DETERMINANTS OF EXCHANGE RATE (USD)

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

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

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AD	Aggregate Demand
ALL	Albanian Lek
ANOVA	Analysis of Variance
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
AS	Aggregrate Supply
CBN	Central Bank of Nigeria
CLT	Central Limit Theorem
CNY	Chinese Yuan
CPI	inflationary trend
DEBT	Federal Debt
DMO	Debt Management Office
ECM	Error Correction Model
EUR	European
EVIEWS	Electronic Views
EXR	Exchange Rate
FOREX	Foreign Exchange Markets
FRED	Federal Reserve Bank of St. Louis
GDP	Gross Domestic Products
GLS	Generalized Least Squares

H_0	Null Hypothesis
H_1	Hypothesis
IFE	International Fishers' Effect
IMF	International Monetary Fund
INF	Inflation Rate
IR	Interest Rate
JB	Jarque-Bera
LM Test	Breusch-Godfrey Lagrange Multiplier Test
MLR	Multiple Linear Regressions
MSE	Model Specification Error
OECD	Organisation for Economic Co-operation and Development
OLG	Overlapping Generations
OLS	Ordinary Least Square
PBC	People's Bank of China
PPP	Purchasing Power Parity
REER	Real Effective Exchange Rate
RER	Real Exchange Rate
RESET	Regression Equation Specification Error Test
RON	Romanian Leu
SEA	Southeast Asia
SLRM	Simple Linear Regression Model
THB	Thai Baht
TOL	Tolerance

TWBD	The Data World Bank
UK	United Kingdom
US	United States
USCB	United States Census Bureau
USD	United States Dollar
UTAR	University Tunku Abdul Rahman
VAR	Vector Autoregression
VIF	Variance Inflation Factor
WLS	Weighted Least Squares
WWI	World War I
WWII	World War II
ZWD	Zimbabwean Dollar

PREFACE

This research project is part of the requirements that need to fulfill by the Bachelor of Business Administration (HONS) Banking and Finance course. The title we have chosen for our research project is "Determinants of exchange rate (USD)".

There are some macroeconomic variables that will bring an impact toward a country's exchange rate. Thus, we have chosen inflation, interest rate and debt as the independent variables in order to identify how these variables affect the exchange rate by using Ordinary Least Square (OLS) method.

By proving the relationship between the macroeconomic variables and the exchange rate, market participants are able to gain a better understanding on the fluctuations of a country's exchange rate.

Besides that, this research also includes the implication for various market participants that are actively engaging in foreign exchange (FOREX) market. In addition, this research is intended to establish a significant contribution to those parties who have concerns about Forex market as well as macro financial environment of United States.

ABSTRACT

This study aims to determine the relationship between the exchange rate of United States and its determinants (inflation, interest rate and debt). The data collection for each independent variable was adopted and taken from many sources such as The Data World Bank, Federal Reserve Bank of St. Louis and Knoema. The annual data set includes 36 observations which are ranging from year 1979 to year 2014.

Ordinary Least Squares (OLS) method is applied in order to examine the statistical relationship between the dependent variable and independent variables in the model. In addition, several tests have been run and carried out for diagnostic checking process by using Eviews. The outcomes indicate that the estimated model of this study has encountered two econometrics problems which are multicollinearity and autocorrelation problems.

The empirical results indicate that inflation and interest rate have a positive and significant impact on the exchange rate of United States. However, the only independent variable, debt shows that it is positively but insignificantly influences the exchange rate of United States.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

This topic highlights on the research background, problem statement, research objectives, hypothesis and the significance of the study. Each chapter is briefly outlined with a layout. Last but not least, a conclusion on this chapter is made.

1.1 Research Background

According to Wessel (2005), there are many countries have tied their respective currencies to the gold standard before World War I (WWI) whereby the currency unit of each country could be converted to a weight of gold. In 1879, the value of United States Dollar (USD) was also been directly linked to the weight of gold whereby US has adopted the gold standard as other countries. For instance, the USD and British Pound was pegged at $20.67/oz and £4.25/oz. Thus, the exchange rate for US$/£ is $4.86/£ ($20.67/£4.25). In this era, the country going to sell their currency and buy back the gold when the currency depreciates. In contrary, the country sells gold and buys back currency when currency appreciates. However, the gold standard was broke down during the beginning of WWI due to the erosion of trade flows and gold's free movement. It forced main nation to freeze the operation of gold standard.

In the Inter-War years and WWII (1914-1944), most of the currencies lost their ability to convert into other currencies. However, the character of

convertible has made the USD remained as the only major trading currency. Before ending of WWII, the Allied nations were set up a monetary system known as Bretton Woods System to replace the gold standard. During this era, the USD was replacing the gold standard to become a primary reserve currency (Investopedia, n.d.).

Under Bretton Woods Agreement, the monetary system based on USD and two new institutions were created. The two new institutions that established to oversee economic activities are International Monetary Fund (IMF) and World Bank (WB). However, the Bretton Woods eventually failed due to the widely changes in the monetary and fiscal policies in year 1945. In year 1945-1973, fixed exchange rate system was exist and USD has become the only currency that held by other central banks. During this period, most of the currencies were pegged to the USD. However, fixed exchange rate system demise in early 1973 due to the over holding of USD by the foreigner that resulted in a lack of confidence in the ability of the US Federal Reserves to convert dollars to gold. Finally, the adoption of floating foreign exchange rate system was introduced after the broken down of fixed exchange rate system in year 1973. In this period, the use of gold standard was permanently abandoned. Although the floating foreign exchange rate has been adopted, but it does not mean that the governments applied merely a free-floating exchange rate system.

Exchange rate can be expressed in term of currency rate of a country relative to another country. Most of the economists claim that a country with flexible exchange rate is considered has a good economy function. The exchange rate system can be categorised into four types which are fixed, managed float, freely floating, and pegged exchange rate (Moffett, Stonehill & Eiteman, 2016). Fixed exchange rate is exchanges rate which are either fixed or fluctuated within a narrow range and it is fully controlled by the government using country's reserves. Managed float exchange rate is an exchange rate that

permits to move freely based on forces of demand and supply with partially controlled by government. Freely floating exchange rate is exchange rate that fully depends on market forces of demand and supply without any government intervention. Pegged exchange rate is a system that a home currency value is pegged to other country's currency, and both currencies move parallel against other currencies (Moffett, Stonehill & Eiteman, 2016; Piana, 2001).

Today, the most popular two types of currency exchange rates systems were floating and pegged. For instance, US, Europe, Japan are the country that adopted a floating exchange rate system whereby the country's currency values change depends on how the currency is being traded on foreign exchange (forex) markets. In contrary, countries that involved in the international trade will always concentrate on maintaining their currency's stability. Thus, those countries normally will choose to peg their currency to protect the competitiveness of their exported goods and services. As an example, Caribbean Islands like Aruba and Barbados pegged their currencies to USD due to the reason of their main source of earnings is come from tourism which paid in dollars. Besides that, the oil-rich countries in Middle East such as Jordan, Saudi Arabia, Qatar and Oman also pegged their currencies to USD since US was the largest oil trading partner for them (Zucchi, 2015).

In this research, USD is chosen as home currency relative to Chinese Yuan (CNY) due to the trading partnership between both countries. According to United States Census Bureau [USCB] (n.d.), China is one of the biggest trading partners to United States among the other countries and it has been ranked as first largest trading partner to US in year 2015. In fact, US-China cooperation has brought a great amount of benefit to both countries. In year 2009, the US organizations and companies were gained a foison profit through a $62.2 billion investment at China. Other than that, by importing labor-

intensive goods from China, US has successfully alleviates the cost of living for Americans by lowering down to two percentage points of price index every year (Shan, n.d.).

1.2 Problem Statement

Exchange rate issues become one of the unsolved problems in the economy and it should be overcome by researcher immediately. In fact, exchange rate is the most importance factors for the developing economy. Therefore, there are a huge number of researcher was studies the behavior of the foreign exchange due to the common effect on it.

The purpose of this study is to identify the determinants of the exchange rate and the effect of each macroeconomic variable in the country. To put in a better and more understanding situation, each problem of dependent and independent variable is further discuss in this section.

According to Necșulescu and Șerbănescu (2013), inflation has become one of the worst phenomena for a nation's economy since it brings a serious impact toward a country's exchange rate. The inflation that consequently perplexing Zimbabwe in year 2000 to 2008 was keep exacerbate when the economy on the "Black Friday" of 14 November 1997 decide to print the Zimbabwean dollar (ZWD$) to honor the liberation war veterans. The action of printing huge quantity of ZWD$ was lead to a higher level of inflation, which is hyperinflation toward Zimbabwe's economy. As a result, the value of ZWD$ was depreciating and the Zimbabwe's exchange rate was affected due to this scenario (Mandizha, 2014).

According to Gente and Leon-Ledesma (2006), there are increasingly on interdependence over the worldwide countries. In order to stabilize as a strong

capital base in the market, the fluctuations of world interest rate are prior for the small open economies to depend on it. Although the other factors tend to cause the crisis of a country, the moderate increase of US interest rate is also a factor that causes the crisis. This is because it can be classified as a push factor by International Monetary Fund (IMF). Tafa (2015) investigates that was a case in Albania with the rise of interest rates on its currency; ALL deposits have leaded to an appreciation on ALL/USD. Thus, USD currency appreciates and become more expensive. In contrast, the rises in ALL deposits interest rates have made the Euro depreciate against ALL.

Many governments tend to borrow either within or outside the country because the public expenditure has been continuously rose throughout the period. On the other hands, the reason of the low capital formation in developing countries also due to the reason that many governments tend to borrows from outside country. However, borrowing with interest attached made the result of debt servicing .The researchers' demand for foreign currency to serving external debt which it may influence the exchange rate of country (Saheed, Sani &Idakwoji , 2015).

1.3   Research Objectives

1.3.1 General Objective

This research paper is aims to examine the determinants of exchange rate on USD form year 1979-2014.

1.3.2 Specific Objectives

i.   To determine whether all independent variables will impact on exchange rate in United State from year1979-2014.

ii. To determine the relationship between inflation and exchange rate in United State from year 1979-2014.

iii. To determine the relationship between interest rate and exchange rate in United State from year 1979-2014.

iv. To determine the relationship between government debt and exchange rate in United State from year 1979-2014.

1.4   Research Questions

i.   Is there any significant relationship between exchange rate and its determinants?

ii. Is there any significant relationship between inflation and exchange rate in United State from year 1979-2014?

iii. Is there any significant relationship between interest rate and exchange rate in United State from year 1979-2014?

iv. Is there any significant relationship between debt and exchange rate in United State from year 1979-2014?

1.5   Hypothesis of Study

H_0: The relationship between inflation rate and exchange rate in United State is not significant.

H_1: The relationship between inflation rate and exchange rate in United State is significant.

H_0: The relationship between interest rate and exchange rate in United State is not significant.

H_1: The relationship between interest rate and exchange rate in United State is significant.

H_0: The relationship between debt and exchange rate in United State is not significant.

H_1: The relationship between debt and exchange rate in United State is significant.

1.6   Significance of Study

This research examines whether the relationship between independent variables (inflation, interest rate and debt) and dependent variable (exchange rate) is significant or insignificant. Besides that, it indicates what the impact on dependent variable is if there are any changes on independent variables by using the data from 1979 to 2014. According to Morrison and Labonte (2013), China began to peg the CNY to dollar at 8.2770 CNY per USD in 1995. The exchange rate of CNY against USD remains constant from August 1995 until July 2005. In year 1995, CNY has appreciate over next three years since some of the major trading partner forces it moved to managed peg system. China

was halted CNY appreciation in July 2008 because of the global economic crisis impact on the China's exporters. However, it was appreciated again in June 2010. The consequences of China's currency policy on the US economy are complicated. This happening when CNY is depreciated and it was cause the China product become cheaper compare to United States product. Therefore, it encourage US consumers demand more on China product and US firms also import China products.

Inflation rate is one of the important variables that affect toward a country's exchange rate. Kuttner and Posen (2000) state that when a country's inflation rate increase relative to another country, the country's exports will drop and the imports will increase. Therefore, the country's currency value will decline and the exchange rate of the country going to appreciate relative to other countries. By understanding the relationship between two variables, it enables the researchers to predict the economic health level.

Interest rate is another variable that influence country's exchange rate. Interest rate is typically referred to a rate that determines the charge or pay on the use of money. An appreciation on interest rate will cause high cost of borrowing, rise in repayment of loan, appreciate in exchange rate, fall in asset prices and increase in the return of savings.Fisher (1930) stated that a country's nominal interest rate and inflation rate has a closer relationship. An increase in a country's nominal interest rate will tend to have a higher inflation and hence depreciates the currency. Therefore, the relationship between interest rate and exchange rate will benefit borrower to borrow an amount in a currency with lowest interest rate.

The government debt is another important determinant that affects the exchange rate. Government debt also defines as public debt or national debt possess by central government. Kia (2013) found that the result in short-run dynamic shows the amount of government debt increases may cause supply of

the country currency increase and depreciation in domestic currency value then exchange rate tends to appreciate. This is due to investors deciding to dump the bond when a huge quantity of government issued bond is held by a foreign investor in high-risk action. This relationship allows the foreign investor to predict a country government debt.

