DETERMINANTS OF THE EXCHANGE RATE IN DEVELOPING COUNTRY: EVIDENCE FROM MALAYSIA

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DECLARATION

We hereby declare that:

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

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

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

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LIST OF ABBREVIATIONS

AD	Aggregate Demand
ADF	Augmented Dickey-Fuller
ARCH	Autoregressive Conditional Heteroscedasticity
AS	Aggregate Supply
ASEAN	Association of Southeast Asian Nations
AUD	Australian Dollar
BLUE	Best Linear Unbiased Estimator
C	Constant
CPI	Consumer Price Index
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum Square
DV	Dependent Variable
EMU	European Monetary Union
EXCR	Exchange Rate
FOREX	Foreign Exchange
FY	Fiscal Year
GDP	Gross Domestic Product
GEXP	Government Expenditure
IFS	International Financial Statistics
IMF	International Monetary Fund
INF	Inflation
INTR	Interest Rate
IV	Independent Variable
JB	Jarque-Bera

LICs	Low-Income Countries
LM	Lagrange *Multipliers*
LOG_EXCR	Log of Exchange Rate
LOG_GEXP	Log of Government Expenditure
MLR	Multiple Linear Regression
MYR	Malaysia Ringgit
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PP	Phillips-Perron
RESET	Regression Equation Specification Error Test
RGDP	Real Gross Domestic Product
RM	Ringgit Malaysia
TOL	Tolerance
UK	United Kingdom
US	United States
USA	United States America
USD	United States Dollar
UTAR	Universiti Tunku Abdul Rahman
VAR	Vector Autoregression
VEC	Vector Error Correction
VIF	Variance Inflation Factor

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PREFACE

FOREX investors, multinational corporations, government, foreign investors and economists are concerned with the movement of exchange rate. This research is prepared for the referees to acquire more details on the movement of exchange rate in Malaysia which will be influenced by some macroeconomic factors. The factors are including the inflation, government expenditure, gross domestic product (GDP) and interest rate. The outcomes of the research that have been done and it can be provided to referees to have a clear and precise view on the actual impact of macroeconomic factors on the exchange rate movement. The results that showed in this research are based on E-views. Hence, the referees are allowed to determine the movement of the exchange rate in Malaysia. To prevent the economic problems and take care of the public interest, this research is useful for the referees to understand specifically about the macroeconomic factors that will influence the exchange rate.

ABSTRACT

This research is to investigate the relationship between the exchange rate and independent variables which are inflation, government expenditure, gross domestic product (GDP) and interest rate in Malaysia. The secondary data was sourced from the period of 1987 to 2016, which was obtained from World Bank which consists from International Monetary Fund (IMF), International Financial Statistic (IFS), Organization for Economic Co-operation and Development (OECD) data files. In addition, the approach that implemented to evaluate the model was Ordinary Least Square (OLS). The result showed that the macroeconomic factors of exchange rate was influencing by inflation, government expenditure, gross domestic product (GDP) and interest rate and result in a direct relationship and statistically significant and insignificant to the exchange rate. In addition, the diagnostic checking procedure was carried out by using E-View 10 software and ran through sample 30 years from 1987 to 2016. Furthermore, according to the literature review, the studies show positively insignificant between inflation and interest rate with exchange rate; negatively significant between government expenditure with exchange rate; and positively significant between gross domestic products (GDP) with exchange rate. However, this research experienced and occurred some limitations, but still useful for government, policy makers, investors and international traders.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

In the outline of study, a short introduction of the research topic will be discussed in this session. The exchange rate chronically overvalued, it will become a major difficulty to the economic growth across the various countries which are including Malaysia. Hence, all the related concepts, crucial factors and concept will be discussed, including few selected macroeconomic determinants that bring impact to the exchange rate. Since October 2015, Malaysia Ringgit (MYR) has suffered a huge downturn against most of the world currencies. The Malaysia Ringgit (MYR) suffered a hard knock which is the price valued at RM4.72 per US Dollar (USD) in the Asian crisis of 1997. Hence, this may indicate the Malaysia policy makers pegging the currency at RM3.80 per USD (Quadry, Mohamad and Yusof, 2017). Hence, the following content of the chapter will describe the problem inspected. The problem and research objectives will be stated precisely to bring out the core objective of this study which is the macroeconomics determinants that affect the exchange rate volatility. Relevant research questions and hypothesis are identified in current chapter in order to guide readers into the major research. Moreover, this chapter will consist the flows of each following chapters. Chapter 1's conclusion will be made at the last part of this chapter.

1.1 Research Background

Developing country refers to the economy which has engaged in the international trade and exchange of goods and services between the countries. According to Nicita (2013), the type of trade will lead to the world economy in prices or supply and demand rising as well as driving the growth of the developing country economy. Other than that, a developing country is also known as emerging market or less developed country. The gross domestic product (GDP) of developing countries is lower compared to those developed countries due to the market is less mature (Business Development Bank of Canada, n.d).

According to Forsyth (1990), it stated that economic size is one of the factors that defined a developing country or economy because population and gross domestic product (GDP) are usually the key indicators. The different population size is very important because it affects the market size, scales of primeval industries and also the specialization in different scopes as well as in the different total levels of savings and investments. Population and gross domestic product (GDP) are the main indicators which related to an economy size compared to the fundamental resources which are human and capital.

Furthermore, there are three important characteristics which are commonly for all developing country. The country will suffer with the low per capita real income level. According to the World Bank (1995), the low-income countries average capital income is only $430 compared the high-income countries such as USA, UK and Japan are $24,930. Therefore, there are many people in developing country will face difficulties on not enough money to spend. Based on the analysis made by Asyesha (n.d.), there are 60 to 75% of the population depended on their agriculture. Furthermore, the developing countries will gain 30 to 50% national income from agriculture alone. They distribute their manpower by sector to sector as it becomes the leading of agriculture in developing countries. There is the estimation made by International Labour Organization, low income developing countries employed 61% of workforce in agriculture while employed only 19% to 20% of workforce in services. In contrast, only 4% of the workforce is employed in the high income developed countries for agriculture, 26% for industry and service they employed 70% of workforce.

Table 1.1: The Workforce Distributed by the Sector (Percentage)

Countries	Agriculture	Industry	Services
Low-Income countries	61%	19%	20%
Middle-Income countries	22%	34%	44%
High-Income countries	4%	26%	70%

Source: International Labour Organization

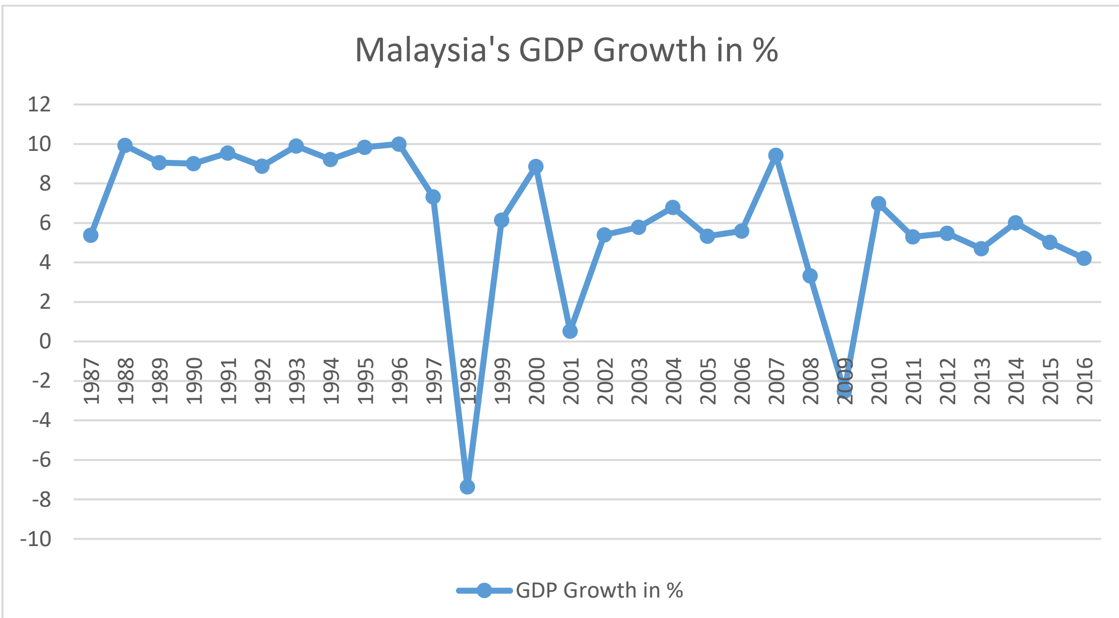
The higher rate of unemployment is also one of the characteristics of developing countries. Agarwal (2017) mentioned that mostly unemployment rate is happened in the rural area because basically the people in rural area is poor and did not receive any education. Hence, due to lack of the levels of education and skills, they did not have enough ability to survive in the industry enterprises and cause the higher of unemployment rate. Based on World Bank data, the unemployment rate in Malaysia was 3.4% in 1982, which increased rapidly to 8.29% in 1986, then dropped to 7.33% in 1987. Therefore, Malaysia was considered a high rate of unemployment during that period.

According to Asia Economic Institute (n.d.), it stated that Malaysia growth rate was rapidly growing and successful implied the export-oriented economic policies in recent years. Furthermore, Malaysian government mentioned that the higher world energy prices, it brings the exports for the oil and gas which have gained the government coffers. In the early years, there are some actions must be taken by Malaysia recently to cushion the side effect that bring by the global financial crisis. There is the data from CIA World Factbook showed since 1997 Asian Financial crisis, the real Gross Domestic Product (GDP) average growth rate is 5.8%. Malaysia has continuous growth past 30 years with the average 5.8% average growth rate per year (Bank Negara Malaysia, 2016).

According to Department of Statistics Malaysia, Official Portal (2018), Malaysia's exports of major products to other countries include electrical and electronic products, palm oil, palm-based products and refined petroleum products. In contrast, Malaysia's imports include intermediate goods, capital goods and consumption goods. There were RM59.9 billion exports and RM56.7 imports. The three countries which are Malaysia's top major trading partners are China, Singapore and European Union.

Based on Figure 1.1, both of the sudden decreases until negative percentage of GDP growth were the result of 1997 Asian Financial Crisis and 2008 Global Financial Crisis. After the crisis, Malaysia had recovered to normal level of GDP growth.

Figure 1.1: Malaysia's GDP Growth in Percentage within year 1987 - 2016



Source: World Bank from year 1987 to 2016

Malaysian Ringgit also known as (RM) is the currency of Malaysia. In year 1973, Malaysian dollar was now allowed to be fluctuated. Before this, the Bank was not bound to buy US Dollar at the floor rate of Ringgit Malaysia 2.4805 for each US Dollar. In the early of 1975, Malaysian dollar was pegged to the United States dollar in order to avoid the depreciation of the Malaysian Dollar. According to Chua and Bauer (2006), in year 1975 occurred the depreciation between Ringgit against United Stated dollar which Malaysia had launched an exchange rate system called "Dirty float" and after that Malaysia currency had been pegged as a part of the composite of currencies. The research did by the Nanyang Technological University (2006) stated that, from 1976 to 1980, there was a rise of 20% of the value of Ringgit and then depreciated with the dollar because US dollar with Ringgit exchange rate is very important to Malaysia financial sector.

The regime was continued until July 1997 which Bank Negara Malaysia decided to stop sustaining the exchange rate in the Asian financial crisis. Asian financial crisis in the year of 1997 to 1998 had pegged Malaysia currency for almost five years at USD $1 = RM3.80. Soft peg means that the current exchange rate is fixed to other reserve currency (Hernández-Verme & Wang, 2009). This regime avoided the daily fluctuations such as depreciation and appreciation for a country to sustain in a financial crisis. This also encouraged international trade and investment because the exchange rate was fixed at that time. The buyer and the seller would not lose any currency exchange differences by eliminating the uncertainty about up and down of currency.

In July 2005, Malaysia changed from fixed exchange rate system to managed floating exchange rate regime. The removal of ringgit peg to USD brought Malaysia to a better stand in an area of globalization, but it would bring instability in the FOREX market. Managed floating exchange rate regime also brought in central bank for intervening the currency when the fluctuation of exchange rate was out of the plan. While other banks were in difficulty, central bank acted as a lender in the banking system.

From year 1987 to 1997, the exchange rate was fluctuating between RM2.50 and RM3.00 for each USD. In the case of 1997 Asian Financial Crisis, the exchange rate rose rapidly from RM2.81 in 1997 to RM3.92 in 1998 for each USD exchange. In the fact of protecting Malaysian economy, Malaysia Government had adopted the fixed exchange rate regime to re-establish solidity. As shown in the graph above, Malaysia was having a fixed exchange rate regime. This regime fixed the exchange rate of USD $1 equal to RM3.80 from 1999 to 2004. After year 2004, managed floating exchange rate regime allowed the exchange rate to fluctuate and be set by market forces on daily basis. In this type of regime, central bank may intervene into the exchange rate market. For example, buying or selling Ringgit Malaysia to rise or weaken the currency in the theory of supply of demand. After adopting the managed floating exchange rate regime in year 2005, it seems to have a little appreciation in the Ringgit Malaysia until 2014. It means Malaysian use less Ringgit Malaysia for exchanging a dollar.

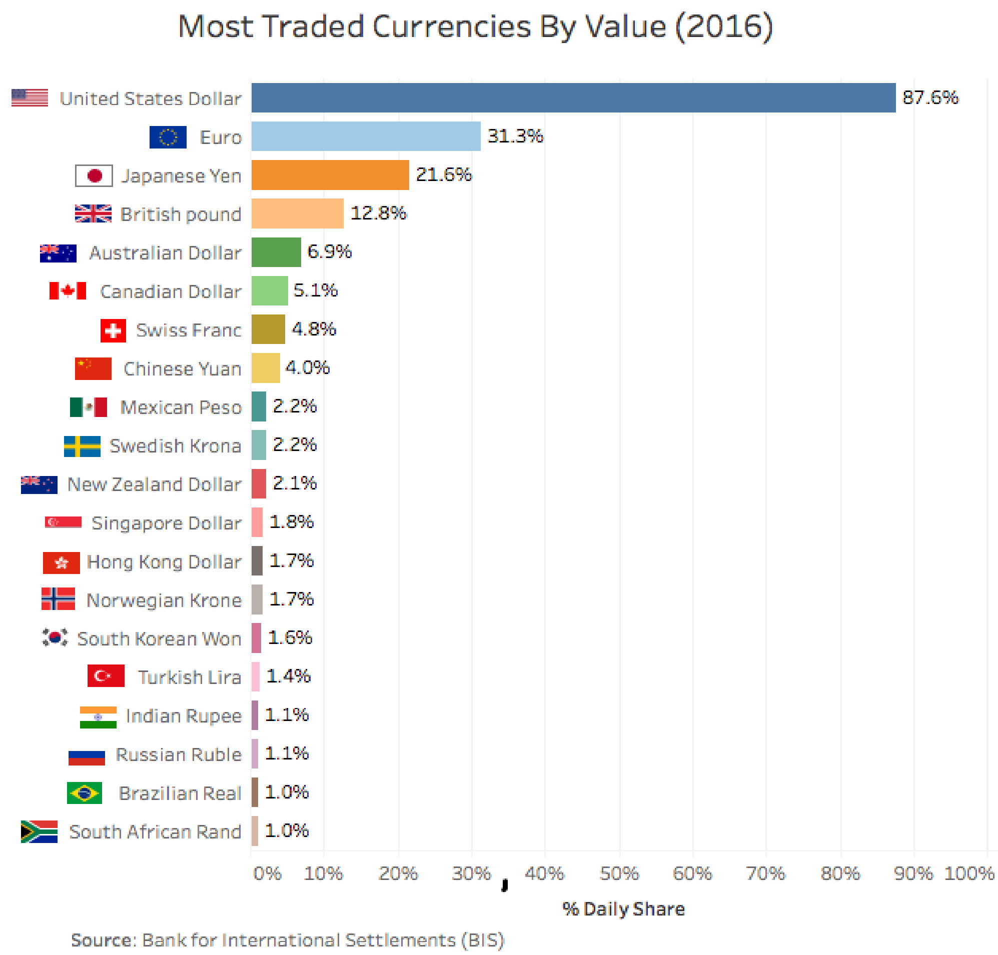
1.2 Problem Statement

According to Wong (2013), exchange rate misalignment is a problem that lies at the core of international economies. It is bad for a country's economic growth because it represents macro economy imbalance regardless of undervaluation or overvaluation. Overvaluation reflects external imbalance that requires lower economic growth by discouraging exports in order to create external balance. In contrast, undervaluation represents internal imbalance and high inflation that limit resources available for domestic investment and restrict supply-side growth. Rodrik (2008) also has found out the impact of the exchange rate misalignments on the economic growth of a country. Overvaluation of the currency can affect the economic growth negatively through slowing down the economic growth of the country. In opposite, undervaluation currency will lead to a positive relationship between the economic growth of country and misalignments. Through this research, the main concern is to investigate how is the trend of exchange rate in Malaysia, and to determine that Malaysia's exchange rate as if it will be affected by inflation, government expenditure, economic growth, and interest rate. So in future, action or effective ways can be taken, and solved by those relevant authorities.

The increment of the interest rate will attract foreigners to invest in our country, and this will cause exchange rate increase (Lioudis, 2018). Normally, a country's currency value will increase if the interest rates increase, this will lead to attract the numbers of foreign investment and will increase the demand of the country's currency. Conversely, if the interest rates is lower relatively, this will lead to unattractive for foreign investment, and the currency's value will decrease. In the same time, one of the complicating factors that will exist is higher interest rate and inflation. Meanwhile, if a country can balance the increased of interest rates without increase in inflation, the country's exchange rate and the currency value is more likely to rise. However, if the inflation rate of a country is greater than others countries, this will lead to currency devaluation (Bergen, 2018).

