of money in the right place as well as minimising risk of wasting resources. The appreciation (rising value) and depreciation (low value) of foreign currency would give effect on a nation's economic structure, by recognising what contributes in affecting the movement of the exchange rate would give the government and policy makers in the country a better view in formulating the effectiveness of the exchange policy to make

sure the stabilisation of the country's economy and to achieve economic development.

Policymakers or regulators should rely on facts to make any changes or enhancements to the provision of laws in order to ensure that a nation improves economic development. This analysis shows that interest rate in directing exchange rate is not significant and this is consistent with the findings of some other researchers (Anita Mirchandani, 2013; Ramasamy and Abar, 2015; Cruz, 2013). In addition, the outcome of this study also indicates that inflation has a positive exchange rate relationship, but in determining the exchange rate where it also aligns with previous research, it is not significant (Sanam and Fetullah, 2017; Anita Mirhcandani, 2013). Furthermore, it illustrates that foreign reserve money playing an important role in influencing Malaysian exchange rate. Therefore, opposed to interest rates and inflation rates, government officials and policy makers should pay more attention to the laws and regulations on foreign reserve money.

b. *International Traders and Investors*

To prevent risks as well as at the same time, improving earnings, hedging investors and brokers can refer to this analysis as their reference while working. The exchange rate will impact the actual return of the global investment portfolio of an investor, according to a report conducted by Bouraoui and Phisuthtiwatcharavong (2015). A better outlook of the exchange rate would allow buyers and traders to minimise different risks while achieving competitiveness through the use of effective and reasonable strategies. In addition, knowledge of exchange rate determinants can assist and help exporters as well as importers in decision-making on risk exposure and firm value (Necsulescu & Serbănescu, 2013; Simpson & Evans, 2004). Investors could have a clearer prediction of international exchange rates by understanding the relationships between foreign reserve money and exchange rates and thereby generating income from investing activities. Around the same time, merchants as well as companies can be mindful that their trades around the globe would affect the balance of a country's foreign exchange and would therefore be more accountable and vigilant in making trade decisions.

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