These studies provide a clearer view on how the exogenous variables affect the endogenous variable. However, the result of these studies is not consistent. This is due to different researchers have different perspectives on the linkage between independent and dependent variables. Some researchers noticed that there was a direct relationship between the endogenous and exogenous variables but some researcher oppose that there was an indirect relationship between the variables. Other than that, some of the researchers even notice that there is no relationship between some of the exogenous variable and exchange rate. This study enables the researchers to gain more knowledge on the determinants of exchange rate in United State.

1.7   Chapter Layout

1.7.1 Chapter 1

This chapter reviews a short brief on the overall of the research. An introduction about the background of the research is discussed. In this chapter, problem statement, study's objectives, hypothesis and significance of the study is identified and end up with a conclusion.

1.7.2 Chapter 2

This chapter discuss the literature reviews based on previous studies that established by other authors which related to this research topic. The article on each independent variable (inflation, interest rate and debt) that affects the dependent variables (exchange rate) has been used for further understanding on this study. The review of literature consists of the methodology, findings, implications and theoretical model.

1.7.3 Chapter 3

This chapter focuses mainly on the research methodology and presents data collection. There is a briefly describe on justification of the model, data collection method, data processing procedures and data analysis description on each type of test. The test description on this chapter has a linkage with the following chapter. It is a pre-step before entering into the following chapter.

1.7.4 Chapter 4

This chapter is mainly focuses on the empirical results and analysis of the data. In this chapter, different types of tests have being applied for the diagnostic purpose which including multicollinearity, heteroscedasticity, autocorrelation, normality and model specification error test. There are some remedies have been discussed to solve the problem for different test.

1.7.5 Chapter 5

This final chapter summarizes the discussion, conclusion and implication of this research. It focuses on major findings, limitations, and recommendations from the obtained result on the whole study of the research. The limitation and recommendation will mainly enhance for the purpose of future study.

1.8 Conclusion

Based on this research paper, the definition, overview and history of exchange rate are explained in details. Furthermore, the objective on this research paper is identifies the determinants of exchange rate on USD form 1979-2014. The factors that influence the exchange rate are inflation, interest rate and government (public) debt. The main purpose of this study is responsible to examine on the significant or insignificant relationship between independent variables (inflation, interest rate and debt) and dependent variable (exchange rate). Next, this paper also describes the impact on dependent variable when there are changes on independent variables. Finally, the literature review will be discussed further in following chapter.

CHAPTER2: LITERATURE REVIEW

2.0 Introduction

Based on the previous research papers, the researchers have investigated the relationship between the exchange rate, nominal interest rate, inflation and public debt. Most of the research papers have proved that the exchange rate will bring impacts on the fluctuations of the nominal interest rate, inflation and public debt. Actually, there is a mutual interdependence relationship between the exchange rate and some of these variables (Mandizha, 2014; Namjour, Gholizadeh & Nobakht, 2014; Ebiringa & Anyaogu, 2014). However, the previous researchers rarely study the effect of nominal interest rate, inflation and public debt on the exchange rate. Thus, the objective of the study is to identify the influence of nominal interest rate, inflation and public debt on exchange rate in United States (US) against China. Besides that, this study will enhance a better understanding on the relationship among the dependent variable and respective independent variable.

2.1 Literature Review

2.1.1 Exchange rate (USD/CNY)

Exchange rate refers to a country's currency price to exchange for another country's currency (BusinessDictionary, n.d.). The exchange rate can be classified into two quotations, which are direct quotation and indirect quotation. For the direct quotation, it indicates that the amount of domestic

currency required on buying or selling one unit of the foreign currency (Home Curency / Foreign Currency). For instance, in US, a direct quote for the USD would be US$0.1542=CNY1. In contrast, in China, a direct quote for CNY would be CNY6.4872= US$1. For indirect quotation, it refers to the price of one unit home currency is expressed in terms of other country's currency (Foreign Currency / Home Currency). As an example, in US, CNY is assumed trading at 6.5000 relative to 1 USD. Hence, in China, the indirect quote for CNY would be CNY1=US$0.1538 (1/direct quotation).

According to Coudert and Couharde (2008); Zeileis, Shah and Patnaik (n.d.); Morrison and Labonte (2013); Shah, Zeileis and Patnaik (2005); Zeileis, Shah and Patnaik (2007), the exchange rate regime for the Chinese Yuan (CNY) was pegged to the USD from year 1995 until 2005 as there is no any changes on the exchange rate of CNY against USD. Shah, Zeileis and Patnaik (2005) stated that the CNY was remained as fixed at 8.2770 relative to USD from August 1995 to July 2005. However, the People's Bank of China (PBC) has decided to give up on a fixed exchange rate to the US dollar on 21th July 2005 since there was a slightly appreciates on CNY. Thus, PBC had made an announcement on reforming the CNY exchange rate regime into a regime that based on forces of market supply and demand without official boundaries exist (managed floating exchange rate). On 21th July 2005, CNY have been re-valued by 2% to 8.11CNY/USD and it no longer be pegged to the USD due to its greater flexibility. According to Bergen (n.d.), there are some variables that will bring an effect to the exchange rate in US against China which including inflation, nominal interest rate and government debt.

2.1.2 Inflation Rate

2.1.2.1 Demand Pull Theory

Inflation refers to continuously and uncontrolled rising of general price level for goods and services that consequently leads to a decaying in the purchasing power of currency and economic. Based on the Inflation Theory (Demand pull theory), inflation occur in the economy whenever the aggregate demand for goods and services are exceed the aggregate supply. According to Namjour et al. (2014) inflation is classified into three main types which are Creeping Inflation, Severe Inflation and Very Severe Inflation. The first type inflation, Creeping Inflation indicates that a moderate rising in the prices whereby the inflation rates increase in the range within 1% to 6 % or 4% to 8% per annum. For the Severe Inflation, its prices increase more accelerate compare to Creeping Inflation which its prices rising within 15% to 25% per annum. On the other hand, Very Severe Inflation that also known as hyperinflation is the most serious inflation whereby the prices estimated increase 50% within six months. In fact, inflation rate plays an important role in judging the healthiness of a country's economy. Thus, a country's economy is considered collapse in case that the country undergoes a critical inflation rate (hyperinflation).

Inflation rate is one of the important variables that will bring effects towards a country's exchange rate. There is several research papers have examine and identify the relationship between both variables. According to the previous studies, some of the researches claim that the relationship between the inflation rate and exchange rate is positively related (Arghyrou, & Pourpourides, 2016; Ebiringa, & Anyaogu, 2014; Kuttner & Posen, 2000; Kwakye, 2015; Nucu, 2011), which indicates that a rises in the inflation rate

will depreciate a country's currency value and thus lead to an appreciation on the country's exchange rate. In contrast, some of the researches argue that the inflation rate and exchange rate is negatively related (Necşulescu & Şerbănescu, 2013; Namjour et al., 2014), whereby the researches stated that a rises in the inflation rate will appreciate a country's currency value and thus decrease the country's exchange rate. Other than that, Abbas, Iqbal and AYAZ (2012) claimed that the relationship between the inflation rate and the exchange rate is not significant.

2.1.2.2   Purchasing Power Parity (PPP) Theory

PPP refers to a country's currency rate have to be converted into another country in order to purchase the same quantity of products in respective country. PPP theory stated that currency exchange rate between two countries equals to the ratio between the prices of products in these countries. Kuttner and Posen (2000) claim that when a country's inflation rate increase relative to another country, the country's exports will drop and the imports will increase. As a result, a country's currency value will depress and the exchange rate of the country going to appreciate relative to other countries.

Other than that, Arghyrou and Pourpourides (2016) that reveals a theoretical model to investigate the asymmetry in exchange rate responses based on inflation have found that both of the dependent (exchange rate) and independent variable (inflation) have a direct relationship. The researches stated that a high level of inflation have a positive impact toward a country's nominal interest rate and exchange rate. Hence, the researchers have strengthen this statement by adopted the Fisher effect Theory that describes the relationship between inflation and interest rate whereby the nominal interest rate going to increase at same rate as inflation. The result of this study shows that a high level of inflation was increased the nominal interest rate and

it was lead to depreciation on a country's currency value. In other word, it causing the country's exchange rate appreciates relative to other countries.

Besides that, Ebiringa and Anyaogu (2014) have investigated a short run and long run relationship between the exchange rate and inflation rate in Nigeria by adopted the Nigeria Historical Data from year 1971- 2010. Based on the research, the empirical evidence shows that there is a significant and positive relationship between the dependent variable (exchange rate) and the independent variable (inflation rate) in both short run and long run. The Autoregressive Distributed Lag Estimates (ARDL) shows that the exchange rate will affected by inflationary trend (CPI) in a positive ways which an rises in the inflation will lead an appreciation on the exchange rate.

In addition, Nucu (2011) that study the influence of the key macroeconomic indicators on the exchange rate of the Romanian leu against EUR and USD have again discovered that the relationship between the exchange rate and inflation was positively related when taking into account the interest rate and balance of payment. The researcher clearly stated that the Romania's exchange rate tend to appreciate against euro continuously when there is a deficit in the Romania's Balance of Payment (import more than export) due to the high inflation rate in the country. Last but not least, Kwakye (2015) that determine the relationship between the exchange rate and key macroeconomic variables in Ghana has also show a positive linkage between the exchange rate and inflation. According to Kwakye (2015), when a country's inflation increases, the domestic goods and services become less competitive as it expensive relative to the import goods. Hence, it will reduce the country's export. Once a country's exports reduce, the demand towards the domestic currency will decrease. As a result, a country's currency value will depress and the country's exchange rate going to appreciate relative to other countries.

As opposed to the findings above, Necşulescu and Şerbănescu (2013) that examined the causal relationship between inflation rate and RON/Euro exchange rate have proven that the relationship between both variables are negatively related. Based on the F-test result, the researchers have concluded that the inflation rate is a significant explanatory variable to the exchange rate. In addition, the researchers stated that the upward trend in the salary will increase the purchasing power and determines most prices that will lead to inflation. As the inflation rate increase by 1 %, the exchange rate tends to decrease 0.05 percentages point. Thus, the empirical result shows a high and indirect relation between the inflation rate and exchange rate.

Other than that, Namjour et al. (2014) have examined the short run relationship between inflation rate and exchange rate during the fifth development plan that started in Iran since year 2011. By using the correlation and least square estimation, the researchers found that the relationship between the dependent and independent variable negatively related in short run. According to the empirical result, rising in the inflation rate will appreciate a national currency whereby the appreciation in the national currency refers to a depreciation of the exchange rate. However, Namjour et al. (2014) have also mentioned that the impact of inflation to exchange rate tend to be different in different regions and situations. For instance, an appreciation in the currency and exchange rate may due to an increase of price on the imported goods and services (inflation).

On the contrary of positive and negative relationship, Abbas et al. (2012) have exploiting the significantly relationship between the inflation rate and exchange rate for ten African Countries (Cameroon, Egypt, Cape Verde, Burundi, Comoros, Gambia, Ethiopia, Algeria, Kenya and Angola) by using data from year 1996 to 2010 that obtained from World Bank. According to empirical evidence, the authors stated that there is a non-significant relationship between the inflation rate and exchange rate among the ten

African Countries except for inflation rate in Gambia which have a significant relationship with the exchange rate.

2.1.3 Nominal Interest Rate

2.1.3.1 Fisher Effect Theory

Interest rate is typically referred to a rate that determines the charge or pay on the use of money. It is normally expressed and defined in the percentage form of the principal based on annually basis. It is the rate used by a lender (creditor) to borrower (debtor). As an example, the bank who acts a lender always use interest rate to identify the money should be paid by a borrower to the bank when making a loan. A rise in interest rate will bring an impact to high cost of borrowing, rise in repayment of loan, appreciate in exchange rate, fall in asset prices and increase in the return of savings. Interest rate can be used to determine the charged of money on the use of assets borrowed such as machinery, cash, housing and automobile. It is also act as a monetary tool in solving the inflation by central bank.

The Fisher Effect is one of the developed economy theory stated that inflation and interest rate will occur simultaneously at the same rate. Nominal interest rate is one type of interest rates. It is given on a loan or investment based on stated rate. It can be more than the real interest rate when inflation occurs. An identified formula based on Fisher Effect is clearly shows that the relationship between real interest rate and nominal interest rate as below:

Nominal Interest Rate = Real Interest Rate + Inflation

Throughout this, it shown that the nominal interest rate has a related connection with the inflation rate. A nominal interest can be defined as a rate that without adjust for inflation (Investopedia, n.d.).

Most of the studies have identified that with evidence that the linkage between interest rate and exchange rate is a positively related. The rising in interest ratemay cause higher inflation thus lower down the currency of home country and make exchange rate going up. This explains the positive relationship between the interest rate and the country's exchange rate. The interest rate has an impact on the exchange rate which can be explained as arise in the interest rate will cause the currency to depreciate and exchange rate to appreciate (Gente & Leon-Ledesma, 2006; Tafa, 2015; Chowdhury & Hossain, 2014; Khan, 2010). On the other hand, a few studies have determined that the interest rate and exchange rate are in negative relationship (Ebiringa & Anyaogu, 2014; Dash, 2012). A study has identified that there is a non-monotonic relationship between interest rate and exchange rate in three effects. The study has proved evidences that each of the effect has the ability to whether appreciate or depreciate the currency (Hnatkovska, Lahiri & Vegh, 2008). There is only an evidence show that interest rate had no impact on exchange rate (Tulasombat, Bunchapattanasakda & Ratanakomut, 2015).