According to Pettinger (2017), the exchange rate is individually related to rate of economic growth, and exchange rate can be affected by economic growth. Besides, economic growth will affect the exchange rate, although it is with other variables working at the same time, and there is no direct link with each other. Basically, a stable exchange rate is a sign to consider the economic strength. Moreover, a stable exchange rate will lead to a low inflation in the countries, competitiveness improvement and also with strong economic performance. Miyamoto, Nguyen and Sheremirov, (2016) suggested that an increment in government expenditure will bring an appreciation of domestic currency, and bring current account to "twin deficit", as well as decrease in consumption. In U.S. data, the trade balance has improved after government spending shock (Corsetti & Müller, 2006; Kim & Roubini, 2008). By utilizing the data of Australia, Canada, U.S., and U.K., government spending increase will cause trade deficit, domestic currency depreciate, and rise in consumption (Monacelli & Perotti, 2010; Ravn, Schmitt-Grohé & Uribe, 2012).

Figure 1.2: Most Traded Currencies by Value



Note: The total sum of the volume is 200%, because each of the currency traded always involves a currency pair.

According to Figure 1.2, the countries that listed in the top seven positions of most traded currency by value around the world in 2016 are develop countries. Followed by China Yuan, was placed in eighth position. So, a study on Malaysia would be interesting because it is a developing country.

1.3 Research Objective

This section is expected to achieve general objective and several specific objectives.

1.3.1 General Objective

The research objective is to identify the determinants of exchange rate in Malaysia from 1987- 2016.

1.3.2 Specific Objective

The specific objectives of this study are:

1. To examine the impact of inflation on exchange rate in Malaysia.
2. To examine the impact of government expenditure on exchange rate in Malaysia.
3. To examine the impact of gross domestic product (GDP) on exchange rate in Malaysia.
4. To examine the effect of interest rate on exchange rate in Malaysia.

1.4 Research Question

1. Is there significant impact of inflation on exchange rate in Malaysia?
2. Is there significant impact of government expenditure on exchange rate in Malaysia?
3. Is there significant impact of gross domestic product (GDP) on exchange rate in Malaysia?
4. Is there significant impact of interest rate on exchange rate in Malaysia?

1.5 Hypotheses of the Study

Hypothesis 1

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

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

Hypothesis 2

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

H_1: There is a significant relationship between government expenditure and exchange rate.

Hypothesis 3

H_0: There is no significant relationship between gross domestic product (GDP) and exchange rate.

H_1: There is a significant relationship between gross domestic product (GDP) and exchange rate.

Hypothesis 4

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

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

1.6 Significance of Study

The research paper was examined exchange rate's determinants in Malaysia over the period of year 1987 to 2016. In general, the result of this research is important for government, policy makers, investors and international traders.

First and foremost, this research study provides for policymakers such as Bank Negara Malaysia, Bursa Malaysia and the Federal Government to implement an effective exchange rate policy in order to manage the foreign currencies and FOREX market. So that, other researchers have considered some important variables such as term of trade, foreign direct investment, money supply (M1, M2, M3), and trade openness in their research.

According to Razi, Shafiq, Atif Ali and Khan, (2012), the researchers have examined that the determinants are having relationship with exchange rate, government will put effort to oversee the determinants to accomplish a desirable exchange rate. Therefore, based on the Razi et al., (2012), it states that policymakers will have a better understanding to develop a competent exchange policy and attain the growth of economic by doing this research. Hence, to maintain the stability of country's economy, government and central bank are required some knowledges about the macroeconomic variables which may have influences to the exchange rate.

Besides that, determinants of exchange rate are also important to those investors and FOREX traders. Based on the study of Bouraoui and Phisuthtiwatcharavong (2015), both researchers stated that investors want to forecast the exchange rate movement in order to gain more profit advantages. Chowdhury and Hossain (2014) have studied about if exchange rate of the countries is stable, it relatively bring more investors to make some investment or trade in an economy. However, if the volatility risk of exchange rate is high, the investor will never invest in such economy. So, to enhance the exchange rate of an economy, it must have a clear view on the purpose of macroeconomic factors.

In addition, exchange rate is also essential for international traders. This is because the conversion of currency can help to facilitate international trade for goods and services, and compare the price of goods in different countries (Mohd Abdoh, Muhamad Yusuf, Mohd Zulkifli, Bulot and Ibrahim, 2016). Thus, exporters and importers need to gain some knowledges about the foreign exchange rate in order to help them in the enterprise value and risk exposure.

1.7 Chapter Layout

Overall chapters will be summarized in this research. The first chapter mainly focuses on providing a whole and general review of the research. This chapter is divided into a number of important parts which are study background, problem statement, research questions, research objectives and significance of study. Chapter 2 will cover the literature reviews from different researchers. The relevant past studies such as theory, model, concept and gap for literature review will be reviewed from journals or articles. Summary of the result of past relevant studies will be done in this chapter so that the general idea about the exchange rate in developing country could be gotten. After studying the relationships among the selected independent variables towards dependent variable, comparison from the past researchers about the exchange rate in developing country will be done in order to discuss about relevant theoretical model and to generate proposed conceptual framework for this research.

Methodology of the research is the main focus of the Chapter 3. Presentation of data, descriptive statistic and the definition of each variable will be provided in this chapter. Also, a few appropriate statistical approaches will be selected in order to examine the hypotheses of the research. Several diagnosis test approaches will also be chosen in order to ensure that the model is statistically significant. In Chapter 4, model estimation and data analysis will be ran in order to get the empirical results. The tests will be ran by using statistically software, E-view. The empirical results will be interpreted in order to decide whether the hypotheses should be rejected or accepted. This chapter will also discuss about the consistency of theory and expectations. In the last chapter, summary of the research becomes the major task. The results of previous studies from different researchers will be justified based on the consistency between their researches and this research. Lastly, this research will be concluded with the research results, limitations, policy implications and suggestions for future study.

1.8 Conclusion

This chapter mainly studied the connection among the independent macroeconomic determinants and rate of exchange in Malaysia. The hypothesis of the study, research objectives, research question, significance of the study and problem statement are discussed. By referring to these, the research questions have been justified, and some objectives have been derived to study the problem. In the next chapter, the past researches conducted by other scholars will be reviewed and investigated in order to know further details about the expected relationship between each independent variable and the dependent variable.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The past chapter is described and explained about the background of research which are supported by the relevance research issues, research questions, research objectives, hypotheses and importance of this study. As a result, the related empirical review and theoretical framework will be explained specifically by referring to above information, so it will be useful for the study in Chapter 2. Empirical review is those literature reviews that have been completed by the past analysts on their studies that have chosen which factors that will have an effect on the exchange rate in Malaysia. This part will be stated an establish fact on this analysis depended on the hypotheses of studies. It gives direction for analysts to attain greater knowledges on the investigation for additional analysis in future. Furthermore, theoretical frameworks are related to the factors that have an impact on the Malaysia's exchange rate will declare in Chapter 2 as well. Last but not least, a conclusion will be made at the end of Chapter 2.

2.1 Review of the Literature

2.1.1 Exchange rate

Nowadays, money, essential term for transaction process or the exchange process in terms of goods and services. Therefore, every country has their own currency to let the people trade in the country. In order to trade between countries, there is the introduction to exchange rate for currency. There are two types of exchange rate which are nominal exchange rate and real exchange rate.

Nominal Exchange Rate

Nominal exchange rate by definition, is the price of a unit of currency for another unit of currency (Yang & Zeng, 2014). For example, the domestic price of foreign currency.

Real Exchange Rate

Real exchange rate by definition, is the relative price level or ratio of the prices between two countries (Yang & Zeng, 2014). People usually use real exchange rate rather than nominal exchange rate as real exchange rate is comparing a country to a country based on the prices of the goods. There is a general formula for computing the real exchange rate from the nominal exchange rate.

$$\text{Real exchange rate} = \frac{Nominal\ exchange\ rate\ \times Domestic\ Price}{Foreign\ Price}$$

In modern generation now, countries are managed adjusting the exchange rate simply depended on economic forces in terms of familiar standard. Real exchange rate plays a main role in the economy. In the area of international trade, the transactions between countries or companies oversea are countless. Every day there are people exchange the domestic currency for foreign currency either to have a visit to the country or having an investment for expanded economic activity (Chinn, 2006).

According to Chowdhury and Hossain (2014), the research on the determinants of exchange rate in Bangladesh from 1990 to 2011. They had used inflation rate, GDP growth rate, interest rate and current account balance to explain the effects to the exchange rate. The result showed all explanatory variables have positive significant relationship with exchange rate. However, it was said that GDP growth rate and the current account balance are the main determinants.

Abdoh, Yusuf, Zulkifli, Bulot and Ibrahim (2016) have done a research about macroeconomic factors that affect the fluctuation of exchange rate in ASEAN countries which are Brunei Darussalam, Malaysia, Philippines, Singapore, Thailand, Indonesia, Cambodia, Laos and Vietnam from 2005 to 2014. They have used export, inflation rate and interest rate to explain the effects to the exchange rate. Unfortunately, the result shows that the inflation rate and interest rate are weak in explaining exchange rate with insignificant relationship. Only export shows the significant relationship.

Ramasamy and Abar (2015) stated the list of variables that influence the exchange rate are relative interest rates, inflation rate, balance of payments, employment rate, corruption index, gross domestic product, deficit/ surplus rate, tax rate and borrowing rate. The result shows the opposite side with the theory that said the interest rate, balance of payments and inflation rate have positive relationship with exchange rate. They used yearly AUD/USD, Euro/USD, AUD/Euro for ten years to test the models.

2.1.2 Inflation

According to Abdurehman and Hacilar (2016), exchange rate is the one of the factor that affects the inflation at most of the time which the view had been examined. However, in order to discuss the relation between inflation and exchange rate, 20 years data forecast for Turkey showed there is a long-term relationship existed in exchange rate and inflation. Therefore, they have conducted a test by using Granger causality but the outcome showed that inflation to exchange rate is not from Granger causality.

Ramasamy and Abar (2015) stated that supposed the relationship between inflation and exchange rate is positively as per theory but the outcome showed that they are contrary. This is due to some of the countries having stronger currency value which those advantages are came from public and investors. It is not from those variables that are outstanding in these countries. Other than that, there are fairly and no corruption happened in these countries. They stabilized their country interest rate and lower unemployment rate. Therefore, direct contrary outcome showed in the model. There is inverse rapport for inflation and exchange rate also discussed by Necsulescu and Serbanescu (2013). For example, when exchange rate declines roughly 0.05 percentage points, it may leads the inflation rate rises by a percentage unit.

Sek, Ooi & Ismail (2012) mentioned that sub period happened when the exchange rate movements, inflation and output movement are correlated between each other. The impacts of the inflation movement, exchange rate and output will directly affect to the international trade. Other than that, higher volatility in exchange rate movement is led by international trade in majority economies. When it comes to long run, there is a study indicated that significant and positive relation exists in inflation and exchange rate. Due to the change of one unit in inflation will cause 1.47% grow in exchange rate. (Ali, Mahmood & Bashir, 2015).

Regarding to Abdoh et al (2016), a weak connection among inflation and exchange rate as the result showed negative correlation between each other. Furthermore, inflation undertakes insignificant relationship with exchange rate since most of the exchange rate trends are depended on the economic condition in ASEAN countries. Other than that, two important elements can encounter into the measuring of macroeconomic performance which is inflation and rate of exchange. When a country has a constant lower inflation rate, it means that the country is facing an increasing currency value. Hence, Mirchandani (2013) indicated that negative relationship happened in inflation and exchange rate. Both hold indirect correlation between each other.

Parveen, Khan and Ismail (2012) mentioned that inflation leads the negative effect on exchange rate which it can consider as reciprocal relationship between inflation and exchange rate because the value of currency will decrease when inflation increases. Other than that, inflation as the most considerable factor that leads to volatility in exchange rate for a country because it brings the changes in exchange rate. Ashok and Vikram (2016) verified the results through the regression analysis which inflation and exchange rate show a negative relevancy where inflation rises may lead to the fall of exchange rate.

Many factors can influence inflation and exchange rate especially for the developing countries. Achsani, Fauzi and Abdullah (2010) mentioned that inflation and exchange rate own clear relationship, but except for Malaysia because the exchange rate of RM becomes more stable after Malaysia practiced for fixed exchange rates regime. The researchers also claimed that inflation and exchange rate in Asian countries have a strong relationship between each other but have no significant relationship in Europe countries. Furthermore, a study in Bangladesh for 1990-2011 period showed that the analysis which inflation holds a positive relationship with exchange rate but they are insignificant within each other (Chowdbury & Hossain, 2014).

The finding of Razi, Shafiq, Ali and Khan (2012) showed that inflation is affecting exchange rate positively. The studies purposely aimed to test whether one of the economic factors, inflation affects the exchange rate. Exchange rate will be influenced by inflation because when there is a movement in inflation, exchange rate will be affected also. However, Madesha, Chidoko & Zivanomoyo (2013) found that negative relationship is existed between inflation and exchange rate by using Zimbabwe annual data started on 1980 to 2007. Moreover, the outcome even showed inflation has a counterpoise condition with exchange rate that will let them in proportion within each other staying in long run.

In contrast, Baljinnyam and Lu (2013) have investigated the inflation and exchange rate are positively correlated and it showed a significant outcome. The scholars proved that when 1% increase in inflation, the exchange rate will draw 4.26% increase. Hence, stabilizing inflation and interest rate can prompt the exchange rate stability. In the previous studies, Hamid, Shahzad, Saqib and Maqbool (n.d.) pointed out there is a negative relation with exchange rate because it reveals when inflation rate goes up through 1%, the exchange rate will go down by 53.2%. Based on the literature review, it indicates inflation and exchange possess a significant relationship within each other.

2.1.3 Government expenditure

The government carries out fiscal policy by using two tools which are government spending and taxes. Fiscal policy is to affect the macro economy of the country such as stabilizing unemployment and inflation, even to increase the national income. By spending, the government will carry out effective projects which would be given by private sector (Blinder & Solow, 1972). Expansionary fiscal policy increases government spending regardless of taxes, while contractionary fiscal policy increases taxes regardless of government spending. The appreciation of exchange rate is good for importers because the price of imports becomes lower, but is bad for exporters. The depreciation of exchange rate is good for exporters because the price of exports becomes lower, but is bad for importers.

According to Galstyan and Lane (2009), there was a positive relationship between government consumption and real exchange rate. When the government consumption increases, the exchange rate increases or becomes stronger. Government consumption made an appreciation of the exchange rate for the sample of European Monetary Union (EMU) member countries in long-run impact. The analysis done on China over the period from 1999:Q1 to

2008:Q4 stated that the government spending statistically impacted the real exchange rate with a positive sign in the long-run. For example, the studies showed that 0.75% appreciation in RMB (China's exchange rate) for each percent increase in government expenditure (Gan, Ward, Ting & Cohen, 2013).

Highlighted from Shen, Yang and Zanna (2018), in low-income countries (LICs), greater government expenditure with huge inflow of foreign trade with external financing brought appreciation of exchange rate and decreasing of output exchanged. The reason behind is the external financing grows the capital amount obtainable for economy. Ajao and Igbekoyi (2013) investigated what affects the real exchange rate in Nigeria over the period between 1981 and 2008. Based on the empirical results, there was a significant relationship between government spending and real exchange rate. The positive significant relationship indicates that increase in government spending increase the real exchange rate in long-run.

Insah and Chiaraah (2013) have studied the relationship between government spending and real exchange rate from 1980 to 2012 in Ghana. It was said that the government spending is a major element of exchange rate volatility and positive relationship having between them. As increasing in government spending, it leads to increase in real exchange rate. Government expenditure was used in Aron, Elbadawi and Kahn (1997)'s research as one of the independent variables collected quarterly from 1970:Q1 to 1995:Q1 in South Africa. The result showed the government spending was significantly and positively influencing equilibrium real exchange rate. Also, the government expenditure has both short-run and long-run effects on the exchange rate. However, unmaintainable government spending would lead to overvaluation.

According to Monacelli and Perotti (2010), there was a negative relationship between government spending and CPI real exchange rate. In contrast to the appreciation, the authors indicated the depreciation of exchange rate by the increase of government spending. The depreciation means the value of exchange rate dropped and became weaker. Al Samara (2009) started the real exchange rate research in the Syrian economy. The researcher stated that the evidence shows the negative relationship between government expenditure in total GDP and real exchange rate. In the research, when government spending increases by 1%, real exchange rate will depreciate by 0.34%, with the assumption of concentrating on consumption and imported goods.

Hyder and Mahboob (2006) studied on a sample in Pakistan from Fiscal Year (FY) 78 to FY05. They found out that there was a negative relationship between current consumption government and real exchange rate. The short-run dynamics of models proposed that when government expenditure exceeds government revenue, it made a depreciation on nominal exchange rate.

Galstyan and Lane (2009) have investigated the long-run relationship between government spending and real exchange rate in Ireland. During the period from 1970 to 2006, a greater government expenditure to GDP ratio strongly influences the real exchange rate positively as investigating in 19 Latin America countries (Carrera & Restout, 2008). This was supported by most of the government expenditures were collected from non-tradable goods. They found that rises in government expenditure are correlated to long-term real appreciation and a growth in relative price of non-tradeable (Galstyan & Lane, 2009, Carrera & Restout, 2008). According to Ogun (2012), government consumption is significantly affecting the real exchange rate. This is mostly because of consumption on non-tradable appreciates the exchange rate via the improvements from current accounts. The real exchange rate will decrease if government expenditure on traded goods (Connolly & Deveraux, 1995, Zakaria & Ghauri, 2011).

2.1.4 Gross Domestic Product (GDP)

The studies of Konchitchki and Patatoukas (2013) define Gross Domestic Product (GDP) as a key variable in determining the economic growth. GDP is also defined as a measurement of the economy within an era (Feldstein, 2017). Moreover, the studies of Syed and Shaikh (2013) define GDP as an economy's chief indicator. GDP also acts as an important role in a nation as it was often used to make comparison of economic growth from one country to another country (Onuoha, Ibe & Njoku, 2015).