Fisher (1930) stated that the relationship between the nominal interest rate of a country and its inflation is positively related. An increase in a country's nominal interest rate will tend to have a higher inflation and hence depreciates the currency. According to Gente and Leon-Ledesma (2006), the authors determine some of the changes in real exchange rate which caused by the shocks of interest rate and lead to misalignments. This study conducted that a rise in world interest rate will bring to an increased real exchange rate (RER). When a country acts as a debtor, the increase of its interest rate will depreciate the equilibrium RER. The study investigate that US interest rate shock will resulted in relative to long term misalignment via the impulse response analysis of dynamic adjustment of RER. The authors have used two-good OLG model on dynamics show that an increase in world interest rate will give different impacts on RER whether time preference rate over or not interest rate of world. During the low time preference, the rise in interest rate will

influence the real effective exchange rate (REER) to decrease, vice versa. After the shock in a creditor country, equilibrium RER will appreciates. In the theoretical model, the researchers mainly focused on four SEA countries which are Thailand, Korea, Malaysia and Singapore to determine the dynamic changes of RER and misalignment of interest rate shocks. They also used VAR model and co-integration analysis to conclude that as a creditor country, there will be an appreciation of REER due to a world interest rate shock positively. This paper found that an unforeseen shock of world real interest rate is high chance to cause currency crises in major indebted countries (Gente & Leon-Ledesma, 2006).

Moreover, Tafa (2015) examined the impact of interest rate on the fluctuation of exchange rate in Albania country also shows that interest rate and exchange rate has a direct relationship. The researcher investigates that when the interest rate of domestic currency rises, this currency will increase against foreign currency based on theoretically. Tafa (2015) has carried out the study by using two models of variables through regression analysis. This study has discovered the ALL current account deposits interest and exchange rates of USD towards ALL which during ALL deposits rise, USD bring to an increase against ALL. This study also examined the interest on current account deposits of ALL and exchange rates of EUR/ALL which ALL is influence the appreciate against EUR. This is explained by a greater interest rate will get a higher rates of return and then cause the home currency's demand rises. This will resulted in an increase in home currency towards foreign currency. This study shows a positive relationship between interest rate of home currency and home currency against foreign currency. Based on the estimated regression model of USD/ALL and ALL interest rate, it shows that a result of interest rate is statistically significant with the exchange rate. Furthermore, the regression output EUR/ALL and ALL interest rate shows the conclusion that the model is insignificant which the increase in ALL interest rate will lead to a decrease EUR/ALL exchange rate.

According to Chowdhury and Hossain (2014), there is a strong evidence to conclude that the interest rate has a positive influence on exchange rate in Bangladesh. The authors used the Ordinary Least Square method and t-test significance based on the results to estimate the model. Due to the small sample size, the unit root test and cointegration test is not suitable to be used. Furthermore, Khan (2010) has identified on the impacts of interest rate on the exchange rate of Pakistan and USA. The author has used Simple Linear Regression Model to investigate the relationship and the result shows that the relationship between interest rate and exchange rate is positively correlated. Due to the expected rate of inflation reflected by nominal interest rate, the author mentions that a high interest rate will depreciate the foreign currencies. According to Ebiringa and Anyaogu (2014) the authors investigate the mutual relationship between inflation, interest rate and exchange rate in Nigeria. The result shows that interest rate has negative and insignificance impact on exchange rate in long. Based on The International Fishers' Effect (IFE), a country with a high inflation would probably have high nominal interest rates. Interest rate has an adverse relationship with exchange rate due to a rise in interest rate influences the currency of the country to appreciate. Dash (2012) stated that high interest rate will decline the money demand and then lead to the currency depreciates because of high inflation. The author uses vector autoregression model of cointegration to investigate the relationship between interest rate and exchange rate.

According to Hnatkovska et al. (2008), the authors stated that a small rise in nominal interest rate tends to appreciate the currency and hence depreciate exchange rate. However, a huge increase in interest rate will depreciate the currency and appreciate the exchange rate. The rise in interest rate has three effects discussed by the authors. This study that has proved evidence that the relationship of an increased interest rate may depreciate or appreciate the exchange rate based on different effects. Firstly, a higher interest rate will

increase the money demand, then appreciate the currency value and depreciate the exchange rate. Next, higher interest rate will increase the fiscal deficit and curb the output. Thus, both effects will make the currency depreciate and exchange rate to appreciate.

However, Tulasombat et al. (2015) found that there is no relationship between the two variables. The authors applied multiple regressions model to run for the relationship between economic factors and exchange rates. However, the output shows that the economic factors have a negative impact on exchange rate. When forward position (bought), balance of payment and international reserve increases, the exchange rate will depreciate but only the interest rate show no relationship with exchange rates.

2.1.4 Government Debt (GD)

Government debt is defined as public debt or national debt owned by central government. Government debt commonly refers to the total amount of money that the government owes to creditors such as individuals, businesses, government and other organization that owe government securities. Meanwhile, Saheed et al. (2015) stated that government debt is the sum of total government financial obligation which borrowed by issuing securities, government bonds and bills. Government debt also classifies into internal debt (debt within the country) and external debt (debt to foreign investor). When government's expenditure exceeds its revenues, the government debt exists as the government shortfalls or deficit budget (Bergen, n.d.).

The government debt is one of the important determinants that affect the exchange rate. There are many representative types of research on the relationship between government debt and exchange rate. Most of the researcher found that government debt has a positive effect on the exchange

rate (Kia, 2013; Nyahoho, 2016), which means an increase of government debt cause decrease in currency value then tend to appreciate of the exchange rate. On the other hands, Saheed et al. (2015) investigated the relationship between public external debts on exchange rate. This is due to public external debt is one of component of government debt. They found that there have positive effects of public external debt on exchange rate in the country. Then, some other researcher state that government debt has a negative effect on the exchange rate (Bouraoui & Phisuthtiwatcharavong, 2015; Lin, 1994),which means an increase of government debt cause the currency value to increase and tend to lead an depreciation of the exchange rate.

Kia (2013) has examined a theoretical monetary model and identified the determinants of exchange rate of Canada in the long run. The empirical analysis was shown that all variables, except interest rate and government debt are statistically significant influence the exchange rate in Canada. Meanwhile, the finding of this paper also shows that government debt had statistically significant effect on the growth of exchange rate over the short run while the government debt not statistically significant over the long run. Besides that, the results in short-run dynamic shows the increase in government debt may cause the rise in the supply of the country currency. As a result, the depreciation of domestic currency value will lead to an appreciation of exchange rate. This is because the investors have decided to dump the bond when a large quantity of government issued bond held by a foreign investor is involved in high-risk action. A higher foreign government debt indicates that a high tendency of future monetization of debt and it lowers the value of foreign currency. In domestic currency's perspective, it stated that the increase in the government debt held by government or investor will cause the future depression of the foreign currency and appreciation of exchange rate. Then, the researchers found that the higher deficit per GDP over the long run can be considered as an expected accumulation of government debt. This will result a depreciation of the domestic currency and appreciation of exchange rate.

Besides that, Nyahoho (2006) has investigated the development of government debt and exchange rate for the OECD countries by comparing the cumulative variations of respective variables from year 1979 to 1995. The outcome showed that there is no any evidence to prove either the conventional or "Wall Street" views of the effect of debt toward the exchange rate. The country with the greatest government debt level will cause a depreciation of its currency and increase in exchange rate. From the research, it indicates that Norway, United Kingdom, Ireland, Canada, and Finland have suffered from currency depreciation and exchange rate appreciation.

In contrast, according to Saheed et al. (2015) that examine the influence of public external debt toward exchange rate in Nigeria provide a result that there is statistically significant effect on public external debt and exchange rate. This is due to the rises in public expenditures and low capital formation in the countries. Therefore, government tend to borrow on either domestic or foreign country or both. However, when one party borrows from another party must paid with the principal and interest when reach the maturity, which results in debt servicing. Through the research, it shows that serving external debt requires the foreign currency demand and affects a country's exchange rate. As a result, it indicates that there has a direct relationship between public external debt and exchange rate in the country.

On the other hand, some researchers found that the relationship between exchange rate and government debt is negatively related. Bouraoui and Phisuthtiwatcharavong (2015) had examined the effects of macroeconomic fundamentals on the exchange rate of the Thai Baht against the US Dollar. The researchers determined the nature relationship between exchange rate in the Thai Baht and government debt by using multiple regression approach over the period from year 2004 to 2013. According to the empirical result, they concluded that government debt has an adverse and insignificant

relationship with the exchange rate in Thailand. It means that high government debt had caused the value of currency increase and the lower exchange rate in Thailand. Besides, the movement of government debt in most developing countries including Thailand show the dissimilar outcomes in an economic recession. Meanwhile, many nations have experienced depreciation on government revenues and budget deficits. The result indicated that the higher the government debt, the real rate of Treasury bill increases. Thus, the inflation rate and interest rate will appreciate and cause a lower exchange rate. Lin (1994) investigated a steady-state effect of government debt toward the exchange rate within a two-country by applying overlapping generation model. The evidence shows that a rise in government debt will depress the real exchange rate of the country by increasing the capital elasticity of output relatively. In order to examine the steady-state effect of government debt toward the exchange rate, the researcher has formulated a two-country OLG model in two countries with different production technologies. The assumption of limited lifetime, no heritage motive and dissimilar production technologies between the two countries have caused an interesting examination of the government debt on the real exchange rate. Thus, the development of OLG model clearly proves that the production technologies is important in the determination of the government debt effect on the long-run real exchange rate

CHAPTER 3: METHODOLOGY

3.0   Introduction of Methodology

This chapter concentrates on methodology which discuss about the method of data collection, variable measurement unit and data processing of the research. The aim of this research is to identify the relationship between the exchange rate and its determinants (inflation, interest rate and debt). The data that has been used to conduct the research are secondary data which derived from the Data World Bank, Federal Reserve Bank of St. Louis and Knoema. The discussion on the research methodology was classified into few different sections. Section 3.1 is the introduction for methodology. Then, section 3.2 discusses about econometric model. Section 3.3 explains the data collection which includes 30 observations that has been taken from the period of 1979 to 2014. Section 3.4 is discussing about four main steps for data processing procedure. Section 3.5 explains the data analysis. Finally, section 3.6 refers to the conclusion for chapter 3.

3.1 Econometric Model

Function of Model:

$$EXR = f(\text{INF, IR, DEBT})$$

Economics model:

$$ln\widehat{EXR}_t = \beta_0 + \beta_1 INF_{1t} + \beta_2 IR_{2t} + \beta_3 DEBT_{3t}$$

Where,

$lnEXR_t$ = Official exchange rate (local currency units (USD) relative to CNY)

INF_{1t} = Inflation, consumer prices (annual %)

IR_{2t} = Nominal Long-term interest rate (%)

$DEBT_{3t}$ = Federal Debt: Total Public Debt (% of GDP)

3.1.1 Justification of the Model

This study investigates the relationship between the dependent variables and three independent variables. The country that has been chosen is United States (US). Based on the regression model which has determined, Official exchange rate is the dependent variable which is measured in local currency units (USD) relative to CNY. However, the three independent variables that bring impact on the dependent variable consisting of Inflation, consumer prices measured in annual percentage, Nominal Interest Rate measured in percentage and Federal Debt: Total Public Debt measured in percentage of Gross Domestic Production (GDP) (The Data World Bank [TWBD], 2016; Federal Reserve Bank of St. Louis, [FRED], 2016; Knoema, 2016).

3.2 Data Collection

3.2.1 Data Sources and Definition

Table 3.1: Data Sources

Variable	Title	Definition	Unit Measurement	Source of data
Exchange Rate	EXR	Exchange rate of U.S Dollar per Chinese Yuan (USD/CNY)	Official exchange rate (Local Currency Unit (USD) relative to CNY)	The World Bank Data
Inflation	INF	Inflation, consumer prices	Annual Percentage (%)	The World Bank Data
Interest Rate	IR	Nominal Interest Rate	Percentage (%)	Knoema
Debt	DEBT	Gross Public Debt	Total Percentage (% of GDP)	Federal Reserve Bank of St. Louis

3.2.2 Data Collection Methods

This research studies the determinants of exchange rate in USD by using annual time series method to estimate the model. Time series data is a values collection on the variable from different time series (Business Dictionary, n.d.). Thus, the researches mainly focus on one country which is United States over a period of time. Based on the data collection, there are 36 observations have been taken from the period of year 1979 to year 2014 in the model. The data collected and used is based from secondary data. Secondary data is referring to a type of quantitative data that was collected by someone else for different purposes and it is readily available from other sources. The dependent variable of this study is exchange rate of US (USD/CNY). There are three independent variables that were chosen which inflation, interest rate are and debt (TWBD, 2016).

3.3   Data Processing Procedure

Figure 3.1: Illustration of Data Processing

Step 1: Collect and retrieved relevant dataset from reliable Official Website (The Data World Bank, Federal Reserve Bank of St. Louis and Knoema)

Step 2: Rearrange and transform dataset needed

Step 3: Study and test the regression analysis through statistics tools (E-Views 7)

Step 4: Explanation and interpretation on the E-views result
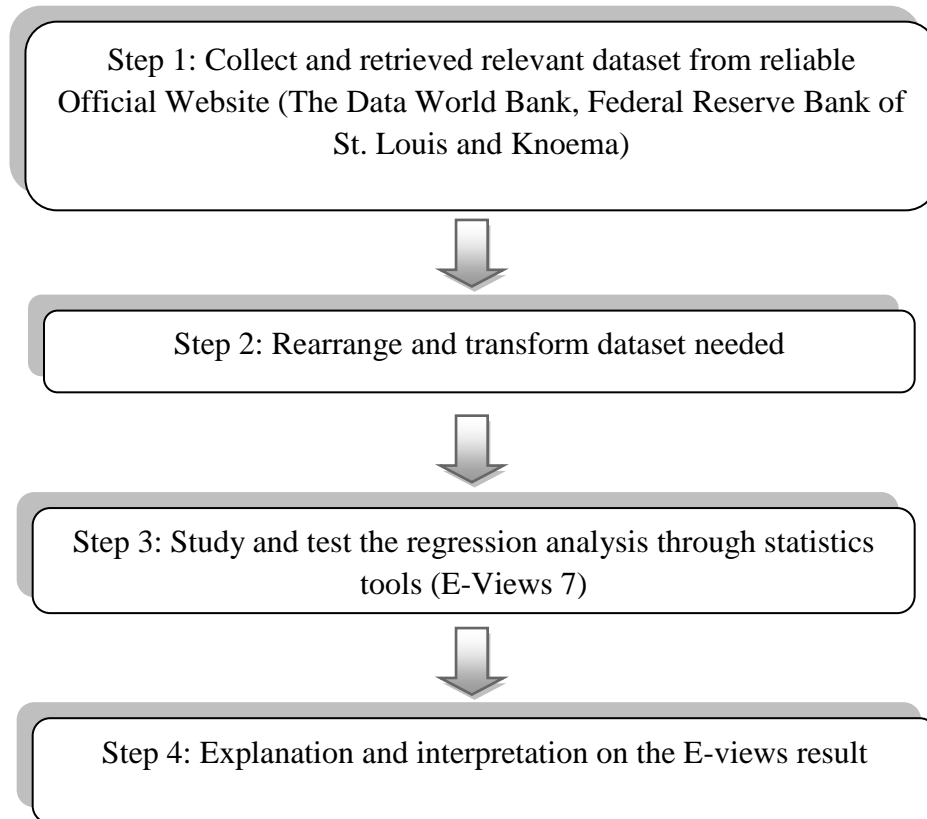
In the research, the data processing is classified into four main steps. First at foremost, the relevant data has been retrieved from the reliable website (The Data World Bank, Federal Reserve Bank of St. Louis and Knoema). Secondly, the collected data will be edited and rearranged into a group form. Thirdly, the statistical tool (E-views 7) was applied in order to run and test the regression analysis on the transformed data. Lastly, there will be the explanation and interpretation on the result generated from the E-views Output.

3.4 Data Analysis

3.4.1 Multiple Linear Regressions

Multiple linear regressions model is a basis form of the linear regression analysis. It examines and evaluates the impact of two or more independent variables, X_t on the dependent variable, Y (Gujarati & Porter, 2009). The equation of multiple linear regressions model as followed:

$Y = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \ldots \beta_k X_{kt} + \mu_t$

Where, t=1, 2, 3, …n.

This model is based on population size. β_1, β_2 and β_3 are acting as the partial regression coefficients in the MLR model. They play a role in indicating how the dependent variable (Y) is affected by the independent variables (X_t) several explanatory variables (independent variables) are used to predict the output of a response variable (dependent variable) on multiple linear regressions (MLR). Most of the researches will prefer to choose and use MLR instead of simple linear regression model. The reason is that simple linear regression only involves one independent variable to affect the dependent variable. Normally, the dependent variable is not only affected by one independent variable but many factors cause it to happen.

Estimated multiple regressions is the model that can get more accurate value form MLR model. It occurs when the coefficients of the MLR model are estimated by using sample data or based on sample size. OLS estimator is help to get the value for estimated regression intercept, slope coefficients and other regression summary measurements. Estimated multiple regression equation as below:

$$\widehat{Y_t} = \widehat{\beta_0} + \widehat{\beta_1} X_{1t} + \widehat{\beta_2} X_{2t} + \cdots + \widehat{\beta_k} X_k$$

Where t=1, 2, 3, …, n.

The assumptions of MLR are error term should be normally distributed; constant variance on the probability distribution of the errors, error values should be statistically independent and no relationship between error and independent variables.

Adjusted R^2 is better compare to R^2 in determining the fit of data in MLR. This is because when a new independent variable is included into the model, R^2 will never decline.

3.4.2 Expected Sign

X_1 = Inflation

Inflation is the main factor that influences the exchange rate on USD. It has positive effect on exchange rate which indicate that a rise in inflation will cause the exchange rate to increase (Sek, Ooi, & Ismail, 2012; Ebiringa, & Anyaogu, 2014). When inflation increases, a country citizen will more prefer to spend on others country's goods and services. Thus, they have to supply their country's currency in order to purchase from other foreign countries. When the supply of a country currency keeps on increase, it will lead to depreciation on the currency value of the country relative to other foreign countries. The depreciation on a currency value indicates that the citizen now have to pay more money to exchange for others countries currency. Thus, it indicates that when the inflation rates are high, the value of a currency depreciates; the exchange rate will increase (Ebiringa & Anyaogu, 2014).

Therefore, the expected sign for inflation is positive.

X_2 = Interest Rate

Interest rate is one of the important determinants that affect the exchange rate of a country. Based on the Fisher effect theory, there is a relationship between

the inflation and the interest rate. The Fisher effect states that the nominal interest rate refers to the sum of real interest rate and inflation rate. Therefore, nominal interest rate tends to increase at the same rate as inflation (Investopedia, n.d.). With that, an increase in inflation and interest rate will cause the currency value of domestic country to depreciate and then lead to an appreciation of exchange rate (Ebiringa & Anyaogu, 2014).

Therefore, the expected sign for interest rate is positive.

X_3 = Government Debt

Government debt is the one of the determinants of exchange rate. An increase in government debt will increase the supply of country's currency and hence decrease the value of currency of the country. As a result, a country's exchange rate relative to other country tends to be appreciated (Saheed et al., 2015).

Thus, the expected sign for debt is positive.

3.4.3 T-Test

T- Test is a popular statistical data analysis used to examine statistical of two population means. A t-test with two-sample was used to determine whether the two samples are equal or not. Moreover, it is being used when the sample size is small, standard deviation is low and at the same time there are unknown variances of two normal distributions. For instant, t-test can used to determine whether the University A's badminton team and University B's badminton team have a different average score in a badminton competition. The differences may due to the random probability in the selection of sample. Moreover, the t-test statistic commonly used to identify P-value that refers to

the probability for one to achieve the results through chance. Hence, in case the p-value less than 1%, 5%, or 10%, the null hypothesis (H_0) will be rejected as it indicates it is less than 1%, 5% or 10% opportunity to get the different observed by chance. In other word, it means that there is a statistically significant difference between the two groups. Other than p-value approach, critical value approach can also use in order to test the significant of each independent variable whereby the critical value can obtain by using the formula ($-t_{\alpha, n-k-1}$ and $t_{\alpha, n-k-1}$) whereas the t-statistic value can obtain from the E-views output (T-test). For this critical value approach, the H_0 will be rejected if the t-statistic value is more than upper critical value or less than lower critical value, vice versa. As short, T-test is a hypothesis testing used to determine the significant effect of each independent variable (X) on the dependent variable (Y). The null hypothesis (H_0) and alternative hypothesis (H_1) can be state as follow:

H_0: $\beta_1 = 0$ (there is no significant effect of independent variable on the dependent variable)

H_1: $\beta_1 \neq 0$ (there is significant effect of independent variable on the dependent variable)

H_0: $\beta_1 \leq 0$ (β_1 has no positive effect on the dependent variable)
H_1: $\beta_i > 0$ (β_1 has a positive effect on the dependent variable)

H_0: $\beta_1 \geq 0$ (β_1 has no negative effect on the dependent variable)
H_1: $\beta_i < 0$ (β_1 has a negative effect on the dependent variable)

Note: the null hypothesis (H_0) is a claim statement (assumption) about an unknown population parameter. However, the alternative hypothesis (H_1) is the opposite of the null hypothesis which is the statement that try to find evidence to support it.

3.4.4 P-value

P-value is the probability that used in determining the statistic of hypothesis test and analysis. It is mainly test on the results of significant and determines the claim on population validity. Null hypothesis and alternative hypothesis are the two hypotheses for the claim. The high the p-value will determine that the date is likely with a true null hypothesis. On the other hand, the low p-value will make the data unlikely with a true null hypothesis. The indicator of probability which is P-value is the value that determined based on the calculation of the study. Moreover, the alpha-value (α) is the level of significance which used to compare with the p-value.

The interpretations of p-value are indicated as followed:

A low p-value which is less than or equal to 0.05 (≤ 0.05) is indicates as a strong evidence to reject the null hypothesis (H_0).

A high p-value which is greater than 0.05 (> 0.05) is indicates as weak evidence against the null hypothesis, thus do not reject the null hypothesis (H_0).

3.4.5 Overall Significant F-Test

F-test is a commonly statistical data analysis that applied to examine the overall significant of the model. It uses to test the linear relationship between all of the independent variables considered together and dependent variable. There are two ways to test the overall significant of the model. Firstly, the p-value approach has been use to determine whether the whole model significant to affect y whereby if the p-value $< \alpha$ (0.01, 0.05, or 0.10), the H_0 will be rejected, and the result indicates that the whole model are significant,

vice versa. Secondly, critical value approach used to compare the critical value with the F-statistic and the H_0 will be rejected if the F test statistic is more than more than upper critical value. The critical value can get from formula (F α, $_{k-1}$, n-k) and the F statistics that refer to the ratio of the among estimate of variance and the within estimate of variance (F=$\frac{MSR}{MSE} = \frac{\frac{SSR}{k}}{\frac{SSE}{n-k-1}}$) can compute by using the One-Way Anova Table. The null hypothesis (H_0) and alternative hypothesis (H_1) can be state as follow:

$H_0 = \beta_1 = \beta_2 = \beta_3 =... =\beta_k$ (the model is insignificant or no linear relationship)

H_1= At least one of the β_i is not equal to 0, where i= 1, 2, 3,…k (the model is significant or there is a linear relationship)

Note: the null hypothesis (H_0) is a claim statement (assumption) about an unknown population parameter. However, the alternative hypothesis (H_1) is the opposite of the null hypothesis which is the statement that try to find evidence to support it.

3.4.6 Diagnostic Testing

3.4.6.1 Multicollinearity

Multicollinearity is phenomenon whenever there is a correlation between two or more predictor's variables in the regression model. The collinear variables are easily identified because there is acausal link between each variable and linear association between independent variables. The multicollinearity can combine either use cross-sectional or time series data to pool the model (Gujarati & Porter, 2009).

The consequences of multicollinearity are the ordinary least squares (OLS) estimators are still BLUE when using The Gauss-Markov theorem. The meaning of BLUE can be explain as B for best, L for linear, U for unbiased

and E for efficient estimator. Unbiased is a multiple sample computes the OLS estimators in the model. Therefore, the OLS estimators have minimum variance and efficient under circumferences that there was a linear unbiased estimators. The OLS estimators for standard error are very sensitive to small changes in the data. Furthermore, the standard errors of estimates are increased and the t-statistic becomes smaller (Gujarati & Porter, 2009).

There are several rules of thumb to detect the multicollinearity problem which includes high R-square but few significant t-ratio, high pair-wise correlation coefficients, variance inflation factor (VIF) and tolerance (TOL). R^2 but few significant t-ratios means the overall measurement on goodness of fit can very high and for t ratio of one or more coefficients is likely to be statistically insignificant. High pair-wise correlation coefficients are the rules to detect the multicollinearity when it applicable to model that consists of two independent variables and detect the correlation between two variables. Therefore most of researcher will choose to use other method such as Variance-inflating factor (VIF) and Tolerance (TOL) to detect the multicollinearity. However, the researcher might require to get Pearson correlation results to test for detect the correlation between the independent variable in a model. The range of correlation coefficient (r) is show as below:

Table 3.2: Range of Correlation Coefficient (r)

Correlation Coefficient, r	Value
Perfect positive correlation	+1.00
Strong positive correlation	0.50 to 0.99
Medium positive correlation	0.30 to 0.49
Weak positive correlation	0.01 to 0.29
No correlation	0

Weak negative correlation	-0.01 to -0.29
Medium negative correlation	-0.30 to -0.49
Stronger negative correlation	-0.50 to -0.99
Perfect negative correlation	-1.00

Variance-Inflation Factor (VIF) and Tolerance (TOL) are used to detect it multicollinearity. The formula of VIF is

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

Variance Inflation Factor (VIF)

Table 3.3: Variance Inflation Factor (VIF)

VIF = 1	No multicollinearity
1 < VIF < 10	No serious multicollinearity
VIF ≥ 10	Serious multicollinearity

VIF is the method that can use in detect for multicollinearity. The result show when VIF is equal to 1, there is no multicollinearity in the model. Meanwhile, when VIF result show infinite, it indicates multicollinearity occur. The result shows lowest multicollinearity if VIF is between 1 and 10. On the other hand, highest multicollinearity happens if the VIF result is equal or greater than 10 in the regression model.