According to Vidyavathi, Keerti and Pooja (2016), they have found that there is an inversely correlated between GDP and exchange rate because of its negative correlation is -0.819. It shows that the higher the GDP growth, it will lead to the exchange rate declines or increases in the value of domestic currency. Moreover, studies from Bhandari (2014), he stated that GDP is negative correlated with exchange rate in India. It specifies that when the GDP increases, rupee relatively appreciates, while GDP decreases, rupee depreciates against dollar. Thus, economic reforms are important for one country in order to boost the confidence for the foreign investors.

Highlighted from Amaghionyeodiwe and Osinubi (2005), the statistical result stated that there is a negative coefficient sign, which is -0.125 between industrial production (GDP) and exchange rate. In this situation, it implies that if the amount of industrial production increases, it will lead to the local currency to appreciate. As the domestic industrial production increase, the domestic money demand will also increase. In addition, Arslan, Najid and Sharafat (2013) have investigated that there is a negative relationship between economic growth and nominal exchange rate in Pakistan. The demand of product in foreign market is less and the exporting products still not yet reach the desired international standards. The economic growth will shrink due to the balance of trade in Pakistan remains negatively.

Based on the studies of Twarowska and Kakol (2014), the empirical study shows that the linking between economic growth and exchange rate variability is positively insignificant. The result of regression analysis shows that the coefficient of GDP is 0.675. Hence, the price level increases and faster economic growth in Poland will cause the zloty depreciation in euro area. When the demand for imports of goods and services increase, the disposable income of the population will increase. However, studies conducted by Khattak, Tariq and Khan (2012) found that RGDP is negative significantly related to exchange rate. It proves that an increase in one country RGDP can stimulate in the stabilization of currency value and cause the value of currency to appreciate.

A research done by Boykorayev (2008) found that the changes in GDP for exchange rate volatility is significant. He stated that the highly volatile countries size (GDP) is crucial for evaluating the nominal exchange rates. The foreign trade sectors will be an important influencer due to the flexible exchange rate can be overcame the negative effect for the economy. Hence, if the country's economy is widely expanded, the price elasticity of demand will be higher and the floating exchange rate system will be able to perform evenly and more effectively respond to the requirements of domestic regulation. The more open the economic system, the stronger the effect of exchange rate on stability in the relative prices in local currency and resource allocation.

Studies from Najaf (2016), he found that there is a positive correlation between GDP and exchange rate at 0.526 of r value and significance level at 0.05. If the productivity shock occurred, there will have a positive income effect which will generate a positive demand pressure on non-tradable goods. Hence, the increased demand would increase the price of non-tradable and will lead to an appreciation in the real exchange rate (Edwards, 1989). Jakob (2015) has investigated that GDP growth rate and exchange rate are having a positive significant relationship. Thus, the more confidence the investors and traders manage business, the more stable the currency in that country. In this situation, the higher economic output can be produced.

Mirchandani (2013) also stated that moderate positive relation with GDP and exchange rate. The exchange rate and income have a direct relationship in long run, but in short run, they have a weak and indirect relationship. However, the obtained statistical result by him indicates that the relationship between these two variables are insignificant. According to Oreiro, Missio and Jayme Jr. (2015), a positive relationship was proved between the real exchange rate and economic growth in developing countries. The competitiveness and profitability of tradable sectors will positively influence the value of currency to be devaluated.

2.1.5 Interest Rate

According to Andries, Capraru, Ihnatov and Tiwari (2017), it said that the relation of interest rate and exchange rate in short term is negative relationship. Conversely, in long term, the relationship between both variables will become positive relationship. When turmoil or any policy change, the exchange rate movements normally will lead over to changes the first month of the interest rate. Inflation will directly be targeting to the monetary policy regime in a developing economy, the relationship of interest rate and foreign exchange rate is different to other advanced develop economies. So central bank must pay more attention on both dependent and independent variable to achieve their own monetary policy goals.

Wilson and Sheefeni (2014) analysed a research in Namibia by using historical data from 1993 to 2012. The result shows that interest rate will not affect exchange rate. At first in economic theory, they said that interest rate will negatively influence to dependent variable. But, after they done a research in

Namibia, they said that interest rate will not affect the exchange rate. This is because, interest rate should be monitored accordingly because interest rate will be affected by many macroeconomic components such as, monetary policy, economic stability. Whereas, exchange rate is one of the macroeconomic variables. However, monitoring interest rate is important for macroeconomic policy making.

Tafa (2015) has done a research of effect of interest rate on exchange rate in Albania from year 2002 to 2014. He found that interest rate will positively affect exchange rate. An increment of interest rate of domestic currency, also will lead the exchange rate to increase. This is because foreign exchange rate also will be affected by other important macroeconomic variables such as income level, term of trade, government control and other factors.

Ali (2016) has done a research on relation between independent variable, interest rate and dependent variable, exchange rate in Pakistan from 1980 to 2015. He stated that in long term, there is negative relationship between both variables. If an increment in interest rate, Pakistan's exchange rate against US Dollar will decrease, this is because high inflation of Pakistan's currency will depreciate against US Dollar. Besides, if decrease in interest rate, it also will decrease the rate of exchange in Pakistan against US Dollar. But in short period, interest rate and rate of exchange will not affected by each other after controlling the impact of economic growth and inflation.

Based on Morosan and Zubas (2015), they have done a research in Romania, and proved that the inverse relationship occurred within interest rate and currency. If any increment of the interest rate, the rate of exchange will decrease, vice versa. Other than that, Shalishali and Ho (2002) have done a research in few countries including Switzerland, Sweden, Netherland, Canada, Germany, France, and Japan. They found that the results are mixed. In some countries, they are holding positive relationship, and some of the countries are holding in negative relationship.

According to Kruskovic (2017), the researcher has done a topic research of exchange rate will be affected by interest rate in monetary policy reaction. The researcher found that in long term, the level of interest rate will positively affect to the exchange rate. Through the research, it showed that any increment of domestic interest rate will lead the foreign exchange to appreciate. Ali, Mahmood and Bashir (2015) have concluded that the relation between the independent variable interest rate and dependent variable exchange rate is in converse relationship. The level of the interest rate will affect to the exchange rate due to the inflation occurred. It means that for long term and short term, if interest rate increase, this will lead the exchange rate to become more volatility.

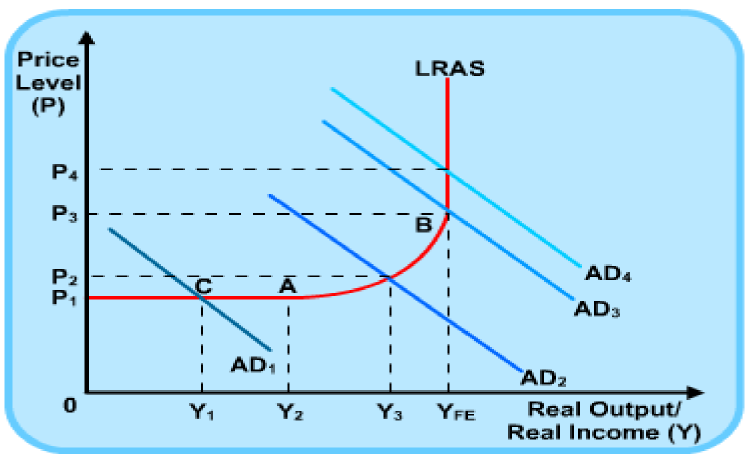
Besides that, Sarc and Karagoz (2016) have done a research of impact of the interest rate on the foreign exchange rate in Turkey by apply secondary data from year 2003 to 2015. They found that there is no evidence to prove that inverse relationship occurred in both interest rate and the rate of exchange. The greater of the interest rate will cause to weaken of exchange rate. Moreover, Chow and Kim (2004) have analysed the impact on the level of interest rate between the foreign exchange rate in four Asian crisis countries including Indonesia, Korea, Thailand, and Philippines. After they concluded in the four countries, the result shows that no strong evidence to conclude that increase in foreign exchange rate volatility is related from the increase in the interest rate.

2.2 Review of Relevant Theoretical Framework

2.2.1 Keynesian Theory

To explain our government expenditure variable, Keynesian Theory was introduced during Great Depression and after by John Maynard Keynes. This Keynesian Theory describes the economy is different from Classical Economies at some points.

Figure 2.1: Keynesian Theory



Source: S-cool, the revision website. (n.d.).

According to Colander (1995), there are three ranges in the macro economy combined into an Aggregate Supply (AS) curve: the Keynesian range, the intermediary range and the classical range. The intermediary range is bending upwards from point A to point B. In intermediary range, the prices and wages are starting to reduce flexibility. Therefore, both price and real GDP change at the same time from Aggregate Demand (AD):3 to AD:2. The decrease of the AD curve implies the decreasing price and decreasing real GDP. The classical range of AS curve is perfectly vertical from point B to straight upwards. In the classical range, the prices and wages are flexible and the market will adjust itself based on the classical theory. When AD curve decreases from AD:4 to AD:3, the price changes without any movement of real GDP at Y:FE point.

Based on the graph above, the Keynesian range is perfectly horizontal. In the Keynesian range, the prices and wages are sticky. The word sticky means the prices and wages are fixed even with the changes of AD curve. The price here is like a minimum level that the firms do not want to sell their goods for a way more lower price because they have to make revenue. If not so, they will be forced to shut down their businesses. The wage here is also a minimum level that the workers do not want to work for a lesser wage because they need a source of income for spending.

When the AD curve stays in the Keynesian range, the AD curve will keep on falling because the economy cannot adjust itself in this situation. This vicious circle of economic contraction will continue until the economy collapses or the government intervention by using policy to stimulate AD curve to reverse the economy condition in the market. For example, work relief to provide jobs for labour. This puts income directly to their hand and the consumers are gaining back their purchasing power. This allows them to make AD curve increases as government spending to generate jobs and income. At the same time, the unemployment rate will be decreased. This leads to the firms to take out loans for investment on factories, workers and capitals. Eventually, the real GDP rose again.

According to Mankiw (1989), the Keynesian theory concludes that increase in government expenditure grows real GDP and employment. This can be explained more by the fiscal policy with multiplier effect together. As expansionary fiscal policy, government spending increase or tax reducing, this is happened to fight against the recession period. A tax cut means there is more income left for consumption.

2.2.2 The Balassa-Samuelson Effect Theory

Based on the research from Mariano, Sablan, Sardon, and Paguta (2016), the model existed between real exchange rate and GDP is known as the Balassa-Samuelson effect. This theory defines that the internal price ratio interpret the divergence of productivity levels in a country's non-tradable and tradable goods (Sidek & Yusoff, 2009). When the productivity in tradable sector becomes higher, it will lead to the wages in both tradable and non-tradable sectors increase. Thus, the research studies by Sidek and Yusoff (2009) justified that a positive productivity shock will enhance trade balance which will caused real exchange rate to appreciate as well as keeping the balance of payment at equilibrium.

According to Choudhri and Khan (2005), the Balassa-Samuelson effect is a main source of recognized the cross-sectional differences in real exchange rate between countries at different levels of income per capita. Hence, the labour productivity differential brings a significant impact on the real exchange rate through its influence on the relative price of non-traded goods. This theory is also used to estimate the effect between the countries at low and high income levels. Highlighted from Dedu and Dumitrescu (2010), when the wages increase in tradable sector, the wages will also increase in the economy at the same time. Therefore, if the relative price of non-tradable increase, it will cause the non-tradable producers to pay a higher wage. In this situation, the overall price level of economy will increase.

Studies from Rodrik (2008), the purpose of the theory is to adjust the measurement of real exchange rate with the relative price of tradable to non-tradable for the growth of a country. The non-tradable's relative prices become higher due to the productivity in tradable is increasing. Hence, the growth of developing countries will become faster when they are capable to increase the profitability of the tradable sector. The increase in total factor productivity in traded goods will tend to result in a real appreciation, whereas, rise in total factor productivity in non-traded goods will cause a real depreciation (Devereux, 2014).

2.2.3 International Fisher Effect Theory

The International Fisher Effect is an exchange rate theory. According to Puci and Mansaku (2016), the meaning of the International Fisher Effect is an expected change in spot rate of two country's currencies in future, and it also will affect to the differences in nominal interest rate of two country. This theory assumes that any depreciation or appreciation of currency is highly-closed related with the differences in nominal interest rate. If one of the country has higher nominal interest rate, it will lead the other country's currency to depreciate due to the increase in inflation rate of that country.

Other than that, Andrea and Rodrigo (2015) mentioned that this theory also assumes that a country with a lower level of interest rates also will lead to a lower level of inflation. This also will directly translate to an increase in the real value when comparing a country's currency with another country's currency. There is a formula to calculate International Fisher Effect. The formula is shown as below:

$$E = [(i_1 - i_2) / (1 + i_2)] \approx (i_1 - i_2)$$

E = Percentage change in the exchange rate of the country.

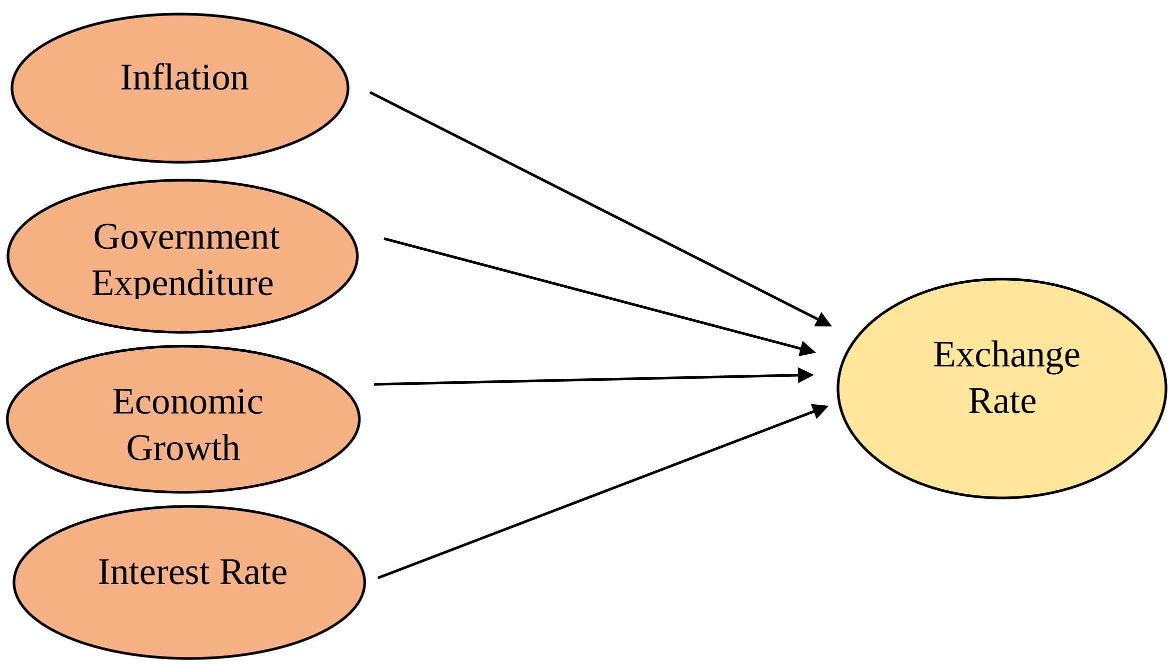
I1 = Country A's interest rate

I2 = Country B's interest rate

In addition, the theoretical model Fisher Effect and International Fisher effect are related model. Fisher Effect mainly is describing the relationship between two variables interest rate and inflation. To compute a country's nominal interest rate, is the sum of the real interest rate and inflation of a country. However, International Fisher Effect expanded more on the theory, it shows that the currency changes are balance to the difference between two country's nominal interest rate (Corporate Finance Institute, 2019).

2.3 Proposed Conceptual Framework

Figure 2.2: Framework of Macroeconomic Variables Influence the Exchange Rate in Malaysia within year 1987 – 2016



In most cases, interest rate shows negatively relationship with the exchange rate in long run and short run as concluded from the studies of several researches. Government expenditure may be ambiguous as it depends on the total government expenditure whether on tradable or non-tradable sectors. Nevertheless, based on the review of the past studies, government expenditure is mostly positively influencing the exchange rate and it is statistically significant in long run. According to the past few studies, inflation has a positive effect on exchange rate and it shows statistically significant in the long run. Based on the studies in different cases, the results show to be consistent with the theoretical argument. In addition, economic growth also has an ambiguous relationship as most of the researchers suggest that economic growth is positively effect on exchange rate and it is statistically significant in developing countries.

2.4 Conclusion

Empirical frameworks from previous investigators have been recognized to be different from the theoretical frameworks. It is always different with the research obtained. There are some researchers discovered the relationship of inflation, economic growth, government expenditure and interest rate in related to exchange rate is significant, vice versa. Some of the studies have been proven the causality relationship as well. There are different and various types of tests have been used in the past studies. For the moment, in order to acquire a better understanding the connection among the independent variables towards the dependent variable, the ordinary least squares (OLS) approach and further explanation will be discussed in the following chapter.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This research determines the issue systematically and it allows further understanding on how the paper is completed scientifically. Multiple models, procedures, and methods will be chosen to accomplish the objectives at every step of the processes in more details. In order to achieve that, the several steps and process will be listed out in this paper that are adopted in figuring the determinants of exchange rate in Malaysia with the logic and interpretations behind. The problem of what specific approach has been used, how the data has been collected, which technique of data analysing has been adopted and why it is chosen and different type of questions will be answered and explained further in chapter three. Last but not least, some of the methods and procedures, such as data selection techniques, sampling decision, data processing and analysis techniques will be analysed later.

3.1 Research Design

The paper is conducted by implementing empirical framework with quantitative methods in the whole progress which implicates that the data used will be quantitative data. Four explanatory variables are inflation, government expenditure, gross domestic product (GDP) and interest rate with a study period from year 1987 to 2016. The frequency of the data was conducted annually with the thirty years collected from database of The World Bank. Data collected were interpreted by using E-Views 10 software; in more detail, time series analysis.