Another method to use for detect multicollinearity is using Tolerance (TOL). The formula TOL is

$$TOL = \frac{1}{VIF}$$

Tolerance (TOL)

Table 3.4: Tolerance (TOT)

TOL = 1	No multicollinearity
TOL 0	Serious multicollinearity

The table indicates that the greater the degree of collinearity of that variable with other regressors, TOL tends to closer to zero. This means that there is serious multicollinearity.

Gujarati and Porter (2009) found that the treating of multicollinearity is shown as below:

i)   Transformation of variables

ii)   Combining cross-sectional and time series data

iii)   A prior information

iv)   Dropping a variables and specification bias

3.4.6.2 Heteroscedasticity

Gujarati and Porter (2009) stated that heteroscedascity affects the variance of the estimated coefficients get different across the observation. It also indicates that the variation of variance is different between true and estimation model. There are some reasons that may cause the heteroscedasticity which includes the error learning model, model misspecification outlier and skewness of regressor. Next, the OLS estimators unbiased and consistent were the consequence for heteroscedasticity. Heteroscedasticity lead the distribution coefficient increase the variances for the model, therefore the OLS estimator

is inefficient and has a minimum variance occur. Therefore, the model no longer the best estimator and BLUE.

Moreover, there were many ways such as graphical method, Park test, Breusch-Pagon-Godfrey test, Glesjer test, White test and Autoregressive conditional heteroscedasticity (ARCH) test are used to detect the heteroscedasticity problem occur stated by the researcher. ARCH test that developed by Engle at 1982 has been used as the example in this studies. This test is used to detect heteroscedasticity problem. In ARCH test, the researcher let the null hypothesis (H_0) as there is no heteroscedasticity problem and alternative hypothesis (H_1) hypothesis as there is heteroscedasticity problem. The result of the hypothesis testing is determined by comparing the significant level and the p-value. The researchers will reject the H_0 if p-value smaller than 5% significance level.

Remedy

According to Gujarati and Porter (2009), the **remedial** as below are suggested to be apply if the model facing the heteroscedasticity problem. First of all, Generalized Least Square or Weighted Least Square can use to solve heteroscedasticity problem when the **error variance σ_t^2 is known**. Heteroscedasticity does not affect the unbiasedness and consistency properties of the OLS estimators however they are no longer efficient. Thus, the researcher can re-estimate the model by applying Generalized Least Square to obtain a correct set of covariance, T-statistics and a new set of parameter estimated which would be more efficient than OLS estimator.

Generalized Least Squares:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \cdots + \beta_k X_{kt} + \varepsilon_t$$

Where the variance of the error term instead of being constant is heteroscedasticity,

Var $(\varepsilon_t) = \sigma_t^2$

If divide each term in the model by the standard deviation of error term, σ_t, then researchers obtain the modified mode

$$\frac{Y_t}{\sigma_t} = \beta_0 \frac{1}{\sigma_t} + \beta_1 \frac{X_{1t}}{\sigma_t} + \beta_2 \frac{X_{2t}}{\sigma_t} + \cdots + \beta_k \frac{X_{kt}}{\sigma_t} + \frac{\varepsilon_t}{\sigma_t}$$

$$Y_t^* = \beta_0 X_t^* + \beta_1 X_{1t}^* + \beta_2 X_{2t}^* + \ldots + \beta_k X_{kt}^* + \varepsilon_t^*$$

Therefore, estimates obtained by OLS of regressing Y* are now BLUE. This procedure is called Generalized Least Squares (GLS).

Weighted Least Squares (WLS)

W_t, adjusting the variables, it is similar to the GLS as below:

$$W_t = \frac{1}{\sigma_t}$$

$$W_t Y_t = \beta_0 W_t + \beta_1 X_{1t} W_t + \beta_2 X_{2t} W_t + \cdots + \beta_k X_{kt} W_t + \varepsilon_t W_t$$

$$Y_t^* = \beta_0 X_t^* + \beta_1 X_{1t}^* + \beta_2 X_{2t}^* + \cdots + \beta_4 X_{4t}^* + \varepsilon_t^*$$

Meanwhile, the true error variances (σ_t^2) are rarely known. Therefore, the researcher can apply the White's Heteroscedasticity Consistent Variance and

Standard Error in order to solve the heteroscedasticity problem when the **error variance σ_t^2 is unknown** (Gujarati & Porter, 2009). These methods are considered to obtain consistent estimates of the variances and covariance of OLS estimator. This show that White's heteroscedasticity corrected standard errors is considerably higher than the OLS standard errors. Therefore, the estimated t values are much smaller than those obtained by OLS.

3.4.6.3 Autocorrelation

Gujarati and Porter (2009) define autocorrelation as the error term for some observations is related to error term of other observation. In other words, under time series data, autocorrelation refers to the correlation between the variables of some observation at different points of time. However, it refers to a correlation between the variables of some observations at different space when it was across-sectional data.

The autocorrelation can be classified into pure autocorrelation and impure autocorrelation. Pure autocorrelation occur when uncorrelated observations of the error term are against in a correct specification equation while the impure autocorrelation occur when the model is not correctly specified. There are some reasons of autocorrelation to be presented in the model. This may be due to the researcher used an incorrect functional form, excluded important variable and data problem in the model. The consequences of autocorrelation on the OLS estimators are still unbiased and consistent. The estimators will be inefficient which they are no longer BLUE and the variance of estimators will be underestimated. When the variances of OLS estimators are underestimated, it will cause the smaller standard error which produces larger t statistic and leads the hypothesis testing invalid.

There are two different ways that can use by the researcher to detect the autocorrelation problem in the model. There are informal tests by using a graphical method and formal test by using Durbin-Watson test, Breusch-Godfrey LM test and Durbin's h test. In this studies paper, Breusch-Godfrey LM test is applicable to the model that using time series data to detect autocorrelation problem. There are few types of remedial to overcome the autocorrelation problem in the model. The researcher can use Generalized Least Squares to transform the model when there has a pure serial correlation. Meanwhile, some researcher also can use Newey-West standard errors when the model has a larger sample size (Gujarati &Porter, 2009).

3.4.6.4 Normality Test

Jarque-Bera Test (JB Test)

Normality of error term is the basic assumption of the linear regression model (Thadewald & Buning, 2007). One of the most famous tests for normality of regression residuals is the Jarque-Bera Test. Gujarati and Porter (2009) stated that Jarque-Bera (JB) test of normality is a large sample test which based on the OLS residuals. It is used to determine whether the error terms have fulfilled the normality assumptions for them to be normally distributed. The researcher finds that the assumption of normality able to derive from exact probability distributions of OLS estimators and also enables us to use the t and F-test statistic for the regression model.

In large samples, t and F statistics have approximately the t and F probability distribution. Thus, T and F tests were used to determine whether the error term is normally distributed or not. In these studies, Jarque-Bera test has been used for this diagnostic checking. The test statistic of JB test is a function of the measures of skewness S and kurtosis K. When the p-value is exceeding the

significant level, it means that the error term is normally distributed. Meanwhile, the error term is not normally distributed if the p-value is smaller than significant level.

3.4.6.5 Model Specification

Model specification error is referring to a model that have correctly specified because heteroscedasticity and autocorrelation may be a potential problem in misspecification model. Gujarati and Porter (2009) identify that have four types of model specification bias which include omitted relevant variable, wrong functional form, includes unnecessary variables and error of measurement. First of all, the omitted of relevant variables will unfit a model. The OLS estimator in the model is biased, inconsistent and no longer BLUE. Then, the researcher might confuse using the wrong function form to estimate the model when there are different types of functional form such as linear form, log form, log-lin form and lin-log form in a model. Next, when researcher includes unnecessary variables will over fit a model and causes the OLS estimator no longer the best. Lastly, the researcher might face some problem to collect data on the variable that will affect the economic behaviour and the data collection might measureincorrectly in a model. In sometimes, the variables used in the econometric analysis are different from the correct values. This caused some serious estimation problem and hypothesis testing to be invalid. The model specification had to detect and solve it as well.

Tserkezos (n.d.) stated that the Ramsey's RESET test which is designed to detect whether the model is correctly specified or not. Moreover, the Ramsey's RESET test is based on performed which using the critical values of the F-distribution. If the result of Ramsey's RESET test shows that there is a model specification error it means that the presence of heteroscedasticity and autocorrelation problem is unable to solve and the changes of the model are

needed. However, if the result of Ramsey's RESET test shows that there is no model specification error exists in the model it means that the heteroscedasticity and autocorrelation problem in the model are not serious (Ramsey, 1969).

3.5   Conclusion

In the nutshell, this chapter has provided clear explanation for the econometric model, data collection, data processing procedure and data analysis. However, several tests are used to conduct the test of relationship between the dependent variables and three independent variables which included Multicollinearity correlation Analysis, Heteroscedasticity (ARCH Test), Autocorrelation (Breusch Godfrey LM Test), Normality Test (Jarque-Bera Test), Model Specification Error (Ramsey-Reset Test), Individual T-test, and Overall Significant F-Test. Then, following chapter will reveal the empirical results of this research paper.

CHAPTER 4: DATA ANALYSIS

4.0   Introduction

The relationship between exchange rate, inflation, interest rate and debt are examined and tested in this chapter. This chapter concentrates on some test to examine their relationship. For example; T-test has being applied to determine the significant of dependent and independent variable. F-test used to determine the overall significant of the model. Besides that, Variance-Inflating Factor (VIF), Autoregressive Conditional Heteroscedasticity (ARCH), Breusch-Godfrey Lagrange Multiplier (LM) Test has being used in order to identify whether the model consists of multicollinearity, heteroscedasticity and autocorrelation problem. Moreover, the researcher also applied Jarque-Bera Test to detect the error term whether is normally distributed or not while Ramsey Reset Test is to detect whether the model is correctly specified or not.

4.1   Diagnostic checking

4.1.1 Multicollinearity

Detection of multicollinearity (3 methods)

4.1.1.1 High pairwise correlation among X variables

Table 4.1: Correlation analysis

	INF	IR	DEBT
INF	1.000000	0.634145	-0.632964
IR	0.634145	1.000000	-0.866840
DEBT	-0.632964	-0.866840	1.000000

The table above shows that INF has a strong positive relationship with IR at 0.634145. On the other hand, INF has strong negative relationship with DEBT at -0.632964. Beside, IR has strong negative relationship with DEBT at -0.866840.

Table 4.2 The Range of Correlation Coefficient (r)

Correlation Coefficient, r	Value
Perfect positive correlation	+1.00
Strong positive correlation	0.50 to 0.99
Medium positive correlation	0.30 to 0.49
Weak positive correlation	0.01 to 0.29
No correlation	0
Weak negative correlation	-0.01 to -0.29
Medium negative correlation	-0.30 to -0.49
Stronger negative correlation	-0.50 to -0.99
Perfect negative correlation	-1.00

4.1.1.2 Variance Inflation Factor (VIF)

Table 4.3: Variance Inflation Factor (VIF)

VIF = 1	No multicollinearity
1 < VIF < 10	No serious multicollinearity
VIF ≥ 10	Serious multicollinearity

Table 4.4: Result of Variance Inflation Factor (VIF)

Variables	VIF= $\frac{1}{1-R^2}$
INF	$\frac{1}{1-0.4300} = 1.7544$
IR	$\frac{1}{1-0.7636} = 4.2301$
DEBT	$\frac{1}{1-0.7630} = 4.2194$

Conclusion:

Since all the VIF that calculated above are between 1 and 10. Thus, there is no serious multicollinearity problem among the variable.

4.1.1.3 Tolerance (TOL)

Table 4.5: Tolerance (TOL)

TOL = 1	No multicollinearity
TOL ≈ 0	Serious multicollinearity

Table 4.6: Result of Tolerance (TOL)

Variables	$TOL = \frac{1}{VIF}$
INF	$\frac{1}{1.7544} = 0.5700$
IR	$\frac{1}{4.2301} = 0.2364$
DEBT	$\frac{1}{4.2194} = 0.2370$

Conclusion:

Since all the TOL that calculated above are closed to 0. Thus, there is serious multicollinearity problem among the variable. As a result, even though the VIF analysis shows that there is no serious multicollinearity in the modelhowever the TOL result shows that the model suffering the multicollinearity. Thus, the researchers can conclude that the model is suffering the multicollinearity problem.

Remedy

There are a few types of remedy can be used in order to overcome the multicollinearity problem. Firstly, the researchers can use priori information to solve the multicollinearity problem (Gujarati & Porter, 2009). The priori information can be obtained from previous empirical work whereby the collinearity problem presented to be less serious or from the relevant theory that categorized under the field of study. For example,

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \varepsilon_t$$

Where: Y_t= EXR X_{1t} = INF X_{2t}= IR X_{3t}= DEBT

A priori information: $\boldsymbol{\beta_1} = 0.2\,\boldsymbol{\beta_2}$

Then, the regression can be run as below:

$$\widehat{\text{EXR}}_t = \beta_0 + 0.2\beta_2 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t}$$
$$= \beta_0 + \beta_2 X_t + \beta_3 X_{3t} + \beta_4 X_{4t}$$

** Where $X_t = X_{2t} + 0.2X_{1t}$

In addition, Gujarati and Porter (2009) stated that combining cross-sectional and time data and becoming panel data also one of the method to overcome the multicollinearity problem. Besides that, researchers also can drop one of the collinear variables or adding new data into the model to increase the sample size and thus overcome the multicollinearity problem. Moreover, transformation of variables also one of the method to overcome multicollinearity problem.

4.1.2 Heteroscedasticity

Hypothesis testing – Heteroscedasticity Test: ARCH Test

H_0: There is no heteroscedasticity problem in the model
H_1: There is heteroscedasticity problem in the model

Significant level = 0.05

Decision Rule: Reject H_0 if the P-value is less than significant level of 0.05. Otherwise, do not reject H_0.

Test Statistics: P-value $= 0.6159 > 0.05$

Decision Making: Do not reject H_0 since the P-value (0.6159) is greater than significant level (0.05).

Conclusion: There is no enough evidence to conclude that the model suffered the heteroscedasticity problem at significant level of 0.05.

ARCH test has been used to examine the model and the p-value is more than the significance value. So, the researchers do not reject null hypothesis and the model is free from the heteroscedasticity problem.

4.1.3 Autocorrelation

<u>Hypothesis testing - Breusch-Godfrey Serial Correlation LM Test</u>

H_0: There is no autocorrelation problem in the model
H_1: There is autocorrelation problem in the model

Significance level: $\alpha = 0.05$

Decision Rule: Reject H_0 if the P-value is less than significant level of 0.05. Otherwise, do not reject H_0.

Test Statistics: P-value $= 0.0003 < 0.05$

Decision Making: Reject H_0 since the P-value (0.0003) is smaller than significant level (0.05).

Conclusion: There is enough evidence to conclude that the model has autocorrelation problem at significant level of 0.05.

Breusch-Godfrey Serial Correlation LM Test has been applied in the model to test autocorrelation problem and the result shows that the model is suffered autocorrelation problem.

Remedy for Autocorrelation

Newey-West HAC Standard Errors & Covariance Test

Table 4.7: Results of Newey-West HAC Standard Errors & Covariance Test

	Standard Error	
	OLS regression	Newey-West test
INF	0.0188	0.0306
IR	0.0269	0.0372
DEBT	0.0043	0.0058

** The standard errors are taken from Breusch-Godfrey LM Test and NEWEY-WEST test.

From the table above, the standard error of INF, IR and DEBT has increased after carried out the Newey-West test. Therefore, this shows that the researchers can use Newey-West test to obtain standard errors of OLS estimators that are corrected for autocorrelation.

4.1.4 Jarque-Bera (JB) Test for Normality

Hypothesis testing - Jarque-Bera (JB) Test for Normality Test

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

Significant level = 0.05

Decision Rule: Reject H_0 if the P-value of the test is less than significance of 0.05. Otherwise, do not reject H_0.

Test Statistics: P-value = 0.9508 > 0.05

Decision Making: Do not reject H_0 since the P-value (0.9508) is more than significance level (0.05).

Conclusion: There is no enough evidence to conclude that the error term is not normally distributed at significance level of 0.05.

Based on the result, the models are normally distributed. Jarque-Bera test was used to test the normality in the model. Normality of error term in a model is important because when the error terms are normally distributed, the model will became unbiased and has a minimum variance. Combine with, this means that they are efficient estimator since the minimum variance are unbiased. Moreover, the model has consistency there is as the sample size increase indefinitely, the estimator converge to their true population value.

4.1.5 Ramsey's Regression Specification Error Test (RESET)

Hypothesis testing - Ramsey's Regression Specification Error Test (RESET)

H_0: The model is correctly specified.

H_1: The model is not correctly specified.

Significance level: $\alpha = 0.05$

Decision Rule: Reject H_0 if the P-value is less than significance level of 0.05. Otherwise, do not reject H_0.

Test Statistics: P-value $= 0.2351 > 0.05$

Decision Making: Do not reject H_0 since the P-value (0.2351) is greater than significance level (0.05).

Conclusion: There is no enough evidence to conclude that the model is not correctly specified at significance level of 0.05.

Ramsey Reset Test has been applied in order to test whether the model is correctly specified. Based on the result, the model is free from the model specification error (model is correctly specified).

4.2 BEST Fitted Model

$$ln\widehat{EXR}_t = \widehat{\beta}_0 + \widehat{\beta}_1 \widehat{INF_{1t}} + \beta_2 IR_{2t} + \widehat{\beta}_3 DEBT_{3t}$$

$$ln\widehat{EXR}_t = -3.5741 + 0.0931 INF_{1t} + 0.1505 IR_{2t} + +0.010 DEBT_{3t}$$

SE   =   0.4789   0.0306   0.0372   0.0058

T-statistic   =   -7.4633   3.0397   4.0405   1.7294

Probability =   0.0000   0.0047   0.0003   0.0934

Number of observation (n) = 36

R-square (R^2)   = 0.7733

Adjusted R-square ($\bar{R}^2$) = 0.7520

F-statistic = 36.3796

Prob (F-statistic) = 0.0000

Where,

$lnEXR_t$ = Official exchange rate (local currency units (USD) relative to CNY)

INF_{1t} = Inflation, consumer prices (annual %)

IR_{2t} = Real interest rate (%)

$DEBT_{3t}$= Federal Debt: Total Public Debt (% of GDP)

4.3 Hypothesis testing on the parameter

4.3.1 Hypothesis for Model Fit (F-test)

The researchers decide to use F-test with p-value approach at significance level of 0.05 in order to test the estimated regression model whether is significant.

H_0: $\beta_1 = \beta_2 = \beta_3 = 0$ (Overall model is insignificant)

H_1: At least one β_i not equal to zero, where $i = 1$, 2 and 3 (overall model is significant)

Level of significance: $\alpha = 0.05$

Decision Rule: Reject H_0 if the p-value is less than significant level, $\alpha = 0.05$. Otherwise, do not reject H_0.

P-value (F-Statistic) $= 0.0000 < 0.05$

Decision Making: Reject H_0 since the p-value which is 0.0000 is less than α equal to 0.05.

Conclusion: There is sufficient evidence to conclude that at least one β_i is not equal to zero at 0.05 significant levels. It indicates that the whole model is statistically significant.

4.3.2 Hypothesis for T-test (Individually):

The researchers decide to use F-test with p-value approach at significance level of 0.05.

Hypothesis

$$H_0: \beta_i = 0$$
$$H_1: \beta_i \neq 0$$

Level of significance: $\alpha = 0.05$

Decision Rule: Reject H_0 whenever the p-value is small than significant level, $\alpha = 0.05$. Otherwise, do not reject H_0.

4.3.2.1 Inflation $(\widehat{\beta}_1)$

H_0: There is no significant relationship between inflation and exchange rate.

H_1: There is significant relationship between inflation and exchange rate.

P-value = 0.0047<0.05

Decision Making: Reject H_0 since the p-value which is 0.0047 is less than α equal to 0.05.

Conclusion: There is sufficient evidence to conclude that inflation is at 0.05 significant levels.

4.3.2.2 Interest rate $(\widehat{\beta}_2)$

H_0: There is no significant relationship between interest rate and exchange rate.

H_1: There is significant relationship between interest rate and exchange rate.

P-value = 0.0003< 0.05

Decision Making: Reject H_0 since the p-value which is 0.0003 is less than α equal to 0.05.

Conclusion: There is sufficient evidence to conclude that interest rate is significant at 0.05 significant levels.

4.3.2.3 Debt ($\widehat{\beta}_3$)

H_0: There is no significant relationship between debt and exchange rate.

H_1: There is significant relationship between debt and exchange rate.

P-value= 0.0934> 0.05

Decision Making: Do not reject H_0 since the p-value which is 0.0934 is greater than α equal to 0.05.

Conclusion: There is no enough evidence to conclude that debt is significant at 0.05 significant levels.

4.4 Interpretation

4.4.1 Interpretation of the coefficients for each variable

$\widehat{\beta}_0$ = -3.5741

When interest rate, inflation and debt are equal to zero, on average, exchange rate is equal to -3.5741%.

$\widehat{\beta}_1$ = 0.0931

For every 1 percentage point increase in inflation, on average, the exchange rate will increase by 9.31%, holding other variables constant.

$\widehat{\beta}_2$ = 0.1505

For every 1 percentage point increase in interest rate, on average, the exchange rate will increase by 15.05%, holding other variables constant.

$\widehat{\beta_3}$ =0.0100

For every 1 percentage point increase in term of debt, on average, the exchange rate will increase by 1%, holding other variables constant.

4.4.2 Interpretation of R squared and adjusted R squared

R^2= 0.7733

There are 77.33% of variation in exchange rate is explained by variation in interest rate, inflation and debt.

Adjusted R^2= 0.7520

There are 75.20% of the variations in exchange rate is explained by variation in interest rate, inflation and debt after taking into account the degree of freedom (include the sample size and number of independent variables).

4.5 Conclusion

In this chapter, the researcher use diagnostic checking to detect the model whether have multicollinearity, heteroscedasticity, autocorrelation problem, normality distributed and model specification error. Besides that, researcher also examined hypothesis testing by using T-test and F-test in this chapter. Next, this chapter included the interpretation and explanation of coefficient of each variable and goodness of fit. Therefore, researcher proceeds to chapter 5 to discuss the future recommendation of this research paper.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

In this globalization era, a country's exchange rate is essential to the economic prosperity. As discussion on the previous chapters, researchers found that there were some factors that play an important role in affecting the fluctuations of the exchange rate. In this chapter, researchers have making a summary on the statistical analyses discussed in chapter 4. Other than that, there will be a discussion on the major findings and a comparison between the expected sign and actual output. Next, implications on the study extract based on the major findings are also will be discuss in this chapter following by the limitations and the recommendations for future research. Last but not least, this research paper will be end up with an overall conclusion.

5.1 Summary of Statistical Analyses

Table 5.1: Summary Result of OLS Regression

Variables	P-value	Description on results
Inflation rate	0.0047	Significant
Interest rate	0.0003	Significant
Debt	0.0934	Insignificant
Diagnostic Checking		
Multicollinearity Variance Inflation Factor (VIF) Tolerance Factor (TOL)	Highest VIF=4.2301 Lowest TOL=0.2364	Not passed, multicollinearity problem
Autoregressive Conditional Heteroscedasticity(ARCH)	0.6159	Passed, no heteroscedasticity problem
Breusch-Godfrey Lagrange Multiplier (LM) Test	0.0003	Do not passed, autocorrelation problem
Jarque-Bera(JB) Normality Test	0.9508	Passed, model is normally distributed
Ramsey Reset Test	0.2351	Passed, no model specification error (or model correctly specified)

5.2 Discussion of major findings

In this studies paper, the researchers found that the empirical result (actual sign) of each independent variable have similar sign with the expected sign that has been discussed in chapter Therefore, the researchers will discuss in details the major findings of each independent variable in this section.

5.2.0 Expected sign versus Actual output

Table 5.2: Result of Expected sign versus Actual output

Variables	Expected Value	Actual Value
Inflation (INF)	Positive (+)	Positive (+)
Nominal Interest Rate (IR)	Positive (+)	Positive (+)
Debt (Debt)	Positive (+)	Positive (+)

5.2.1 Inflation

Inflation rate is one of the important variables in this study since it brought an effect toward a country's exchange rate. Inflation rate plays a significant role in determine a country's economy conditions. Hence, a country's economy considers collapse whenever a country suffering a hyperinflation problem.

This study shows a result that the dependent variable (US exchange rate) and the independent variable (inflation) are positively related. This statement has also been supported by some previous research. In the previous research paper,

Ebiringa and Anyaogu (2014) have proved that the inflation was significantly and positively affecting the exchange rate by using the Autoregressive Distributed Lag Estimates (ARDL) model. In the long run, the result from the ARDL model shows that an increase in the inflation will lead an appreciation on a country's exchange rate.

Other than that, Kuttner and Posen (2000); Arghyrou and Pourpourides (2016) that study the relationship between the exchange rate and inflation by adopting the economic theory (Purchasing Power Parity (PPP) Theory and Fisher effect Theory) also found a similar result as Ebiringa and Anyaogu (2014). Based on the PPP Theory, a country's exports will decline and its imports will increase when a country's inflation rate increase relative to another country. In this situation, a country's currency value will depress and the country's exchange rate going to appreciate relative to other countries (Kuttner & Posen, 2000). Next, Fisher effect Theory shows that a rises in inflation was increased the nominal interest rate and it was lead to a depreciation of a country's currency value. As a result there was an appreciation on a country's exchange rate relative to other countries (Arghyrou & Pourpourides, 2016).