3.2 Date Collection Methods

This research is to conclude the variables that will significantly influence the exchange rate in Malaysia. The response variable in our research is exchange rate and the explanatory variables are inflation, government expenditure, economic growth and interest rate. We are using the secondary data to measure the variables. Annual time series data covering from year 1987 to year 2016 were used, the data were sourced from the World Bank online database. The sources in World Bank database consist from International Monetary Fund (IMF), International Financial Statistics (IFS), Organization for Economic Co-operation and Development (OECD) data files. Table 3.1 shows the data sources.

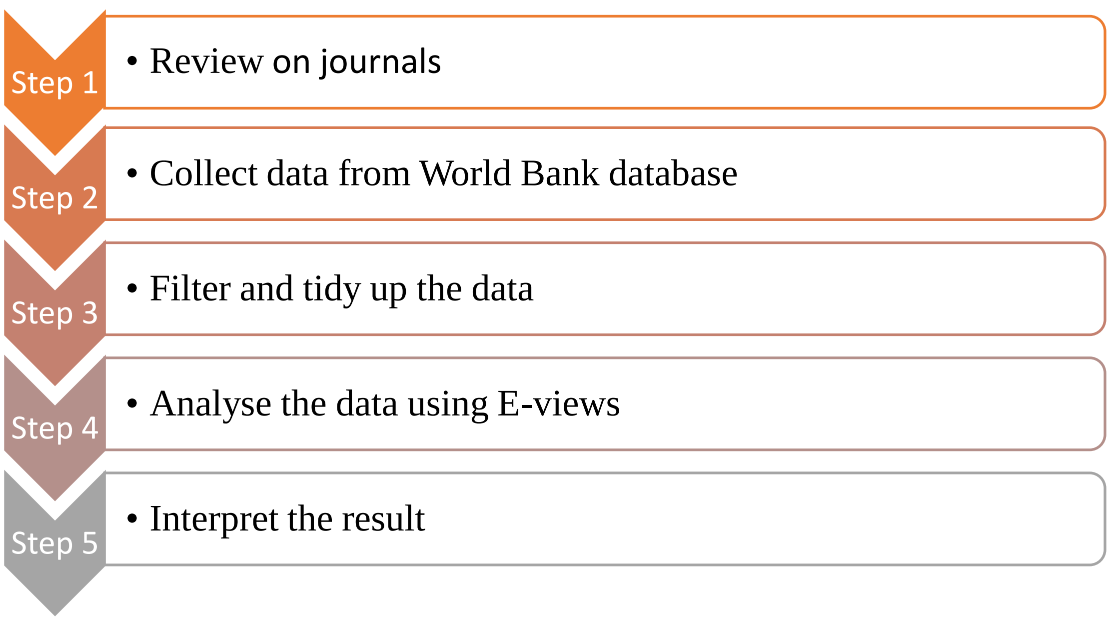
Table 3.1: Data Sources

Type of Variables	Variables	Proxy	Measurement	Explanation	Sources
Dependent Variable	Exchange Rate	Real Effective Exchange Rate	Index (2010 = 100)	Nominal effective exchange rate divided by a price deflator or index of costs	World Bank
Independent Variables	Inflation	Inflation, Consumer Prices	Annual Percentage (%)	The process of continuously increase in prices of goods and services in an economy.	World Bank
	Government Expenditure	General Government Final Consumption Expenditure	Ringgit Malaysia (RM)	Includes all government spending for purchasing goods and services, national defense and security, but excludes government military expenditures	World Bank

	Economic Growth	GDP Growth	Annual Percentage (%)	Total market value of all final good and services produces within a country in a specific time period.	World Bank
	Interest Rate	Real Interest Rate	Percentage (%)	Lending interest rate adjusted for inflation as measured by GDP deflator	World Bank

3.3 Data Processing

Figure 3.1: Data Processing Process



Step 1: Review on journals

The first step of this research is to conduct the review on the relevant journals. The journals could be obtained from Google Scholar or UTAR library database. After we found the journals, we need to identify the variables that relate with our topic.

Step 2: Collect the data from World Bank database

After identifying the variables, we collect the secondary data from World Bank website. The data are collected in annually basis for ensuring the consistency among the response variable and the explanatory variables.

Step 3: Filter and tidy up the data

After selecting and checking the data collected from World Bank website, the data will be downloaded into excel file. The data needs to be rearranged and edited into more useful form for running the analysis tests.

Step 4: Analyse the data using E-views

In order to generate a reliable result, we are using E-views (Econometric View) software to run a time series analysis on the data that we obtained.

Step 5: Interpret the result

In this step, interpretations of the result that are generated from E-views which will be discussed in Chapter 4.

3.4 Data Analysis Econometric Model

3.4.1 Multiple Linear Regression (MLR) Model

Economic Function:

EXCR = f (INF, GEXP, GDP, INTR)

Economic Model:

$$LOG\_EXCR_t = \beta_0 + \beta_1 INF_t + \beta_2 LOG\_GEXP_t + \beta_3 GDP_t + \beta_4 INTR_t + \mu_t$$

Where, LOG_EXCR = log (Exchange rate, index)

INF = Inflation rate, consumer prices (%)

LOG_GEXP	=	log (Government expenditure, RM)
GDP	=	Gross domestic product growth (%)
INTR	=	Real interest rate (%)
μ	=	Error term

3.4.2 Ordinary Least Square

By using measureable strategy in a linear regression model for analysis, it gauges the relationship between one or more explanatory variable and an explained variable. It is a technique with a goal that evaluates the connection by allocate the minimum of the total of squares in the difference among the observed responses and forecasted value of the explained variable designed as a straight line linear function (Poston, n.d.). Another that, Pooled OLS estimator also act as the best cursory treatment in the first-semester text (Wooldridge, 2010). It is also considered as the basic estimator for all the researchers.

3.4.2.1 BLUE

i) Best: or efficient, it has minimum variance
ii) Linear: linear function of parameters
iii) Unbiased: its average or expected value of coefficient is equal to the true value

3.4.3 P-value

P-value is refer to the probability to find the observed or even more extreme when it comes to the result for null hypothesis (H_0) of the study question is correct. In addition, how the hypothesis is being tested, is depended on the word extreme which is mentioned above (Stats Direct, 2018). From those previous studies, the researchers can know that if the p-value is less than **α** (alpha) which is calculated in the statistical test, the conclusion that can made by the researchers is the studies' results is statistically significant ("A brief explanation", n.d). Furthermore, 0.05 or 5% is the significance level that normally used to interpret p-value.

- Reject H_0, if p-value < **α** (Significance level)
- Do not reject H_0, if p-value > **α** (Significance level)

3.4.4 Coefficient of Determination (R^2)

R^2 is defined as a method to explain the total variation in the independent variable between the variations in the dependent variable. In addition, R^2 also known as goodness of fit that measures how well does the data fitted into the model. The higher the value, the better to fit in the model. For example, the closer the R^2 value to 1, the stronger the impact of the independent variables towards dependent variable. However, an increase in the number of independent variable into the econometric model will cause the R^2 becomes more inaccurate, this is because R^2 will automatically increase when adding in new variable even the variable could not be explained to the dependent variable. Therefore, we need to apply the adjusted R^2 (Business Dictionary, 2018).

3.4.5 T-Test

This is to statistically test whether the coefficient can be reliable or not, when it comes to the test statistic following by the t-distribution. In year 1908, t-test is introduced by William Sealy Gosset (Research optimus, n.d). T-test has many functions that can be used such as to test the individual regression coefficients which are intercept (β_0) and the partial regression coefficients ($\beta_1, \beta_2, \beta_3, \beta_4$). Basically, the independent variable significant or insignificant in affecting the dependent variable can be determined by t-test. Other than that, to identify the positive or negative effects of explanatory variables towards response variable.

There are two types of t-test which is one-sample and two-sample t-test. The one-sample t-test basically is used to test the null hypothesis that whether the population mean is tally with the certain value while comparing the both sample of the mean value is belonging to two-sample t-test. Furthermore, t-test is commonly applied in the research because the test statistic will be followed with the normal distribution. Jarque-Bera test can be tested by using t-test. The other use of t-test is to figure out the sets of data or sample these two differences. In decision making, reject H_0 while the test statistic is falling outside the range of critical value.

Hypotheses for T-test

H_0: Insignificant relationship between manipulated variable and the explained variable.

H_1: Significant relationship between manipulated variable and the explained variable.

Decision rule: Reject H_0 if p-value of t-statistic is smaller than the significance level. Otherwise, do not reject H_0.

3.4.6 F-test

Sir Ronald A Fisher developed F-test as the variance ratio in the 1920s (Lomax & Li, 2011). It is used frequently in testing the overall significance of the estimated multiple regression model. There are two hypotheses which for over significance of F-test. In addition, to interpret the overall F-test, we need to compare the p-value for the F-test to the certain significance level to conclude that the regression model is significant in order to explain the dependent variable.

Hypotheses for F-test:

$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (The model is insignificant)

$H_1 : At\ least\ one\ of\ the\ \beta_i\ is\ not\ simultaneously = 0, where\ i = 1,2,3,4$

(The model is significant)

Decision rule: Reject H_0 if p-value is smaller than significance level. Otherwise, do not reject H_0.

3.5 Diagnostic Testing

3.5.1 Multicollinearity

Multicollinearity is a problem where two or more independent variables are highly correlated with one and another. There is some reason why multicollinearity occurs such as inappropriate use of dummy variables, include two independent variables that are similar and variable that is a combination of two variables. However, multicollinearity does not violate OLS assumption. According to Gujarati and Porter (1999), OLS estimators still remain BLUE as long as there is no perfect multicollinearity which is showed by the R^2= 1 and then VIF is infinite. There is still minimum variance but it does not mean the variance will be small.

We can detect the multicollinearity problem by using various methods below:

i) High R^2 but few significant t ratios

ii) There is a high correlation between independent variables

iii) Variance Inflation Factor (VIF)

iv) Tolerance (TOL)

High R^2 such as 0.9 and few significant t ratios such as there are many insignificant t ratios in independent variables. TOL use the formula 1-R^2 to detect the presence of multicollinearity. If the TOL is close to 1, it indicates that the multicollinearity problem exists. However, the most common method to detect multicollinearity problem is VIF. VIF shows how much the variance of the coefficient estimate is being inflated by multicollinearity. If the VIF is greater than 10, then there will be a serious multicollinearity problem.

$$VIF = \frac{1}{1-r^2_{X_2X_3}} \qquad TOL = \frac{1}{VIF} = (1 - r^2_{X_2X_3})$$

Hypothesis for multicollinearity:

H_0: There is no multicollinearity problem

H_1: There is multicollinearity problem

Decision Rule: Reject H_0 if VIF is more than 10 which means that the two independent variables are highly correlated. Do not reject H_0 if VIF is smaller than 10 represents that the two independent variables do not have serious multicollinearity problem.

However, we can solve the multicollinearity problem by increasing the sample size if possible, replacing t test with F test and eliminating the independent variables that are highly correlated with another (Multicollinearity, n.d.). However, the action of dropping the independent variable which are highly correlated with other independent variables might cause model specification bias. This is because it might drop the important independent variables related to the dependent variable.

3.5.2 Heteroscedasticity

Heteroscedasticity is one of the assumptions of the classical linear regression model which the error term having the same variance. Under the OLS estimation, the model will fail to achieve BLUE because heteroscedasticity happened and the variance should be stayed constant. Hence, the misleading t-test and F-test results will be not accurate because of the variance is extremely large.

Other than that, heteroscedasticity also can be described as a situation that the error term is same across all values of independent variable. Therefore, heteroscedasticity test is very important in the regression analysis. Many studies and research such as econometric used heteroscedasticity test frequently. White test and ARCH test are commonly applied in a regression of squared residuals on all products and cross products of the explanatory variables (Holgersson & Shukur, 2003).

Hypothesis for Heteroscedasticity:

H_0: There is homoscedasticity

H_1: There is heteroscedasticity problem

Decision Rule: Reject H_0 if p-value is smaller than significance level. Otherwise, do not reject H_0.

3.5.3 Autocorrelation

Autocorrelation may be arose from either impure or pure autocorrelation where impure serial correlation is generated from specification error. For example, omitted variable, and pure autocorrelation is caused by correlation of residuals in different periods. According to Babatunde, Ikughur, Ogunmola, and Oguntunde (2014), the researchers stated that the effect on the dependent variable becomes a part of error term when an essential independent variable is omitted from a regression model. They further discussed that a relevant variable cannot be excluded in a model as it will make the OLS estimators become biased.

In addition, autocorrelation can be the cause of non-linearity, pure disturbance on the dependent variables, and also measurement error. Biased regression results might be occurred due to there is an autocorrelation existed in a model. Therefore, the detection for the autocorrelation problem is shown below.

Hypothesis for Autocorrelation:

H_0: There is no autocorrelation problem.

H_1: There is autocorrelation problem.

Decision Rule: Reject H_0 if the p-value is smaller than the significance level, indicates that there is serial correlation problem. Otherwise, do not reject H_0.

3.5.4 Model Specification

Model specification is a process for forming a reliable regression model based on the theory supported. If the model contains specification error, it can be detected by using Ramsey-RESET Test through E-view software. There is existed possibilities that the researchers may select the wrong variables or form an invalid econometric model. There are several errors that normally happens in the model specification such as, omitted important variables, included unimportant variables, or have chosen the incorrect functional form, unit error, misspecification of the error term (Gujarati & Porter, 2009).

Hypothesis for Model Specification Test:

H_0: Model specification is correct.

H_1: Model specification is incorrect.

Decision Rule: Reject H_0 if the p-value is less than the significance level, indicates that the model has specification error. Do not reject H_0 if p-value is larger than significance level, then the model specification is correct.

3.5.5 Normality Test

Jarque-Bera (JB) test will be used to test the normality distribution of an econometric model. JB test is applicable for time series because it considers skewness and kurtosis. In a normal distribution, the coefficient of skewness and kurtosis must be 0 and 3. If refer to the Central Limit Theorem, it mentions that by increasing the sample size, then the chance of the model becomes normally distributed is higher. When the error term is normally distributed, it will ensure BLUE characteristics in the OLS estimators (Stephanie, 2016).

Hypothesis for Normality Test:

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

Decision Rule: Reject H_0 if the p-value of JB statistic is less than the significant level, indicates that the error term is not normally distributed. Do not reject H_0 if the p-value is more than the significance level, signifies a normally distributed error term.

3.5.6 Stability Test

3.5.6.1 Cumulative Sum (CUSUM) and Cumulative Sum Square (CUSUMSQ) Test

They are tests that take cumulative sum of the recursive residuals. According to Inclan and Tiao (1994), both tests are observing the locations of change points for stability of time series. CUSUM test helps to show if coefficients of regression model are changing systematically. CUSUMSQ test is useful for showing if the coefficients of regression model changing suddenly.

The tests have been entitled to different criticisms regarding their interpretation both in terms of size and power. However, it is considered strong for those changes in the coefficients of the small activity assumed that structural invariance holds (Caporale & Pittis, 2004).

Hypothesis for CUSUM and CUSUMSQ:

H_0: The model is stable.

H_1: The model is not stable.

Decision Rule: Reject H_0 if CUSUM and CUSUMSQ statistics values fallout from the range of the distribution. Otherwise, do not reject H_0.

3.6 Unit Root Test

This is to test the variable that used in the research is stationary or non-stationary. The function of this test includes detecting any possible structural break in the time series since the test is frequently used in time series analysis. Besides, Elder and Kennedy (2001) also proved that the test is linked with the time series data to prove the stationary time series analysis would have independent and constant mean and variance over the period.

Hypothesis for Unit Root Test:

H_0: All variables have a unit root and non-stationary.

H_1: All variables do not have a unit root and stationary.

Decision Rule: Reject H_0 if the p-values of ADF test and PP test are less than the significant level. Do not reject H_0 if the p-values of ADF test and PP test are more than the significant level.

3.6.1 Augmented Dickey–Fuller (ADF) Test

Augmented Dickey–Fuller (ADF) is the most recommended test procedure for unit root test. By using time-series data, it is normally used to test for the stationary or non-stationary of the data (Elder & Kennedy, 2001). Moreover, the researchers who are applying ADF test normally tend to count on the consequence of the lag orders and consequently hit the behaviour of the test together with the limited sample size (Cheung & Lai, 1995).

3.6.2 Phillips–Perron (PP) Test

Phillips-Perron test is a non- parametric test based on the estimates of long-run variance it can detect the serial correlation through parametric autoregressive structure instead of using Augmented Dicker-Fuller test (ADF). According to Fahami (2011), Phillips-Perron test for any “nuisance” autocorrelation because the strength against the different forms of the autocorrelation, and not a must for remaining homoscedasticity. Phillips-Perron test is more suitable on using in the situation of a relax assumption on the distribution of error (Chandran & Munusamy, 2009).

3.7 Granger Causality Test

Clive Granger introduced granger causality test in 1969 and the main purpose is to understand the causality between two time series and also to test one time series is important in estimating another (Libdeh & Harasheh, 2011). Maziarz (2015) stated that causal relations are interpreted from data by Granger causality rather than using any of the theories. Granger causality is a very popular method to test causality but it also receives many criticisms because it attempts to deduce the causal relationship between random variables and the absence of theoretical background.

When adopting Granger causality analysis, it will be difficult to be differentiated direct cause, indirect cause, and pseudo-cause because of homologous data. Two variables can only be testing the relationships when there are multiple of variables, Granger causality test will become ineffective. Furthermore, Granger causality test also have the other weakness which is unable to eliminate the effects of other variables such as X_3, X_4, X_5, …, X_i whilst testing whether X_1 Granger causes X_2 (Damos, 2016).

In addition, Granger causality test can be used to test the relationship between variables and they have a profound outcome. In order to determine the relationships among the variables, especially the causal relationships of the independent variables towards our dependent variable, our research project will apply the Granger causality test.