However, Nucu (2011) stated that there were two possible relationships between the exchange rate and inflation rate. First, by abandoned other variables, there was a significant negative linear relationship between exchange rate and inflation rate. Based on the result obtained from Pearson Correlation Coefficient, one unit growth in inflation rate will decrease a country's exchange rate by 0.44 units. Second, by taking into account the other variables such as interest rate and balance of payment, there will be a positive relationship between the exchange rate and inflation rate. Nucu (2011) stated that the a country's exchange rate tend to appreciate continuously when there is a deficit in the country's Balance of Payment (import more than export) due to the high inflation rate in the country.

In contrary, there are also some of the researchers argued that there was an insignificant relationship between the exchange rate and inflation. According to Abbas et al. (2012), the Autocorrelation test that applied in the research show a result that a country's inflation rate has a non-significant relationship toward the country's exchange rate.

5.2.2 Nominal Interest Rate

Nominal interest rate serves as an important character in the study which affects the exchange rate of a country simultaneously when inflation occurs. When inflation happened, high inflation will lead to high nominal interest rate. The result on this study shows that nominal interest rate is positively and significantly towards the exchange rate of the country. This output is similar with the Chowdhury and Hossain (2014), they had identified and found that nominal interest rate is positively and significantly affects the exchange rate and currency value of a country by applying overall significance test (F-test) based on the analysis of variance (ANOVA). In theoretical, the positive result is showing consistent with Fisher (1930) who stated that a high inflation will cause high interest rate, thus the currency value of a country will depreciate and the exchange rate will increase.

In contrary, Ebiringa and Anyaogu (2014) stated that interest rate has a negative and insignificance relationship with exchange rate by using Autoregressive Distributed Lag (ARDL) co-integration analysis. Interest rate influences exchange rate negatively which stated that an rises in interest rate will lead to currency of the country to appreciate. Moreover, Dash (2012) has used the vector Autoregression model and error correction model (ECM) to show that there are negatively and insignificantly relationship between interest rate and exchange rate.

5.2.3 Government Debt

The researcher indicates that government debt and exchange rate have a positive relationship which means that an increase in government debt will lead to an increase in exchange rate. It is persistent with the study from Saheed et al. (2015) who examine the relationship between public external debts on exchange rate. Kia (2013) and Nyahoho (2016) also supported the result by investigated the impact of government debt on the exchange rate. According to Saheed et al. (2015), the researcher used OLS on the secondary data adpoted from the CBN and DMO, the results shows that the independent variables, such as external debt and debt service are significantly influence the exchange rate fluctuation in Nigeria. Moreover, the researcher wants to know the fundamental determinants and use the exchange rate as an indicator to measure the price-cost competitiveness. Besides, the results also reveals that the real exchange rate appreciates when the shock increase in the government debt (Kia, 2013).

In addition, according to Nyahoho (2016), the researcher investigates the development of government debt in conjunction with the exchange rate for a few countries of the OECD. The result shows that when the levels of debt increase the exchange rate tends to appreciate in Norway, United Kingdom, Ireland, Canada and Finland. On the other hand, Bunescu (2014) also proved that there are positive relationship between government debt and exchange rate. In the research paper, the researcher determines the presence or non-presence of a connection for Romania's external debt components and the development of RON/EUR exchange rate. Then, the result of this study indicates that when the level of external debt decrease it will cause the national currency appreciate and the level of exchange rate depreciate.

Furthermore, Gaol, Kuncoro and Sebayang (n.d.) also indicates that government debt have positive effects to exchange stability. The evidence their studies show that the coefficients value of government debt is 0.617162, which means that 1% increase in fiscal credibility will lead to the value of the exchange rate increase by 2.56%.

However, there are some researcher found that the exchange rate and government debt are negatively related. According to Bouraoui and Phisuthtiwatcharavong (2015), the researcher tells that there are negative and non-significant relationship between government debt and the THB/USD exchange rate. The result shows the coefficient for debt is -0.000717, which means that exchange rate decrease by 0.000717 % when government debt increase by 1 %, assume that other variables remain constant.

In addition to that, according to Lin 1994, the researcher investigate the impact of government debt on the exchange rate by using the method of two-country OLG model in either two countries there have different production technology. Then, the result reveals that a rise in government debt will depreciate the real exchange rate by holding other variables constant.

5.3   Implications of study

5.3.1 Policy Makers

As the discussion on the major findings, researchers conclude that the exchange rate and inflation rate are positively and significantly related. In other words, it is important for the policy makers to know that inflation rate may be one of the significant elements that will bring an effect toward a country's exchange rate. Hence, this research paper may be a guideline for the

policy makers when they are making the economic policy decisions to control the inflation rate that will bring an effect toward a country's exchange rate. Based on the Inflation Theory (Demand pull theory), inflation occur in the economy when the aggregate demand (AD) for goods and services are exceed the aggregate supply (AS). When a country suffering the inflation problem, the country's exchange rate going to increase relative to other countries. Since the result of this research paper shows a relationship between the exchange rate and inflation rate, the policy makers therefore can decide whether to implement the fiscal policy in order to controlling the AD and AS that will bring an effect toward the inflation rate. In fact, fiscal policy is a type of policies that implement to slower down the growth of AD and/or fasten the growth of AS by make changes on the government's tax and spending levels. When a country suffering the inflation problem due to AD for goods and services are more than the AS, the policy makers will decide to tighten the fiscal policy in order to reduce the AD. In this situation, the government can reduce a country's public spending as well as increase the government taxes to decreased the AD and boost the AS in order to lower down the inflation rate. As the inflation rate controllable, the value of a country's currency will appreciate and the exchange rate will decrease.

5.3.2 Market Investors

Foreign exchange market is a globalization market which enables for the trading of currencies activities. The market investors include buyer and seller of the currencies. The market determines on the current market price of the related currency against other currencies value. Exchange rates are influenced by the supply and demand factors. With this, the demand factors will directly affected by the inflation, interest rate and debt. When the demand of goods in US increases, it will lead to an appreciation of USD. In this case, market investor who holds the USD worry about the future currency value of USD

will depreciate so they sell the dollars. Thus, this will lead to depreciation on the currency value of dollars. The rising and falling of interest rate act as a determinant for the market investors in order to sell or buy the currency and affect exchange rate of currency. Thus, this research study is useful and plays a sound of effective for the investor to make the decision on buying or selling to gain profit.

5.3.3 Researchers

When conducting this research, it is crucial for researcher to identify how the macroeconomic factors influence exchange rate in United States. This research paper provides some useful guideline and reference for researcher in their future studies. Researcher can examine recommendation in this paper in order to obtain an accurate result when they doing their research. Usually, different researcher will come out different view and results in their research. This implies that when doing research, researcher need to determine whether interest rate has significant relationship with exchange rate or not. In conclusion, these papers served as guide to researcher in determine how interest rate affecting exchange rate in United States in future research.

5.3.4 Government

Government debt is one of the elements of exchange rate in this research. In this study, the model shows a positively relationship between government debt and exchange rate whereby an increase in government debt level will lead to an appreciation on the country's exchange rate. Thus, this research paper may be a guideline for government to make a decision for the budget allocation. For instance, government can decide whether to implement the

policy on state debt restrictions in order to maintaining the exchange rate. This is because when the country debt burden is high it would lower the flexibility the government distribute its budget. This can seriously influence the economic performance if the government can't control the aggressiveness for this fiscal. Moreover, this research study is useful because government can decide whether want to implement the policy of tax increases in order to make an optimum profit. Both policies tend to benefit the government because it helps to maintain the exchange rate in a proper ways.

5.4 Limitations of the study

According to the research on the previous chapters, the researchers found that they are facing some limitations that will influence the accuracy of the statistical result. First at all, the researchers are unable to use a large sample size to test the relationship between the dependent and independent variables. In others word, the researchers have facing the insufficient data problem when they are doing these research paper. Researchers have using the annual data from year 1979 to 2014, which are 36 observations to run the model since they are only able to obtain the nominal interest rate from year 1979 onwards. In this research, annual data of each variable has been used in running the tests. The application of annual data will lead to a higher probability to get autocorrelation problem. By using a tiny size of observations, the researchers are unable to get enough and adequate information in the regression model. Thus, there were higher tendency that the diagnostic checking result to be inaccurate and misleading.

Furthermore, time series data is applied to run the model in this research paper. Time series data is a set of data that examines the value of each variable at different period of time. Due to the limitation on data available to be accessed, thus the researchers have decided to use time series data instead of panel data.

5.5 Recommendations of future research

During the research period, the researchers found that the sample size is one of the main issues to ensure the accuracy level of the model regression. Therefore, the recommendation is provided in this section to the future researchers in order to improve the accuracy of the research. According to the Central Limit Theorem (CLT), future researchers is more encouraged to test the relationship between the dependent and independent variables by using monthly, quarterly or semi-annually data compare to the annually data. Besides that, Gujarati and Porter (2009) stated that larger sample size provides more valuable information and accurate results as it has a high tendency to keep the model from suffering multicollinearity, heteroscedasticity and autocorrelation problem. Hence, the future researchers should enlarge the sample size in the study in order to get a more reliable result.

Recommendation on the combination of cross-sectional and time series data sources in the research in order to get an accurate result. The selection on cross-sectional data only enables to focus on one country and cannot be generalized to another country. In contrast, if researchers study on time series data, spurious relationship may happens. Therefore, panel data is more preferred as compared to other techniques because it provides a more actual and informative data.

5.6 Conclusion

This chapter is present an overall summary for the result generated and also a discussion on major findings for each of the independent variables. In addition, this chapter has covered the implications for all the independent variables from different perspectives. Lastly, this chapter has highlighted the limitations on the study and the researchers have addressed severe recommendations for the future studies.

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APPENDIX

Appendix 1: Original Output: Log-lin Form

Dependent Variable: LNEXR

Method: Least Squares

Date: 07/13/16   Time: 23:04

Sample: 1979 2014

Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.574054	0.498578	-7.168499	0.0000
INF	0.093073	0.022686	4.102565	0.0003
IR	0.150473	0.032200	4.673132	0.0001
DEBT	0.009981	0.005057	1.973725	0.0571

R-squared	0.773273	Mean dependent var	-1.642786
Adjusted R-squared	0.752017	S.D. dependent var	0.561614
S.E. of regression	0.279672	Akaike info criterion	0.394039
Sum squared resid	2.502921	Schwarz criterion	0.569986
Log likelihood	-3.092702	Hannan-Quinn criter.	0.455449
F-statistic	36.37957	Durbin-Watson stat	0.776874
Prob(F-statistic)	0.000000		

Appendix 2: Multicollinearity Test: Auxiliary Model 1 (Dependent variable =INF)

Dependent Variable: INF

Method: Least Squares

Date: 07/13/16   Time: 23:05

Sample: 1979 2014

Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.487758	3.745071	1.198311	0.2393
IR	0.314265	0.240941	1.304326	0.2011
DEBT	-0.048140	0.037885	-1.270677	0.2127

R-squared	0.430028	Mean dependent var	3.679386
Adjusted R-squared	0.395484	S.D. dependent var	2.760076
S.E. of regression	2.145976	Akaike info criterion	4.444721
Sum squared resid	151.9720	Schwarz criterion	4.576681
Log likelihood	-77.00498	Hannan-Quinn criter.	4.490779
F-statistic	12.44879	Durbin-Watson stat	0.489584
Prob(F-statistic)	0.000094		

Appendix 3: Multicollinearity Test: Auxiliary Model 2 (Dependent variable =IR)

Dependent Variable: IR

Method: Least Squares

Date: 07/13/16   Time: 23:06

Sample: 1979 2014

Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.32166	1.373861	9.696513	0.0000
INF	0.156002	0.119604	1.304326	0.2011
DEBT	-0.122109	0.017190	-7.103323	0.0000

R-squared	0.763599	Mean dependent var		6.591111
Adjusted R-squared	0.749272	S.D. dependent var		3.019535
S.E. of regression	1.511965	Akaike info criterion		3.744353
Sum squared resid	75.43927	Schwarz criterion		3.876313
Log likelihood	-64.39835	Hannan-Quinn criter.		3.790410
F-statistic	53.29667	Durbin-Watson stat		0.369926
Prob(F-statistic)	0.000000			

Appendix 4: Multicollinearity Test: Auxiliary Model 3 (Dependent variable =DEBT)

Dependent Variable: DEBT

Method: Least Squares

Date: 07/13/16   Time: 23:07

Sample: 1979 2014

Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	96.01871	3.899365	24.62419	0.0000
INF	-0.968953	0.762549	-1.270677	0.2127
IR	-4.951196	0.697025	-7.103323	0.0000

R-squared	0.763007	Mean dependent var	59.81967
Adjusted R-squared	0.748644	S.D. dependent var	19.20338
S.E. of regression	9.627694	Akaike info criterion	7.446820
Sum squared resid	3058.852	Schwarz criterion	7.578780
Log likelihood	-131.0428	Hannan-Quinn criter.	7.492877
F-statistic	53.12239	Durbin-Watson stat	0.309525
Prob(F-statistic)	0.000000		

Appendix 5: Correlation Output

Correlation			
	INF	IR	DEBT
INF	1.000000	0.634145	-0.632964
IR	0.634145	1.000000	-0.866840
DEBT	-0.632964	-0.866840	1.000000