Hypotheses for Granger Causality Test:

H_0 : The independent variable does not granger cause the dependent variable (Exchange rate).

H_1: The independent variable does granger cause the dependent variable (Exchange rate).

Decision Rule: Reject H_0 if the p-value is smaller than significance level. Otherwise, do not reject H_0.

3.8 Johansen Co-Integration Test

Co-integration can be known as two variables that are not moving in the same direction although the both variables are co-integrated. Engle and Granger (1987) have stated that there will be a long-run equilibrium relationship happened, when the two variables are co-integrated. Therefore, the co-integration will be occurred when two or more time series variables are combined and unstable at the same time. In addition, Johansen Co-Integration test can be adopted to identify the number of co-integrating relationships between the dependent and independent variables (Naidu, Pandaram and Chand, 2017).

The co-integration test also can be used to check whether the co-integration vectors are able to hold the long-run equilibrium relationship. According to Johansen (1991), there are two different types of test statistics can be applied for the co-integration, which are Trace Test and Maximum-Eigenvalue Test. Besides that, the Johansen procedure can be defined as maximum likelihood method that is used to identify the number of co-integrating vectors in a non-stationary time series Vector Autoregression (VAR) with restrictions imposed, which known as a vector error correction model (VEC).

Hypotheses for Johansen Co-Integration Test:

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

H_1: There is long run relationship between the variables.

Decision Rule: Reject H_0 if p-value is smaller than significance level. Otherwise, do not reject H_0.

3.9 Conclusion

The research framework of this research has been illustrated graphically and described in order to let the readers have understanding about the close relationship between each of the independent variable and the dependent variable. This chapter has clearly stated the data collection method and explained the methodology and diagnosis tests that will be used to study the relationship between each explanatory variable and the response variable. Besides, the hypotheses will be tested with the selected methods and tested in the next chapter.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter explains the data analysis starting from year 1987 to 2016. In this chapter, we are showing empirical results from Ordinary Least Square, descriptive analysis, inferential analysis of R-squared and F-test, multicollinearity test, heteroscedasticity test, autocorrelation test, model specification test, normality test, unit root test, granger causality test and Johansen co-integration test.

4.1 Ordinary Least Square

4.1.1 Original Econometric Model

The table below is generated without running out the diagnostic checking.

Table 4.1: Regression Results for Original Econometric Model

Variables	Dependent Variable: LOG_EXCR
	Coefficient
Constant	6.850481** (14.05195)
Independent Variables	
INF	0.001931 (0.182086)
LOG_GEXP	-0.092683** (-4.904793)
GDP	0.009317** (2.569755)

INTR	0.004334 (1.083423)
R-squared	0.701686
Adjusted R-squared	0.653956
F-statistic	14.70107**
Jarque-Bera statistic	0.060721**

Notes: 1. The asterisk ** shows significant at 5% significance level; 2. Figures in parenthesis (…) are t-statistics; 3. Data period within thirty years, from 1987 to 2016. LOG_EXCR = Log Exchange Rate, INF = Inflation Rate, LOG_GEXP = Log Government Expenditure, GDP = Gross Domestic Product, INTR = Interest Rate.

4.1.2 Descriptive Analysis

Table 4.2: Summary of Descriptive Statistics for All Variables

	LOG_EXCR	**INF**	**LOG_GEXP**	**GDP**	**INTR**
Mean	4.652400	2.673726	24.55484	6.101310	3.627749
Median	4.607842	2.640158	24.54997	6.072166	4.336984
Maximum	4.916184	5.440782	25.76478	10.00270	10.63331
Minimum	4.478261	0.290008	23.21316	-7.359415	-5.289432
Std. Dev.	0.118429	1.279599	0.811821	3.852228	3.559353
Skewness	0.519926	0.346297	0.021129	-1.756896	-0.524026
Kurtosis	1.958587	2.703615	1.735616	6.624434	3.211044
Jarque-Bera	2.707289	0.709415	2.000565	31.85407	1.428689
Probability	0.258297	0.701379	0.367776	0.000000	0.489513
Sum	139.5720	80.21177	736.6451	183.0393	108.8325
Sum Sq. Dev.	0.406736	47.48384	19.11253	430.3501	367.4008
Observations	30	30	30	30	30

Exchange rate was measured by LOG_EXCR. It indicates a mean of 4.65 in the 30years and an average median of 4.61. Maximum value at 4.92; while minimum value at 4.48. For inflation rate, it shows a mean of 2.67% and an average median of 2.64%. Maximum rate at 5.44% and minimum rate at 0.29%.

The other variable is government expenditure. It was measured by LOG_GEXP. Results show a mean value of 24.5548 and an average median of 24.55. The maximum value at 25.76 and the minimum value at 23.21. For Gross Domestic Product, the mean value is 6.10% and the median of 6.07%. The highest GDP is 10% and the lowest is -7.36%. One more variable is interest rate. The average interest rate for 30 years is 3.63% and median of 4.34%. The highest interest rate from 1987 to 2016 is 10.63% and the lowest is -5.29% in Malaysia.

4.2 Empirical Results

The table 4.3 is generated after solving the autocorrelation problem.

Table 4.3: Regression Results for Final Econometric Model

Variables	**Dependent Variable: LOG_EXCR**
	Coefficient
Constant	6.850481** (8.815306)
Independent Variables	
INF	0.001931 (0.132199)
LOG_GEXP	-0.092683** (-3.157856)
GDP	0.009317** (3.095716)
INTR	0.004334 (0.948325)
R-squared	0.701686
Adjusted R-squared	0.653956
F-statistic	14.70107**
Jarque-Bera statistic	0.060721**

Notes: 1. The asterisk ** shows significant at 5% significance level; 2. Figures in parenthesis (…) are t-statistics; 3. Data period within thirty years, from 1987 to 2016. LOG_EXCR = Log Exchange Rate, INF = Inflation Rate, LOG_GEXP = Log Government Expenditure, GDP = Gross Domestic Product, INTR = Interest Rate.

4.2.1 Final Econometric Model with BLUE

$$LOG\_EXCR_t = \beta_0 + \beta_1 INF_t + \beta_2 \text{LOG\_}GEXP_t + \beta_3 GDP_t + \beta_4 INTR_t + \mu_t$$

$$\widehat{LOG\_EXCR}_t = 6.850481 + 0.001931\, INF_t - 0.092683\, \text{LOG\_GEXP}_t + 0.009317\, GDP_t + 0.004334\, INTR_t$$

Where, LOG_EXCR	=	log (Exchange rate, index)
INF	=	Inflation rate, consumer prices (%)
LOG_GEXP	=	log (Government expenditure, RM)
GDP	=	Gross domestic product growth (%)
INTR	=	Real interest rate (%)
μ	=	Error term

4.2.2 Interpretation of Coefficient

4.2.2.1 Constant

$\boldsymbol{\widehat{\beta_0} = 6.850481}$

When inflation rate, government expenditure, Gross Domestic Product and interest rate are equal to zero, on average, the exchange rate is equal to 6.850481%.

4.2.2.2 Inflation (INF)

$\boldsymbol{\widehat{\beta_1} = 0.001931}$

By holding other variables constant, when INF increase by 1 percentage point, on average, then EXCR grow by 0.1931%.

4.2.2.3 Government Expenditure (LOG_GEXP)

$\widehat{\boldsymbol{\beta_2}} = \boldsymbol{-0.092683}$

By holding other variables constant, when GEXP grow by 1 percentage, on average, then EXCR drop by 0.092683%.

4.2.2.4 Gross Domestic Product (GDP)

$\widehat{\boldsymbol{\beta_3}} = \boldsymbol{0.009317}$

By holding other variables constant, when Gross Domestic Product grow by 1 percentage point, on average, then EXCR increase by 0.9317%.

4.2.2.5 Interest Rate (INTR)

$\widehat{\boldsymbol{\beta_4}} = \boldsymbol{0.004334}$

By holding other variables constant, when interest rate rise by 1 percentage point, on average, then EXCR increase by 0.4334%.

4.2.3 T-test

Decision Rule: Reject H_0 if p-value is smaller than 5% significance level. Otherwise, do not reject.

4.2.3.1 Inflation (INF)

$\boldsymbol{H_0 : \beta_1 = 0}$

$\boldsymbol{H_1 : \beta_1 \neq 0}$

P-value: 0.8959

Decision Making: Do not reject null hypothesis because p-value of 0.8959 is larger than significance level of 5%.

Conclusion: The research does not have enough evidence to conclude that the relationship between inflation and exchange rate exists significantly at the 5% significance level.

4.2.3.2 Government Expenditure (LOG_GEXP)

$\boldsymbol{H_0 : \beta_2 = 0}$

$\boldsymbol{H_1 : \beta_2 \neq 0}$

P-value: 0.0041

Decision Making: Do reject null hypothesis because p-value of 0.0041 is smaller than significance level of 5%.

Conclusion: The research does have enough evidence to conclude that the relationship between government expenditure and exchange rate exists significantly at the 5% significance level.

4.2.3.3 Gross Domestic Product (GDP)

$\boldsymbol{H_0 : \beta_3 = 0}$

$\boldsymbol{H_1 : \beta_3 \neq 0}$

P-value: 0.0048

Decision Making: Do reject null hypothesis because p-value of 0.0048 is smaller than the significance level of 5%.

Conclusion: The research does have enough evidence to conclude that the relationship between gross domestic product (GDP) and exchange rate exists significantly at the 5% significance level.

4.2.3.4 Interest Rate (INTR)

$H_0 : \beta_4 = 0$

$H_1 : \beta_4 \neq 0$

P-value: 0.3520

Decision Making: Do not reject null hypothesis because p-value of 0.3520 is larger than 5% significance level.

Conclusion: The research does not have enough evidence to conclude that the relationship between interest rate and exchange rate exists significantly at the 5% significance level.

4.2.4 R-squared and Adjusted R-squared

Table 4.4: Results of R-Squared and Adjusted R-Squared

Models	R-squared	Adjusted R-squared
Final Model	0.701686	0.653956

The coefficient of determination, R-squared is a summary measure of goodness of fit. It shows the extent to which the variation in dependent variable is explained by the variation in independent variables in regression analysis. There is 70.17% of the total variation in exchange rate can be explained by the variation of inflation, government expenditure, Gross Domestic Product (GDP) and interest rate jointly.

For adjusted R-squared, there is 65.40% of the total variation in exchange rate can be explained by the variation of inflation, government expenditure, GDP and interest rate jointly, after taking into account the degree of freedom. The degree of freedom includes number of sample and number of independent variables.

4.2.5 F-test

Table 4.5: Result of F-Test

Models	F-Test	P-Value
Final Model	14.70107	0.000003

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

$$H_1 : At\ least\ one\ of\ the\ \beta_i\ is\ not\ simultaneously = 0, where\ i = 1, 2, 3, 4$$

Decision Rule: Reject H_0 if p-value is smaller than significance level of 5%, otherwise do not reject H_0.

Decision Making: Do reject null hypothesis because the p-value of 0.000003 is less than the significance level of 5%.

Conclusion: This research does have enough evidence to conclude that at least one of the β_i is not simultaneously equal to zero at the significance level of 5%. The model is significant to impact on exchange rate.

4.3 Diagnostic Checking

Decision Rule: Reject H_0 if p-value is less than significance level of 5%. Otherwise, do not reject H_0.

4.3.1 Multicollinearity

4.3.1.1 High Pair-wise Correlation Coefficient

Table 4.6: Correlation Matrix for the Variables

	INF	LOG_GEXP	GDP	INTR
INF	1	-0.205121	0.030054	-0.129528
LOG_GEXP	-0.205121	1	-0.339780	-0.331120
GDP	0.030054	-0.339780	1	-0.024982
INTR	-0.129528	-0.331120	-0.024982	1

According to the table above, the four independent variables have weak or medium correlations with each other. Weak correlation has a range from 0.01 to 0.29 value; while medium correlation has a range from 0.30 to 0.49 value. The correlation coefficients do not go beyond to strong correlation with a range from 0.50 to 0.99 value. Therefore, it does not cause serious multicollinearity problem.

4.3.1.2 Variance Inflation Factor (VIF) and Tolerance (TOL)

Table 4.7: Results of Centered VIF, VIF and TOL Calculated

Variables	Centered VIF	R-squared	$VIF = \frac{1}{1-R^2}$	$TOL = \frac{1}{VIF}$
INF	1.100786	0.091558	1.100786	0.908441
LOG_GEXP	1.406142	0.288834	1.406141	0.711166
GDP	1.165585	0.142062	1.165585	0.857938
INTR	1.211196	0.174370	1.211196	0.825630

As we calculated the Variance Inflation Factor (VIF) by using the R-squared generated from each independent variable, the VIF calculated is almost the same with the centered VIF generated directly from the E-views. According to the tables above, serious multicollinearity problem does not exist as the VIFs are less than 10. Therefore, we can stay in these four independent variables without dropping them. As we calculated the Tolerance by using the VIF, the TOL calculated is far away from 0. This indicates there is no serious multicollinearity problem.

4.3.2 Heteroscedasticity

Table 4.8: Result of ARCH Test

Heteroskedasticity Test: ARCH

F-statistic	0.337915	Prob. F(1,27)	0.5659
Obs*R-squared	0.358459	Prob. Chi-Square(1)	0.5494

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

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

Decision Making: Do not reject null hypothesis because the p-value of 0.5494 is greater than the significance level of 5%.

Conclusion: This research does have enough evidence to say that there is homoscedasticity at 5% significance level.

4.3.3 Autocorrelation

Table 4.9: Result of Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	5.807859	Prob. F(2,23)	0.0091
Obs*R-squared	10.06686	Prob. Chi-Square(2)	0.0065

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

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

Decision Making: Do reject null hypothesis because the p-value of 0.0065 is less than the significance level of 5%.

Conclusion: This research does have enough evidence to say that the autocorrelation problem existed at 5%significance level.

We made use of Newey-West test in this situation.

Table 4.10: Standard Error of OLS Regression and Newey-West Test

Models	OLS Regression	Newey-West Test
	Standard Error	
INF	0.009100	0.014610
LOG_GEXP	0.016237	0.029350
GDP	0.003116	0.003010
INTR	0.003647	0.004570

Notes: Standard errors are taken from Breusch-Godfrey Serial Correlation LM and Newey-West Test.

4.3.4 Model Specification Bias

Table 4.11: Result of Ramsey-RESET Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LOG_EXCR C INF LOG_GEXP GDP INTR
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	2.640353	24	0.0143
F-statistic	6.971463	(1, 24)	0.0143
Likelihood ratio	7.650372	1	0.0057

H_0 : *The model specification is correct.*

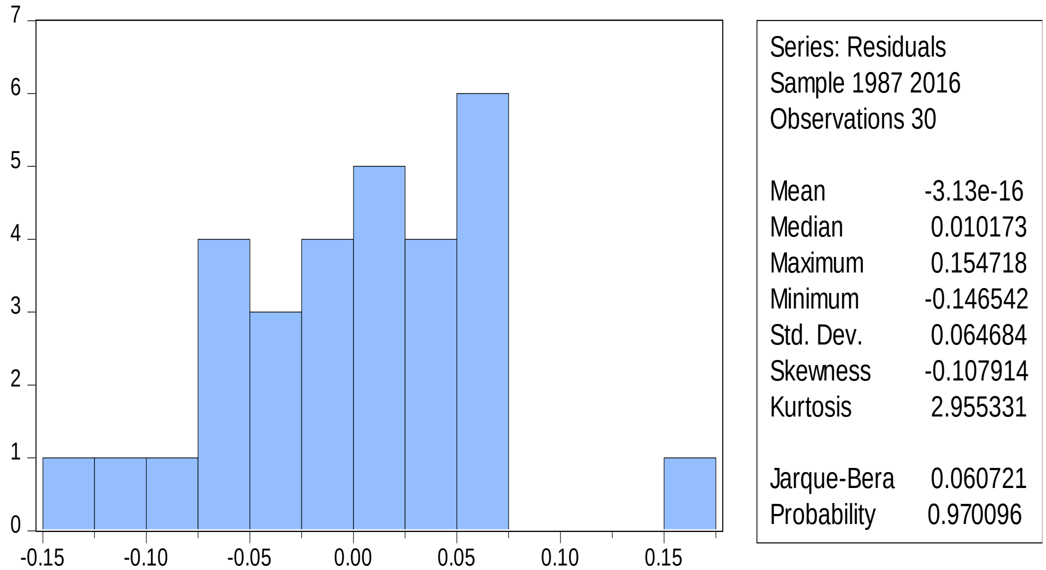
H_1 : *The model specification is incorrect.*

Decision Making: Do reject null hypothesis because the p-value of 0.0143 is less than the significance level of 5%.

Conclusion: This research does have enough evidence to say the model specification is wrong at 5% significance level. This model specification error may be caused by the logarithms of exchange rate and government expenditure. We chose to logarithm exchange rate and government expenditure variables because the data are not in the percentage form.

4.3.5 Normality Test

Table 4.12: Result of Jarque-Bera (JB) Test



H_0 : ***The error term is normally distributed in the model.***

H_1 : ***The error term is not normally distributed in the model.***

Decision Rule: Reject H_0 if p-value is smaller than significance level of 5%. Otherwise, do not reject H_0.

Decision Making: Do not reject null hypothesis because the p-value of 0.970096 is greater than the significance level of 5%.

Conclusion: This research does not have enough evidence to conclude that the error term is not normally distributed in the model at the significance level of 5%.

4.3.6 Stability Test

Figure 4.1: Result of CUSUM Test

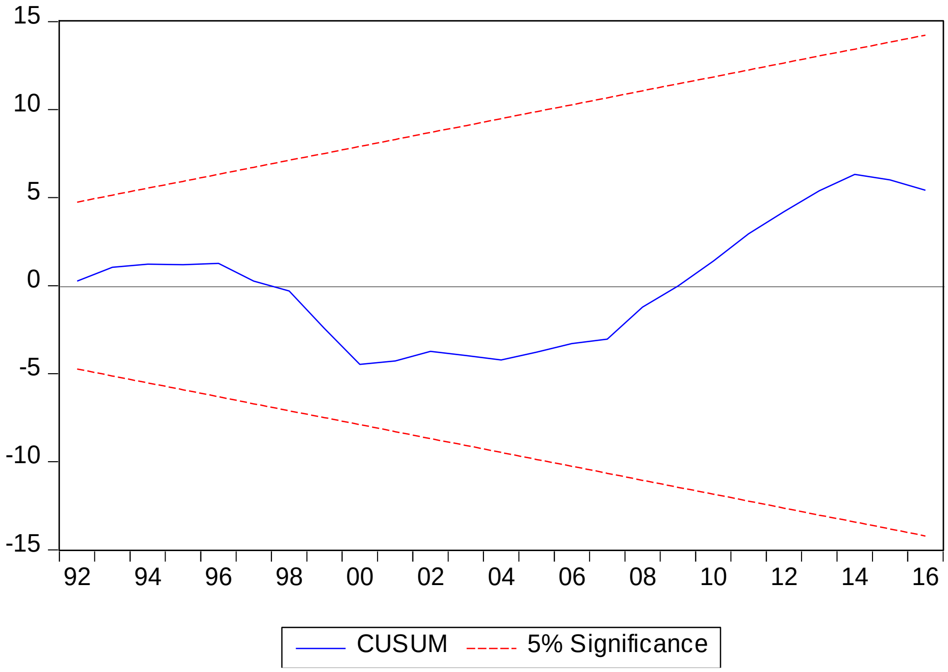
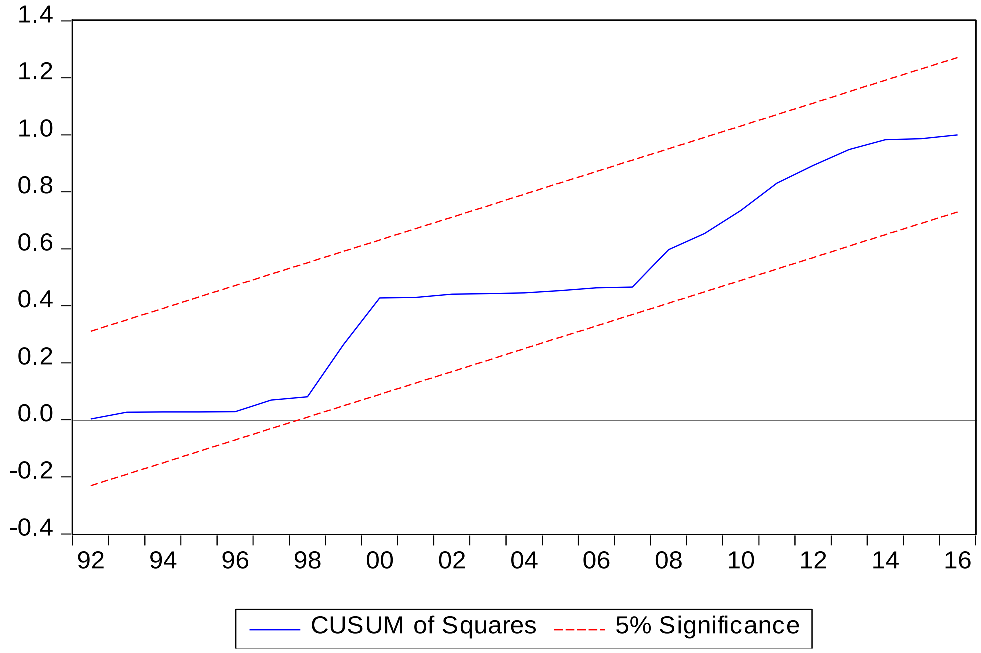


Figure 4.2: Result of CUSUMSQ Test



H_0 : ***The model is constant.***

H_1 : ***The model is not constant.***

Decision Making:

Do not reject null hypothesis because the CUSUM and CUSUMSQ statistics value within the range of 5% significance level.

Conclusion:

This research does have enough evidence to say that the model is constant under CUSUM and CUSUMSQ tests.

4.4 Unit Root Test

H_0: LOG_EXCR/ INF/ LOG_GEXP/ GDP/ INTR have a unit root and non-stationary.

H_1: LOG_EXCR/ INF/ LOG_GEXP/ GDP/ INTR do not have a unit root and stationary.

Decision Rule:

Reject H_0 if p-value is smaller than the significance level of 5%. Otherwise, do not reject.

4.4.1 Augmented Dickey-Fuller (ADF) Test

Table 4.13: Results of ADF Test

Variables	Level		First Difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
LOG_EXCR	-1.956110 (0)	-2.585759 (0)	-4.815387** (0)	-4.673719** (0)
INF	-4.787746** (0)	-5.228899** (0)	-6.428363** (1)	-6.337904** (1)
LOG_GEXP	-0.925089 (0)	-2.004845 (0)	-5.021307** (0)	-5.035215** (0)
GDP	-4.386508** (0)	-5.092713** (0)	-7.607007** (1)	-7.453922** (1)
INTR	-6.469254** (0)	-7.653361** (0)	-8.263341** (1)	-8.094620** (1)

Notes: 1. The asterisk ** shows significant at 5% significance level; 2. Figures in parenthesis (…) are optimal lag length based on Schwarz Criterion (SIC); 3. Data period within thirty years, from 1987 to 2016. LOG_EXCR = Log Exchange Rate, INF = Inflation Rate, LOG_GEXP = Log Government Expenditure, GDP = Gross Domestic Product, INTR = Interest Rate.

Conclusion:

Level Phase

Intercept:

It is concluded that INF, GDP and INTR are stationary at Level phase in ADF test at significance level of 5%.

Trend and Intercept:

It is concluded that INF, GDP and INTR are stationary at Level phase in ADF test at the significance level of 5%.

First Difference Phase

Intercept:

It is concluded that all the variables including the dependent variable are stationary at First Difference phase in ADF test at the significance level of 5%.

Trend and Intercept:

It is concluded that all the variables including the dependent variable are stationary at First Difference phase in ADF test at the significance level of 5%.

4.4.2 Phillips-Perron (PP) Test

Table 4.14: Results of PP Test

Variables	Level		First Difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
LOG_EXCR	-1.906029 (7)	-2.648629 (3)	-7.875979** (27)	-7.357432** (27)
INF	-4.832183** (3)	-5.248983** (2)	-10.32838** (2)	-10.18482** (2)
LOG_GEXP	-1.011350 (5)	-2.292982 (2)	-5.010635** (5)	-5.022410** (4)
GDP	-4.399499** (3)	-5.092713** (0)	-17.92540** (16)	-18.12751** (16)
INTR	-6.395064** (4)	-7.409443** (3)	-19.41060** (2)	-19.02118** (2)

Notes: 1. The asterisk ** shows significant at 5% significance level; 2. Figures in parenthesis (…) are bandwidth based on Newey-West using Bartlett kernel; 3. Data period within thirty years, from 1987 to 2016. LOG_EXCR = Log Exchange Rate, INF = Inflation Rate, LOG_GEXP = Log Government Expenditure, GDP = Gross Domestic Product, INTR = Interest Rate.

Conclusion:

<u>Level Phase</u>

Intercept:

It is concluded that INF, GDP and INTR are stationary at Level phase, according to PP test at the significance level of 5%.

Trend and Intercept:

It is concluded that INF, GDP and INTR are stationary at Level phase, according to PP test at the significance level of 5%.

<u>First Difference Phase</u>

Intercept:

It is concluded that all the variables including the dependent variable are stationary at First Difference phase, according to PP test at the significance level of 5%.

Trend and Intercept:

It is concluded that all the variables including the dependent variable are stationary at First Difference phase, according to PP test at the significance level of 5%.

4.5 Granger Causality Test

$\boldsymbol{H_0: Variable\ X\ does\ not\ granger\ cause\ Variable\ Y.}$

$\boldsymbol{H_1: Variable\ X\ does\ granger\ cause\ Variable\ Y.}$

Decision Rule: Reject H_0 if p-value is less than significance level of 5%. Otherwise, do not reject.

Table 4.15: Results of Granger Causality Test

Independent Variable	**Dependent Variable**				
	LOG_EXCR	INF	LOG_GEXP	GDP	INTR
LOG_EXCR	-	2.54148	2.84025	1.40991	4.11780**

INF	0.37544	-	0.28575	0.47973	8.53424**
LOG_GEXP	1.91752	1.56686	-	2.17493	3.30026
GDP	0.00442	3.52857**	2.04882	-	6.72272**
INTR	0.40976	1.35328	0.39711	1.84680	-

Notes: 1. The asterisk ** shows significant at 5% significance level; 2. We are using 2 lags for annual data.

Based on the table above, there is some causal relationship between the variables. There are causal relationships between three variables (Exchange Rate, Inflation Rate and Gross Domestic Product) towards Interest Rate. However, Interest Rate does not granger cause those three variables. There is also causal relationship between Gross Domestic Product towards Inflation Rate. At the same time, Inflation Rate does not granger cause Gross Domestic Product. As a conclusion, there is only unidirectional causal relationship between the variables.

4.6 Johansen Co-Integration Test

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

H_1: There is long-run relationship between the variables.

Decision Rule: Reject null hypothesis if p-value is less than the significance level of 5%. Otherwise, do not reject null hypothesis.

Table 4.16: Results of Johansen Co-Integration Test

Hypothesized No. of CE(s)	**Trace**			**Max-Eigen**		
	Stats.	**5% Critical Value**	**P-value**	**Stats.**	**5% Critical Value**	**P-value**
$r = 0$	132.2418	69.81889	0.0000**	72.96323	33.87687	0.0000**
$r \geq 1$	59.27861	47.85613	0.0030**	31.91173	27.58434	0.0130**
$r \geq 2$	27.36689	29.79707	0.0930	19.57165	21.13162	0.0814
$r \geq 3$	7.795236	15.49471	0.4876	6.523958	14.26460	0.5469
$r \geq 4$	1.271279	3.841466	0.2595	1.271279	3.841466	0.2595

Notes: The asterisk ** shows significant at 5% significance level.

Decision Making: Reject null hypothesis since the p-value of Trace statistic (0.0000 and 0.0030) and p-value of Max-Eigen (0.0000 and 0.0130) are smaller than 5% significance level.

Conclusion: There is enough evidence to say that there is a long-run relationship between the variables at the significance level of 5%.

4.7 Conclusion

OLS method was used to estimate our model. Diagnostic checking was ran through our sample 30 years from 1987 to 2016. With only Government Expenditure and Gross Domestic Product being significant, other variables such as Inflation Rate and Interest Rate showed insignificant in bringing effect to Exchange Rate.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

In discussion, conclusion and implication, the regression analysis results would be discussed. After summarization, there will have an overall discussion on the major findings in this research. The policy implication will be covered in this chapter and several policies will be suggested to policymakers. The limitations of the research also will be investigated and stated, and recommendations on the future study will be given to other scholars for their future studies. In addition, a conclusion of the research will be discussed.

5.1 Summary of Statistical Analysis

Table 5.1: Summary for Diagnostic Checking

Problems of Econometric	Results
Multicollinearity a) High Pair-wise Correlation Coefficient b) Variance Inflation Factor (VIF) c) Tolerance (TOL)	There is no serious multicollinearity problem.
Heteroscedasticity a) Autoregressive Conditional Heteroscedasticity (ARCH) Test	There is homoscedasticity.
Autocorrelation a) Breusch-Godfrey Serial Correlation LM Test	There is serial correlation problem. The problem is solved by Newey-West test.
Model Specification Bias a) Ramsey-RESET Test	There is model specification error. It may be caused by two logarithms

	variables in the model such as exchange rate and government expenditure.
Stability Test a) CUSUM b) CUSUMSQ	Model is stable
Normality of Error Term a) Jarque-Bera Test	Error term is normally distributed.
F-Test	Model is significant.

The table 5.1 summarized the E-view results of diagnostic checking. There is an autocorrelation problem and it is solved by running Newey-West test. There is incorrect in model specification. It indicates that the measurements in variables are not correctly specified.

Table 5.2: Summary of Unit Root Test and Granger Causality Test

DV	**IV**	**Unit Root (ADF and PP Test)**	**Granger Causality Test**
LOG_EXCR	INF	Stationary	Not significant at 5%
	LOG_GEXP	Stationary	Not significant at 5%
	GDP	Stationary	Not significant at 5%
	INTR	Stationary	Not significant at 5%

The table 5.2 summarized the unit root test (ADF test and PP test) and granger causality test. It is concluded that all the variables including the dependent variable are stationary at significance level of 5%. Besides that, all the four independent variable does not have a causal relationship with exchange rate.

Table 5.3: Summary of Johansen Co-Integration Test

Long Run Relationship Test: Johansen Co-Integration Test	
Trace Test	Max-Eigen Test
Co-integrated at r = 1	Co-integrated at r = 1

The table 5.3 summarized the Johansen Co-Integration test. It is concluded there is a long-run relationship between the variables. Trace test and Max-Eigen test showed significant at r = 1 at the significance level of 5%.

Table 5.4: Comparison of Past Findings and the Results

Variables	Results	Consistency	Inconsistency
Inflation	Positively but insignificant at 5% significance level	• Abdurehman and Hacilar (2016) • Chowdbury and Hossain (2014)	• Sek, Ooi and Ismail (2012) • Necsuleseu and Serbaneseu (2013) • Ramasamy and Abar (2015) • Ali, Mahmood and Bashir (2015) • Abdoh et al (2016) • Parveen, Khan and Ismail (2012) • Ashok and Vikram (2016) • Achsani, Fauzi and Abdullah (2010) • Chowdbury and Hossain (2014) • Razi, Shafiq, Ali and Khan (2012) • Madesha, Chidoko and Zivanomoyo (2013) • Baljinnyam and Lu (2013) • Hamid, Shahzad, Saqib and Maqbool (n.d) • Mirchandani (2013)

Government Expenditure	Negatively and significant at 5% significance level	• Monacelli and Perotti (2010) • Al Samara (2009) • Hyder and Mahboob (2006)	• Galstyan and Lane (2009) • Gan, Ward, Ting and Cohen (2013) • Shen, Yang and Zanna (2018) • Ajao and Igbekoyi (2013) • Insah and Chiaraah (2013) • Aron, Elbadawi and Kahn (1997) • Carrera and Restout (2008)
Gross Domestic Product (GDP)	Positively and significant at 5% significance level	• Najaf (2016) • (Edwards, 1989) • Jakob (2015) • Mirchandani (2013) • Oreiro, Missio and Jayme Jr. (2015)	• Vidyavathi, Keerti and Pooja (2016) • Bhandari (2014) • Amaghionyeodiwe and Osinubi (2005) • Arslan, Najid and Sharafat (2013) • Twarowska and Kakol (2014) • Khattak, Tariq and Khan (2012) • Boykorayev (2008)
Interest Rate	Positively but insignificant at 5% significance level	• Wilson and Sheefeni (2014) • Ali (2016) • Sarc and Karagoz (2016)	• Andries et al (2017) • Tafa (2015) • Ali (2016) • Morosan and Zubas (2015) • Kruskovic (2017) • Ali, Mahmood and Bashir (2015)

We are using inflation, government expenditure, gross domestic product (GDP) and interest rate to estimate the effects on exchange rate in Malaysia. Most of the past findings we found are not consistent with our empirical result. We have filtered the past findings with two elements: significant or insignificant relationship and positive or negative sign. Therefore, many past findings are filtered out as compared with our results. However, there are still some past findings tally with our results.

5.2 Discussion of Major Findings

The research aims to investigate the exchange rate for the developing country because of exchange rate misalignment is a problem that lies at the core of international economies. For example, a country's exchange rate misalignment it will lead to undervaluation or overvaluation. Therefore, major is to understand drivers of exchange rate which namely inflation, government expenditure, Gross Domestic Product (GDP) and interest rate so that action or effective ways can be taken by relevant authorities to solve the problems.

5.2.1 Expected sign versus Actual outcome

Table 5.5: Expected Relationship of Independent Variables with Exchange Rate versus Actual Outcome

Independent Variables	**Expected Relationship with Exchange rate**	**Results**
Inflation	Negative	Positive
Government Expenditure	Negative	Negative
GDP	Positive	Positive
Interest Rate	Positive	Positive

For inflation variable, based on the empirical result in this study, it indicates positive association that happened within inflation and exchange rate in

Malaysia by having a positive coefficient of 0.001931. Besides, inflation owns an insignificant impact with exchange rate in Malaysia from 1987 to 2016 since p-value (0.8959) is larger than significance level (5%). Hence, this also answers the first research objective which is to investigate the impact of inflation on exchange rate in Malaysia. The outcome is tally with some of the empirical results from Abdurehman and Hacilar (2016) and Chowdbury and Hossian (2014).

The empirical results from Monacelli and Perotti (2010), Al Samara (2009) and Hyder and Mahboob (2006) showed the consistent results with the result of government expenditure. Therefore, the result indicated that negative relation with government spending and exchange rate with the negative coefficient value (-0.092683). Furthermore, p-value has proven significant relationship occurs since p-value (0.0041) is lower than significance level (5%). Thus, research objective of examining the impact of government expenditure on exchange rate in Malaysia is fulfilled. The policy changed regarding government expenditure is expected to be effective in affecting exchange rate.

According to the empirical results, gross domestic product get a significant and positive results on exchange rate, and result is tally with the empirical results from Najaf (2016), Edwards (1989), Jakob (2015), Mirchandani (2013) and Oreiro, Missio and Jayme Jr (2015). Based on the result in this research, the coefficient of gross domestic product is 0.009317 which shows a positive connection with exchange rate. It is consistent with expected sign. Furthermore, GDP owns a positive relationship with exchange rate because p-value (0.0048) is lower than significance level (5%). In short, it met the research objective which is to test the impact of GDP on exchange rate in our country.