Appendix 6: Heteroscedasticity Test (ARCH Test): Auxiliary Model 1

Heteroskedasticity Test: ARCH

F-statistic	0.239072	Prob. F(1,33)	0.6281
Obs*R-squared	0.251738	Prob. Chi-Square(1)	0.6159

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/13/16   Time: 23:09
Sample (adjusted): 1980 2014
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.059732	0.019657	3.038786	0.0046
RESID^2(-1)	0.082063	0.167835	0.488950	0.6281

R-squared	0.007193	Mean dependent var	0.065504
Adjusted R-squared	-0.022893	S.D. dependent var	0.091939
S.E. of regression	0.092985	Akaike info criterion	-1.857308
Sum squared resid	0.285326	Schwarz criterion	-1.768431
Log likelihood	34.50289	Hannan-Quinn criter.	-1.826628
F-statistic	0.239072	Durbin-Watson stat	1.881492
Prob(F-statistic)	0.628111		

Appendix 7: Heteroscedasticity Test (ARCH Test): Auxiliary Model 2

Heteroskedasticity Test: ARCH

F-statistic	0.441314	Prob. F(2,31)	0.6472
Obs*R-squared	0.941244	Prob. Chi-Square(2)	0.6246

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/13/16   Time: 23:10
Sample (adjusted): 1981 2014
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.066554	0.022782	2.921277	0.0064
RESID^2(-1)	0.129978	0.176579	0.736091	0.4672
RESID^2(-2)	-0.109891	0.170695	-0.643785	0.5244

R-squared	0.027684	Mean dependent var	0.067410
Adjusted R-squared	-0.035046	S.D. dependent var	0.092617
S.E. of regression	0.094226	Akaike info criterion	-1.802153
Sum squared resid	0.275232	Schwarz criterion	-1.667474
Log likelihood	33.63660	Hannan-Quinn criter.	-1.756224
F-statistic	0.441314	Durbin-Watson stat	1.972694
Prob(F-statistic)	0.647169		

Appendix 8: Heteroscedasticity Test (ARCH Test): Auxiliary Model 3

Heteroskedasticity Test: ARCH

F-statistic	0.450450	Prob. F(3,29)	0.7189
Obs*R-squared	1.469276	Prob. Chi-Square(3)	0.6894

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/13/16   Time: 23:10
Sample (adjusted): 1982 2014
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056625	0.026501	2.136735	0.0412
RESID^2(-1)	0.141863	0.183740	0.772082	0.4463
RESID^2(-2)	-0.115334	0.182005	-0.633685	0.5313
RESID^2(-3)	0.142133	0.175595	0.809439	0.4249

R-squared	0.044524	Mean dependent var	0.068641
Adjusted R-squared	-0.054319	S.D. dependent var	0.093770
S.E. of regression	0.096283	Akaike info criterion	-1.729835
Sum squared resid	0.268843	Schwarz criterion	-1.548441
Log likelihood	32.54228	Hannan-Quinn criter.	-1.668802
F-statistic	0.450450	Durbin-Watson stat	2.037471
Prob(F-statistic)	0.718908		

Appendix 9: Autocorrelation Test (Breusch-Godfrey Serial Correlation LM Test): Auxiliary Model 1

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	17.25590	Prob. F(1,31)	0.0002
Obs*R-squared	12.87329	Prob. Chi-Square(1)	0.0003

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/13/16   Time: 23:11
Sample: 1979 2014
Included observations: 36
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.507194	0.423968	1.196303	0.2406
INF	-0.014896	0.018819	-0.791522	0.4347
IR	-0.024990	0.026902	-0.928911	0.3601
DEBT	-0.004749	0.004274	-1.111244	0.2750
RESID(-1)	0.637053	0.153358	4.154022	0.0002

R-squared	0.357591	Mean dependent var	-9.21E-16
Adjusted R-squared	0.274700	S.D. dependent var	0.267417
S.E. of regression	0.227745	Akaike info criterion	0.007064
Sum squared resid	1.607898	Schwarz criterion	0.226997
Log likelihood	4.872853	Hannan-Quinn criter.	0.083826
F-statistic	4.313974	Durbin-Watson stat	1.753207
Prob(F-statistic)	0.006868		

Appendix 10: Autocorrelation Test (Breusch-Godfrey Serial Correlation LM Test): Auxiliary Model 2

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	8.496414	Prob. F(2,30)	0.0012
Obs*R-squared	13.01777	Prob. Chi-Square(2)	0.0015

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/13/16   Time: 23:11
Sample: 1979 2014
Included observations: 36
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.576608	0.458397	1.257877	0.2181
INF	-0.016167	0.019294	-0.837955	0.4087
IR	-0.028981	0.028769	-1.007370	0.3218
DEBT	-0.005377	0.004566	-1.177701	0.2482
RESID(-1)	0.599334	0.178030	3.366475	0.0021
RESID(-2)	0.084047	0.193534	0.434275	0.6672

R-squared	0.361605	Mean dependent var	-9.21E-16
Adjusted R-squared	0.255205	S.D. dependent var	0.267417
S.E. of regression	0.230785	Akaike info criterion	0.056352
Sum squared resid	1.597853	Schwarz criterion	0.320272
Log likelihood	4.985655	Hannan-Quinn criter.	0.148468
F-statistic	3.398566	Durbin-Watson stat	1.707448
Prob(F-statistic)	0.014989		

Appendix 11: Autocorrelation Test (Breusch-Godfrey Serial Correlation LM Test): Auxiliary Model 3

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	8.968105	Prob. F(3,29)	0.0002
Obs*R-squared	17.32523	Prob. Chi-Square(3)	0.0006

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/13/16   Time: 23:11
Sample: 1979 2014
Included observations: 36
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.712649	0.423555	1.682541	0.1032
INF	-0.017000	0.017692	-0.960903	0.3445
IR	-0.038268	0.026620	-1.437578	0.1613
DEBT	-0.006472	0.004208	-1.538243	0.1348
RESID(-1)	0.609767	0.163275	3.734604	0.0008
RESID(-2)	-0.127802	0.195433	-0.653943	0.5183
RESID(-3)	0.433971	0.167795	2.586320	0.0150

R-squared	0.481257	Mean dependent var	-9.21E-16
Adjusted R-squared	0.373930	S.D. dependent var	0.267417
S.E. of regression	0.211593	Akaike info criterion	-0.095640
Sum squared resid	1.298374	Schwarz criterion	0.212266
Log likelihood	8.721522	Hannan-Quinn criter.	0.011828
F-statistic	4.484053	Durbin-Watson stat	1.675439
Prob(F-statistic)	0.002502		

Appendix 12: Newey West Test Output

Newey West Test

Dependent Variable: LNEXR
Method: Least Squares
Date: 07/13/16   Time: 23:12
Sample: 1979 2014
Included observations: 36
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed
    bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.574054	0.478883	-7.463319	0.0000
INF	0.093073	0.030619	3.039713	0.0047
IR	0.150473	0.037241	4.040539	0.0003
DEBT	0.009981	0.005771	1.729444	0.0934

R-squared	0.773273	Mean dependent var	-1.642786
Adjusted R-squared	0.752017	S.D. dependent var	0.561614
S.E. of regression	0.279672	Akaike info criterion	0.394039
Sum squared resid	2.502921	Schwarz criterion	0.569986
Log likelihood	-3.092702	Hannan-Quinn criter.	0.455449
F-statistic	36.37957	Durbin-Watson stat	0.776874
Prob(F-statistic)	0.000000		

Appendix 13: Jarque-Bera Normality Test Output

Series: Residuals	
Sample 1979 2014	
Observations 36	
Mean	-9.21e-16
Median	0.020623
Maximum	0.596232
Minimum	-0.546592
Std. Dev.	0.267417
Skewness	0.058522
Kurtosis	2.768623
Jarque-Bera	0.100852
Probability	0.950824
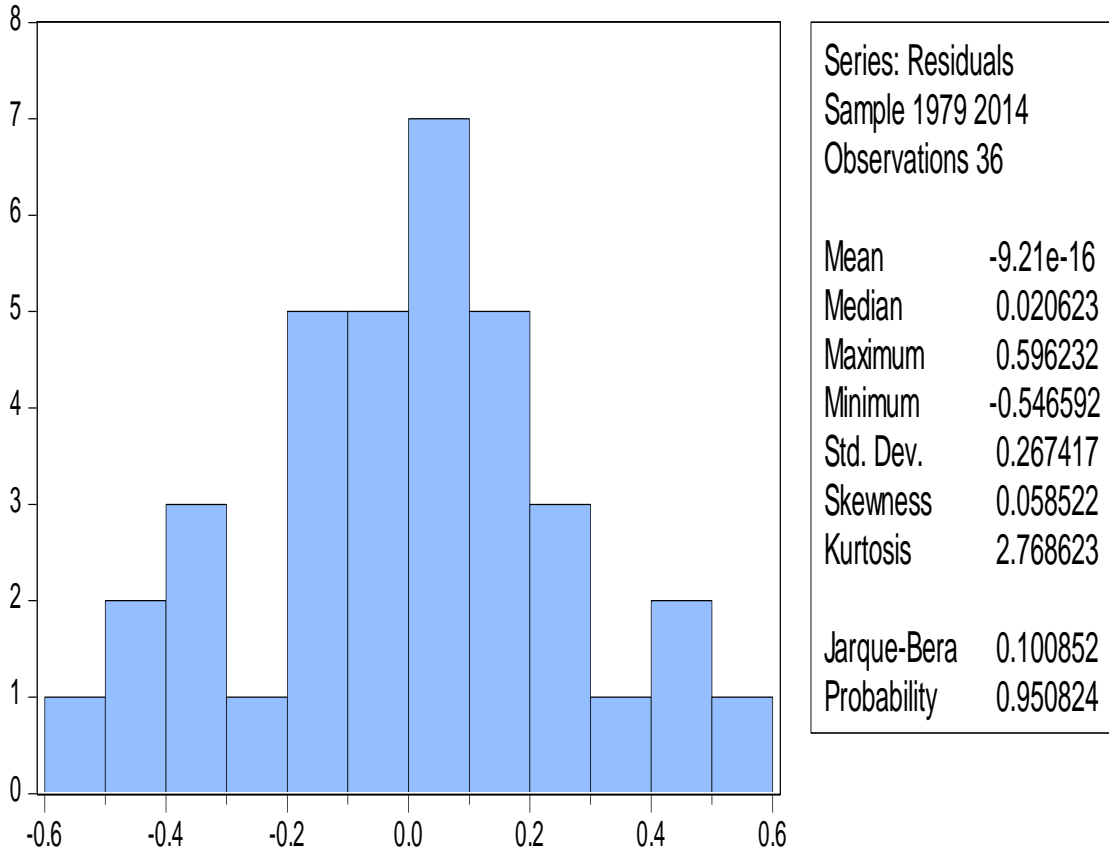
Appendix 14: Ramsey's Regression Specification Error Test Output

Ramsey RESET Test
Equation: EQ01
Specification: LNEXR C INF IR DEBT
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.210848	31	0.2351
F-statistic	1.466153	(1, 31)	0.2351
Likelihood ratio	1.663592	1	0.1971

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.113031	1	0.113031
Restricted SSR	2.502921	32	0.078216
Unrestricted SSR	2.389891	31	0.077093
Unrestricted SSR	2.389891	31	0.077093

LR test summary:

	Value	df
Restricted LogL	-3.092702	32
Unrestricted LogL	-2.260906	31

Unrestricted Test Equation:
Dependent Variable: LNEXR
Method: Least Squares
Date: 07/13/16   Time: 23:14
Sample: 1979 2014
Included observations: 36
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed
   bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.664540	2.724818	-2.078869	0.0460
INF	0.140589	0.064994	2.163111	0.0384
IR	0.267953	0.151923	1.763746	0.0876
DEBT	0.017055	0.011939	1.428578	0.1631
FITTED^2	0.244601	0.289462	0.845019	0.4046

R-squared	0.783512	Mean dependent var	-1.642786
Adjusted R-squared	0.755578	S.D. dependent var	0.561614
S.E. of regression	0.277657	Akaike info criterion	0.403384
Sum squared resid	2.389891	Schwarz criterion	0.623317
Log likelihood	-2.260906	Hannan-Quinn criter.	0.480146
F-statistic	28.04868	Durbin-Watson stat	0.869502
Prob(F-statistic)	0.000000		

Appendix 15: OLS Final Output

Dependent Variable: LNEXR

Method: Least Squares

Date: 07/13/16   Time: 23:12

Sample: 1979 2014

Included observations: 36

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed
bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.574054	0.478883	-7.463319	0.0000
INF	0.093073	0.030619	3.039713	0.0047
IR	0.150473	0.037241	4.040539	0.0003
DEBT	0.009981	0.005771	1.729444	0.0934

R-squared	0.773273	Mean dependent var	-1.642786
Adjusted R-squared	0.752017	S.D. dependent var	0.561614
S.E. of regression	0.279672	Akaike info criterion	0.394039
Sum squared resid	2.502921	Schwarz criterion	0.569986
Log likelihood	-3.092702	Hannan-Quinn criter.	0.455449
F-statistic	36.37957	Durbin-Watson stat	0.776874
Prob(F-statistic)	0.000000		