For interest rate variable, the findings of this study demonstrate that interest rate affects exchange rate positively due to its positive slope of coefficient which is 0.004334. Hence, they own a positive relation, but it is insignificant over the years since p-value (0.3520) is greater than significance level (5%). Nevertheless, outcome shown is tally with the empirical results from Wilson and Sheefeni (2014), Ali (2016) and Sarc and Karagoz (2016). So, this will meet our fourth research objective which is to examine the relationship for interest rate and exchange rate. Other than that, it is expected that policy about interest rate cannot influence exchange rate effectively.

5.3 Implications of the Study

According to the research, the independent variables that showed significantly influencing exchange rate are government expenditure and Gross Domestic Product (GDP), whereas, the inflation and interest rate showed insignificant. However, only government expenditure is negatively related to exchange rate. Gross Domestic Product (GDP), inflation and interest rate show positively related to exchange rate.

The depreciation or appreciation in foreign currency tends to affect the economy of a country. Hence, policymakers and government need to own a better understanding for the factors that would influence the exchange rate. The reason is, they will have a clear view in developing an effective exchange policy to protect the country's economy to be stable and to achieve the growth of an economy. In addition, policymakers should adjust the provision of law in order to boost the economic growth. According to Mohd Abdoh et al. (2016) and Nwude (2012), the interest rate and inflation showed insignificantly. Therefore, policymakers and government may be concerned on the rules and regulations in relation to FOREX reserve and international trades relative with interest rate. If the policymakers fail to understand the determinants of exchange rate, it will cause to implementation of inappropriate policy and lead the economy of a country difficult to overcome the problems during economic downturn happened.

According to the research, there will have some valuable information for investment decision making to the investors, for example, hedgers, speculators and arbitragers. The investors should notice that the changes in government expenditure and economic growth tend to forecast the exchange rate movement of Malaysia due to the government expenditure and economic growth showed significantly affecting the Malaysia's exchange rate in this research. Bouraoui and Phisuthtiwatcharavong (2015), the researchers mentioned that the earnings of an investor's global investment portfolio will be influenced by the FOREX rate. Thus, the approach that helps to decrease the risks and to gain competitiveness, those investors should have a superior forecast performance on the FOREX rate.

The understanding of determinants of exchange rate is important to help the international traders, such as exporters and importers and risk exposures (Simpson & Evans, 2004). Therefore, the foreign exchange rate will affect the export and import of a nation. The exchange rate has a strong effect on a country's trade and it shows extremely high correlation with real exchange rate and exports and also between the real exchange rate and imports (Kemal & Qadir, 2005). If the exchange rate is overvalued, it will lead to rising in deficit of trade and the falling of reserves, and thus, the use of exchange control and trade barriers will increase. Hence, trade deficits will lead to relative currency decline and cause the home currency to depreciate. While demand of imported goods become inelastic, then the impact of FOREX rate on international trade will become insignificant.

5.4 Limitations of the Study

There were few limitations found when doing research of this study. The first limitation in this study will be data constraint. This is because World Bank does not have the latest updated data. For example, interest rate in World Bank do not have data since start from 2017 onwards. So, we do not have any nearest data as at 2019. The findings will be more accurate if World Bank have more updated data.

Secondly, we use 30 years annual data to estimate the model. Annual data is categorized as low frequency data, so it might be not able to estimate the volatility, and the data might be unable to achieve a normal standard variable (Zhou, 1996). So, it would be a smaller sample size if we compare by using 30 years quarterly with 30 years monthly data to estimate the model. According to Das and Rahmatullah (2016), a small sample size may face difficulties in obtaining a normally distributed error term.

Last but not least, selection of macroeconomic variables, we may have omitted some important variables that will affect the exchange rate significantly. We have only chose four macroeconomic variables which are inflation, government expenditure, GDP and interest rate. However, exchange rate for one country will be affected by the other macroeconomic variables. Therefore, throughout this finding, it might not be able to prove comprehensively or accurately in the determinants of the exchange rate in developing country.

5.5 Recommendations for Future Research

For future researcher, we would recommend to use other resources to get the updated data. Example, use IMF or other platform as databank to get most updated data. If we have more data, the result of the findings will be more accurate.

Other than that, we would recommend to use higher frequency data like monthly, quarterly or daily data. This is because we can increase the reliability of the result. According to Hansen and Lunde (2011), higher frequency data also will help to get more accurate data, and can estimate the volatility of the exchange rate movement. In addition, by using a large sample size, it will help to get a normally distributed error term.

Lastly, future researcher are recommended to include more macroeconomic variables into their studies. There are few suggested macroeconomic variables that can be included to the studies such as money supply, term of trade and foreign direct investment. Future researchers can try on other macroeconomic variables to study more depth for this exchange rate.

5.6 Conclusion

As conclusion, our study, determinants of exchange rate in developing countries: evidence from Malaysia. The main purpose is to find out that which macroeconomics variables such as inflation, government expenditure, GDP and interest rate affect exchange rate in the developing country.

This research have found that inflation and interest are insignificant to affect exchange rate while government expenditure and gross domestic product have significant relationships with exchange rate. Hence, the major findings are well explained those variable relationships. Furthermore, this study also conducts hypotheses testing for each variable.

The recommendations on the future study are given in order to give a direction and improvement for future researchers. In addition, when conducting this research, there are some limitations could be found and some of the useful suggestions are provided for future researchers. Other than that, in order for policymakers, investors and central bank to implement the new strategy or policies, the implication of study has been reviewed and discussed. At last, the research objectives have been accomplished in this paper which to identify the determinants of exchange rate in Malaysia from 1987-2016.

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APPENDICES: EVIEW OUTPUTS

APPENDIX 1: ORDINARY LEAST SQUARES (OLS) MODEL

Estimated Output

Dependent Variable: LOG_EXCR
Method: Least Squares
Date: 01/22/19 Time: 13:00
Sample: 1987 2016
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.850481	0.487511	14.05195	0.0000
INF	0.001931	0.010607	0.182086	0.8570
LOG_GEXP	-0.092683	0.018896	-4.904793	0.0000
GDP	0.009317	0.003626	2.569755	0.0165
INTR	0.004334	0.004000	1.083423	0.2890

R-squared	0.701686	Mean dependent var	4.652400
Adjusted R-squared	0.653956	S.D. dependent var	0.118429
S.E. of regression	0.069666	Akaike info criterion	-2.339186
Sum squared resid	0.121335	Schwarz criterion	-2.105653
Log likelihood	40.08778	Hannan-Quinn criter.	-2.264476
F-statistic	14.70107	Durbin-Watson stat	0.733780
Prob(F-statistic)	0.000003		

Descriptive Statistics

	LOG_EXCR	INF	LOG_GEXP	GDP	INTR
Mean	4.652400	2.673726	24.55484	6.101310	3.627749
Median	4.607842	2.640158	24.54997	6.072166	4.336984
Maximum	4.916184	5.440782	25.76478	10.00270	10.63331
Minimum	4.478261	0.290008	23.21316	-7.359415	-5.289432
Std. Dev.	0.118429	1.279599	0.811821	3.852228	3.559353
Skewness	0.519926	0.346297	0.021129	-1.756896	-0.524026
Kurtosis	1.958587	2.703615	1.735616	6.624434	3.211044
Jarque-Bera	2.707289	0.709415	2.000565	31.85407	1.428689
Probability	0.258297	0.701379	0.367776	0.000000	0.489513
Sum	139.5720	80.21177	736.6451	183.0393	108.8325
Sum Sq. Dev.	0.406736	47.48384	19.11253	430.3501	367.4008
Observations	30	30	30	30	30

APPENDIX 2: MULTICOLLINEARITY

Pair-Wise Correlation Collinearity

	INF	LOG_GEXP	GDP	INTR
INF	1	-0.205121	0.030054	-0.129528
LOG_GEXP	-0.205121	1	-0.339780	-0.331120
GDP	0.030054	-0.339780	1	-0.024982
INTR	-0.129528	-0.331120	-0.024982	1

Variance Inflation Factor (VIF) / Tolerance (TOL)

Variance Inflation Factors
Date: 01/22/19 Time: 13:02
Sample: 1987 2016
Included observations: 30

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.237667	1469.074	NA
INF	0.000113	6.072567	1.100786
LOG_GEXP	0.000357	1332.186	1.406142
GDP	1.31E-05	4.190337	1.165585
INTR	1.60E-05	2.512773	1.211196

Dependent Variable: INF
Method: Least Squares
Date: 01/22/19 Time: 13:10
Sample: 1987 2016
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.15390	8.509512	1.780819	0.0866
LOG_GEXP	-0.489108	0.335948	-1.455903	0.1574
GDP	-0.026984	0.066825	-0.403799	0.6897
INTR	-0.084234	0.072087	-1.168501	0.2532

R-squared	0.091558	Mean dependent var	2.673726
Adjusted R-squared	-0.013262	S.D. dependent var	1.279599
S.E. of regression	1.288056	Akaike info criterion	3.467711
Sum squared resid	43.13631	Schwarz criterion	3.654538
Log likelihood	-48.01567	Hannan-Quinn criter.	3.527479
F-statistic	0.873478	Durbin-Watson stat	1.257442
Prob(F-statistic)	0.467480		

Dependent Variable: LOG_GEXP
Method: Least Squares
Date: 01/22/19 Time: 13:11
Sample: 1987 2016
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	25.71340	0.412226	62.37687	0.0000
INF	-0.154117	0.105857	-1.455903	0.1574
GDP	-0.072021	0.034877	-2.064979	0.0490
INTR	-0.084646	0.038050	-2.224573	0.0350

R-squared	0.288834	Mean dependent var	24.55484
Adjusted R-squared	0.206777	S.D. dependent var	0.811821
S.E. of regression	0.723033	Akaike info criterion	2.312841
Sum squared resid	13.59218	Schwarz criterion	2.499667
Log likelihood	-30.69261	Hannan-Quinn criter.	2.372608
F-statistic	3.519898	Durbin-Watson stat	0.432291
Prob(F-statistic)	0.028960		

Dependent Variable: GDP
Method: Least Squares
Date: 01/22/19 Time: 13:11
Sample: 1987 2016
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	55.42970	24.02532	2.307137	0.0293
INF	-0.230961	0.571970	-0.403799	0.6897
LOG_GEXP	-1.956347	0.947393	-2.064979	0.0490
INTR	-0.185540	0.213284	-0.869918	0.3923

R-squared	0.142062	Mean dependent var	6.101310
Adjusted R-squared	0.043069	S.D. dependent var	3.852228
S.E. of regression	3.768359	Akaike info criterion	5.614722
Sum squared resid	369.2137	Schwarz criterion	5.801548
Log likelihood	-80.22083	Hannan-Quinn criter.	5.674489
F-statistic	1.435073	Durbin-Watson stat	1.820309
Prob(F-statistic)	0.255244		

Dependent Variable: INTR
Method: Least Squares
Date: 01/22/19 Time: 13:11
Sample: 1987 2016
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	52.52689	21.56840	2.435364	0.0220
INF	-0.592338	0.506921	-1.168501	0.2532
LOG_GEXP	-1.889051	0.849175	-2.224573	0.0350

GDP	-0.152435	0.175230	-0.869918	0.3923

R-squared	0.174370	Mean dependent var	3.627749
Adjusted R-squared	0.079104	S.D. dependent var	3.559353
S.E. of regression	3.415673	Akaike info criterion	5.418192
Sum squared resid	303.3373	Schwarz criterion	5.605018
Log likelihood	-77.27288	Hannan-Quinn criter.	5.477959
F-statistic	1.830362	Durbin-Watson stat	2.336301
Prob(F-statistic)	0.166417		

Variables	**Centered VIF**	**R-squared**	$VIF = \frac{1}{1-R^2}$	$TOL = \frac{1}{VIF}$
INF	1.100786	0.091558	1.100786	0.908441
LOG_GEXP	1.406142	0.288834	1.406141	0.711166
GDP	1.165585	0.142062	1.165585	0.857938
INTR	1.211196	0.174370	1.211196	0.825630

APPENDIX 3: HETEROSCEDASTICITY

Autoregressive Conditional Heteroscedasticity (ARCH) Test

Heteroskedasticity Test: ARCH

F-statistic	0.337915	Prob. F(1,27)	0.5659
Obs*R-squared	0.358459	Prob. Chi-Square(1)	0.5494

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/22/19 Time: 13:03
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003009	0.001027	2.930471	0.0068
RESID^2(-1)	0.084481	0.145330	0.581304	0.5659

R-squared	0.012361	Mean dependent var	0.003359
Adjusted R-squared	-0.024219	S.D. dependent var	0.004433
S.E. of regression	0.004486	Akaike info criterion	-7.909200
Sum squared resid	0.000543	Schwarz criterion	-7.814903
Log likelihood	116.6834	Hannan-Quinn criter.	-7.879667
F-statistic	0.337915	Durbin-Watson stat	1.517995
Prob(F-statistic)	0.565857		

APPENDIX 4: AUTOCORRELATION

Breush-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	5.807859	Prob. F(2,23)	0.0091
Obs*R-squared	10.06686	Prob. Chi-Square(2)	0.0065

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/22/19 Time: 13:03
Sample: 1987 2016
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.212985	0.419568	0.507630	0.6165
INF	-0.002578	0.009100	-0.283267	0.7795
LOG_GEXP	-0.007786	0.016237	-0.479561	0.6361
GDP	7.70E-05	0.003116	0.024720	0.9805
INTR	-0.004404	0.003647	-1.207529	0.2395
RESID(-1)	0.695729	0.217890	3.193024	0.0040
RESID(-2)	-0.161782	0.209051	-0.773887	0.4469

R-squared	0.335562	Mean dependent var	-3.13E-16
Adjusted R-squared	0.162230	S.D. dependent var	0.064684
S.E. of regression	0.059205	Akaike info criterion	-2.614666
Sum squared resid	0.080620	Schwarz criterion	-2.287720
Log likelihood	46.21999	Hannan-Quinn criter.	-2.510073
F-statistic	1.935953	Durbin-Watson stat	1.726913
Prob(F-statistic)	0.117644		

Newey-WEST Test

Dependent Variable: LOG_EXCR
Method: Least Squares
Date: 01/22/19 Time: 13:03
Sample: 1987 2016
Included observations: 30
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.850481	0.777112	8.815306	0.0000
INF	0.001931	0.014610	0.132199	0.8959

LOG_GEXP	-0.092683	0.029350	-3.157856	0.0041
GDP	0.009317	0.003010	3.095716	0.0048
INTR	0.004334	0.004570	0.948325	0.3520

R-squared	0.701686	Mean dependent var	4.652400
Adjusted R-squared	0.653956	S.D. dependent var	0.118429
S.E. of regression	0.069666	Akaike info criterion	-2.339186
Sum squared resid	0.121335	Schwarz criterion	-2.105653
Log likelihood	40.08778	Hannan-Quinn criter.	-2.264476
F-statistic	14.70107	Durbin-Watson stat	0.733780
Prob(F-statistic)	0.000003	Wald F-statistic	20.16649
Prob(Wald F-statistic)	0.000000		

APPENDIX 5: MODEL SPECIFICATION

Ramsey Regression Equation Specification Error Test (RESET) Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LOG_EXCR C INF LOG_GEXP GDP INTR
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	2.640353	24	0.0143
F-statistic	6.971463	(1, 24)	0.0143
Likelihood ratio	7.650372	1	0.0057

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.027312	1	0.027312
Restricted SSR	0.121335	25	0.004853
Unrestricted SSR	0.094023	24	0.003918

LR test summary:

	Value
Restricted LogL	40.08778
Unrestricted LogL	43.91297

Unrestricted Test Equation:
Dependent Variable: LOG_EXCR
Method: Least Squares
Date: 01/22/19 Time: 13:04
Sample: 1987 2016
Included observations: 30
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

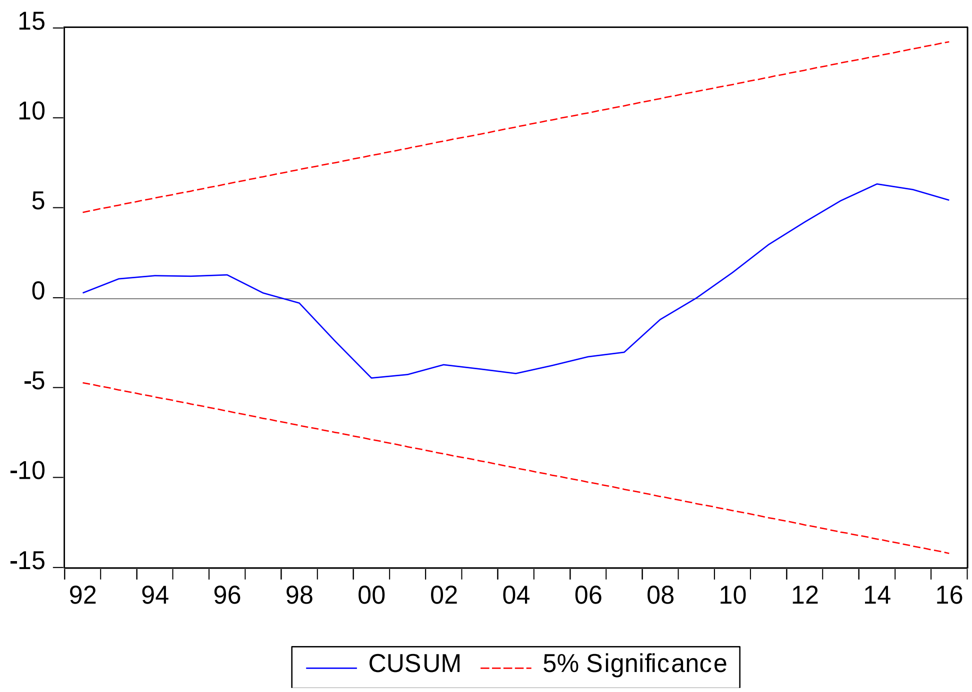
Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-193.4570	82.36361	-2.348817	0.0274
INF	-0.089672	0.038002	-2.359663	0.0268
LOG_GEXP	4.010329	1.689249	2.374031	0.0259
GDP	-0.404518	0.170153	-2.377382	0.0258
INTR	-0.188887	0.079024	-2.390245	0.0250
FITTED^2	4.757917	1.953689	2.435350	0.0227

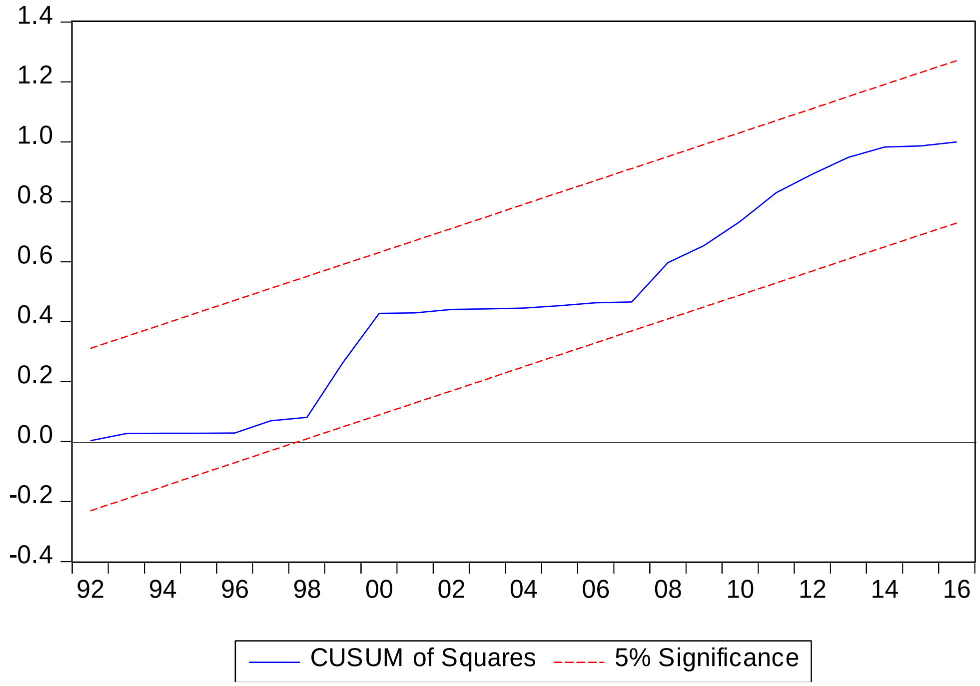
R-squared	0.768834	Mean dependent var	4.652400
Adjusted R-squared	0.720675	S.D. dependent var	0.118429
S.E. of regression	0.062591	Akaike info criterion	-2.527531
Sum squared resid	0.094023	Schwarz criterion	-2.247292
Log likelihood	43.91297	Hannan-Quinn criter.	-2.437880
F-statistic	15.96433	Durbin-Watson stat	1.054105
Prob(F-statistic)	0.000001	Wald F-statistic	16.69644
Prob(Wald F-statistic)	0.000000		

APPENDIX 6: STABILITY TEST

CUSUM Test

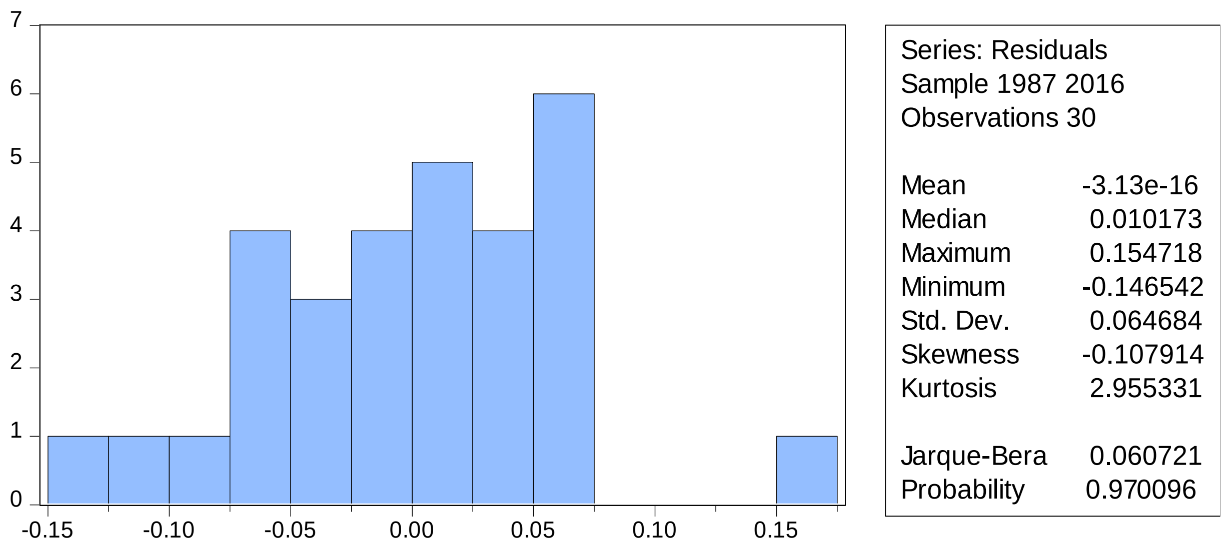


CUSUMSQ Test



APPENDIX 7: NORMALITY TEST

Jarque-Bera Test



APPENDIX 8: UNIT ROOT TEST

Augmented Dickey-Fuller Test

Variable: LOG_EXCR

Level and Intercept

Null Hypothesis: LOG_EXCR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.956110	0.3035
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_EXCR)
Method: Least Squares
Date: 01/22/19 Time: 13:17
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCR(-1)	-0.168600	0.086191	-1.956110	0.0609
C	0.770305	0.401634	1.917928	0.0658

R-squared	0.124126	Mean dependent var	-0.015101
Adjusted R-squared	0.091687	S.D. dependent var	0.055408
S.E. of regression	0.052807	Akaike info criterion	-2.977876
Sum squared resid	0.075291	Schwarz criterion	-2.883580
Log likelihood	45.17920	Hannan-Quinn criter.	-2.948344
F-statistic	3.826366	Durbin-Watson stat	1.651989
Prob(F-statistic)	0.060871		

Level, Trend and Intercept

Null Hypothesis: LOG_EXCR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.585759	0.2888
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_EXCR)
Method: Least Squares
Date: 01/22/19 Time: 13:19
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCR(-1)	-0.357381	0.138211	-2.585759	0.0157
C	1.697969	0.666628	2.547101	0.0171
@TREND("1987")	-0.003216	0.001879	-1.711342	0.0989

R-squared	0.212798	Mean dependent var	-0.015101
Adjusted R-squared	0.152244	S.D. dependent var	0.055408
S.E. of regression	0.051016	Akaike info criterion	-3.015648
Sum squared resid	0.067669	Schwarz criterion	-2.874204
Log likelihood	46.72689	Hannan-Quinn criter.	-2.971349
F-statistic	3.514193	Durbin-Watson stat	1.533019
Prob(F-statistic)	0.044578		

First Difference and Intercept

Null Hypothesis: D(LOG_EXCR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.815387	0.0006
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_EXCR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:19
Sample (adjusted): 1989 2016

Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_EXCR(-1))	-0.905205	0.187982	-4.815387	0.0001
C	-0.010830	0.010696	-1.012496	0.3206

R-squared	0.471415	Mean dependent var	0.001912
Adjusted R-squared	0.451085	S.D. dependent var	0.074020
S.E. of regression	0.054841	Akaike info criterion	-2.900014
Sum squared resid	0.078195	Schwarz criterion	-2.804856
Log likelihood	42.60019	Hannan-Quinn criter.	-2.870923
F-statistic	23.18796	Durbin-Watson stat	1.932475
Prob(F-statistic)	0.000055		

First Difference, Trend and Intercept

Null Hypothesis: D(LOG_EXCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.673719	0.0045
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_EXCR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:19
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_EXCR(-1))	-0.905039	0.193644	-4.673719	0.0001
C	-0.010703	0.023550	-0.454500	0.6534
@TREND("1987")	-8.03E-06	0.001322	-0.006077	0.9952

R-squared	0.471416	Mean dependent var	0.001912
Adjusted R-squared	0.429129	S.D. dependent var	0.074020
S.E. of regression	0.055927	Akaike info criterion	-2.828587
Sum squared resid	0.078195	Schwarz criterion	-2.685850
Log likelihood	42.60021	Hannan-Quinn criter.	-2.784951
F-statistic	11.14809	Durbin-Watson stat	1.932716
Prob(F-statistic)	0.000346		

Variable: INF

Level and Intercept

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.787746	0.0006
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 01/22/19 Time: 13:20
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.854915	0.178563	-4.787746	0.0001
C	2.365273	0.532004	4.445968	0.0001

R-squared	0.459162	Mean dependent var	0.063367
Adjusted R-squared	0.439131	S.D. dependent var	1.637641
S.E. of regression	1.226449	Akaike info criterion	3.312595
Sum squared resid	40.61277	Schwarz criterion	3.406891
Log likelihood	-46.03262	Hannan-Quinn criter.	3.342127
F-statistic	22.92251	Durbin-Watson stat	2.015291
Prob(F-statistic)	0.000054		

Level, Trend and Intercept

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.228899	0.0011
Test critical values:	1% level	-4.309824	

	5% level	-3.574244	
	10% level	-3.221728	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 01/22/19 Time: 13:20
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.913776	0.174755	-5.228899	0.0000
C	3.240743	0.706834	4.584872	0.0001
@TREND("1987")	-0.047799	0.026640	-1.794229	0.0844

R-squared	0.518749	Mean dependent var	0.063367
Adjusted R-squared	0.481730	S.D. dependent var	1.637641
S.E. of regression	1.178954	Akaike info criterion	3.264829
Sum squared resid	36.13822	Schwarz criterion	3.406273
Log likelihood	-44.34002	Hannan-Quinn criter.	3.309127
F-statistic	14.01294	Durbin-Watson stat	2.122294
Prob(F-statistic)	0.000074		

First Difference and Intercept

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.428363	0.0000
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 01/22/19 Time: 13:21
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(INF(-1))	-2.043562	0.317898	-6.428363	0.0000
D(INF(-1),2)	0.355866	0.181975	1.955574	0.0623
C	0.000529	0.263155	0.002010	0.9984

R-squared	0.788813	Mean dependent var	-0.007795
Adjusted R-squared	0.771214	S.D. dependent var	2.852020
S.E. of regression	1.364165	Akaike info criterion	3.563401
Sum squared resid	44.66269	Schwarz criterion	3.707383
Log likelihood	-45.10591	Hannan-Quinn criter.	3.606214
F-statistic	44.82177	Durbin-Watson stat	1.949729
Prob(F-statistic)	0.000000		

First Difference, Trend and Intercept

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.337904	0.0001
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 01/22/19 Time: 13:21
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-2.061650	0.325289	-6.337904	0.0000
D(INF(-1),2)	0.365893	0.186129	1.965804	0.0615
C	0.267185	0.615132	0.434354	0.6681
@TREND("1987")	-0.016608	0.034500	-0.481383	0.6348

R-squared	0.790920	Mean dependent var	-0.007795
Adjusted R-squared	0.763649	S.D. dependent var	2.852020
S.E. of regression	1.386538	Akaike info criterion	3.627450
Sum squared resid	44.21719	Schwarz criterion	3.819426
Log likelihood	-44.97058	Hannan-Quinn criter.	3.684535
F-statistic	29.00189	Durbin-Watson stat	1.949848
Prob(F-statistic)	0.000000		

Variable: LOG_GEXP

Level and Intercept

Null Hypothesis: LOG_GEXP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.925089	0.7655
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_GEXP)
Method: Least Squares
Date: 01/22/19 Time: 13:21
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GEXP(-1)	-0.012370	0.013371	-0.925089	0.3631
C	0.391204	0.327936	1.192927	0.2433

R-squared	0.030722	Mean dependent var	0.087987
Adjusted R-squared	-0.005177	S.D. dependent var	0.055948
S.E. of regression	0.056092	Akaike info criterion	-2.857161
Sum squared resid	0.084952	Schwarz criterion	-2.762864
Log likelihood	43.42883	Hannan-Quinn criter.	-2.827628
F-statistic	0.855789	Durbin-Watson stat	2.008058
Prob(F-statistic)	0.363115		

Level, Trend and Intercept

Null Hypothesis: LOG_GEXP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.004845	0.5744
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_GEXP)
Method: Least Squares
Date: 01/22/19 Time: 13:21
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GEXP(-1)	-0.335220	0.167205	-2.004845	0.0555
C	7.853059	3.865924	2.031354	0.0526
@TREND("1987")	0.030147	0.015568	1.936495	0.0637

R-squared	0.152900	Mean dependent var	0.087987
Adjusted R-squared	0.087739	S.D. dependent var	0.055948
S.E. of regression	0.053437	Akaike info criterion	-2.922928
Sum squared resid	0.074243	Schwarz criterion	-2.781484
Log likelihood	45.38246	Hannan-Quinn criter.	-2.878629
F-statistic	2.346482	Durbin-Watson stat	1.695749
Prob(F-statistic)	0.115651		

First Difference and Intercept

Null Hypothesis: D(LOG_GEXP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.021307	0.0004
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_GEXP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:21
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GEXP(-1))	-1.015458	0.202230	-5.021307	0.0000
C	0.089444	0.021343	4.190809	0.0003

R-squared	0.492322	Mean dependent var	-0.002483
Adjusted R-squared	0.472796	S.D. dependent var	0.079952
S.E. of regression	0.058052	Akaike info criterion	-2.786195
Sum squared resid	0.087622	Schwarz criterion	-2.691037
Log likelihood	41.00672	Hannan-Quinn criter.	-2.757104
F-statistic	25.21352	Durbin-Watson stat	1.925426
Prob(F-statistic)	0.000032		

First Difference, Trend and Intercept

Null Hypothesis: D(LOG_GEXP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.035215	0.0019
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_GEXP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:22
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GEXP(-1))	-1.028169	0.204196	-5.035215	0.0000
C	0.107782	0.031241	3.450012	0.0020
@TREND("1987")	-0.001109	0.001371	-0.808603	0.4264

R-squared	0.505261	Mean dependent var	-0.002483
Adjusted R-squared	0.465682	S.D. dependent var	0.079952
S.E. of regression	0.058443	Akaike info criterion	-2.740583
Sum squared resid	0.085389	Schwarz criterion	-2.597847
Log likelihood	41.36817	Hannan-Quinn criter.	-2.696947
F-statistic	12.76584	Durbin-Watson stat	1.944925
Prob(F-statistic)	0.000151		

Variable: GDP

Level and Intercept

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.386508	0.0017
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 01/22/19 Time: 13:22
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.835876	0.190556	-4.386508	0.0002
C	5.113865	1.383800	3.695522	0.0010

R-squared	0.416108	Mean dependent var	-0.040303
Adjusted R-squared	0.394483	S.D. dependent var	5.058420
S.E. of regression	3.936209	Akaike info criterion	5.644785
Sum squared resid	418.3311	Schwarz criterion	5.739082
Log likelihood	-79.84939	Hannan-Quinn criter.	5.674318
F-statistic	19.24145	Durbin-Watson stat	1.906927
Prob(F-statistic)	0.000158		

Level, Trend and Intercept

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.092713	0.0016
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDP)
Method: Least Squares
Date: 01/22/19 Time: 13:22
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.984028	0.193223	-5.092713	0.0000
C	8.800868	2.196272	4.007185	0.0005
@TREND("1987")	-0.184898	0.088586	-2.087209	0.0468

R-squared	0.499902	Mean dependent var	-0.040303
Adjusted R-squared	0.461433	S.D. dependent var	5.058420
S.E. of regression	3.712228	Akaike info criterion	5.558839
Sum squared resid	358.2965	Schwarz criterion	5.700283
Log likelihood	-77.60316	Hannan-Quinn criter.	5.603137
F-statistic	12.99492	Durbin-Watson stat	1.961715
Prob(F-statistic)	0.000122		

First Difference and Intercept

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.607007	0.0000
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:22
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-2.108171	0.277135	-7.607007	0.0000
D(GDP(-1),2)	0.550045	0.166910	3.295463	0.0030
C	-0.268107	0.802365	-0.334146	0.7412

R-squared	0.779070	Mean dependent var	0.002633
Adjusted R-squared	0.760659	S.D. dependent var	8.516265
S.E. of regression	4.166367	Akaike info criterion	5.796405

Sum squared resid	416.6067	Schwarz criterion	5.940387
Log likelihood	-75.25147	Hannan-Quinn criter.	5.839218
F-statistic	42.31586	Durbin-Watson stat	2.184298
Prob(F-statistic)	0.000000		

First Difference, Trend and Intercept

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.453922	0.0000
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:23
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-2.109093	0.282951	-7.453922	0.0000
D(GDP(-1),2)	0.550011	0.170384	3.228078	0.0037
C	-0.566397	1.872022	-0.302559	0.7649
@TREND("1987")	0.018632	0.105147	0.177202	0.8609

R-squared	0.779371	Mean dependent var	0.002633
Adjusted R-squared	0.750594	S.D. dependent var	8.516265
S.E. of regression	4.253074	Akaike info criterion	5.869115
Sum squared resid	416.0387	Schwarz criterion	6.061091
Log likelihood	-75.23305	Hannan-Quinn criter.	5.926199
F-statistic	27.08251	Durbin-Watson stat	2.185669
Prob(F-statistic)	0.000000		

Variable: INTR

Level and Intercept

Null Hypothesis: INTR has a unit root

Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.469254	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTR)
Method: Least Squares
Date: 01/22/19 Time: 13:23
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTR(-1)	-1.216133	0.187987	-6.469254	0.0000
C	4.452053	0.959658	4.639207	0.0001

R-squared	0.607850	Mean dependent var	-0.005242
Adjusted R-squared	0.593326	S.D. dependent var	5.640972
S.E. of regression	3.597303	Akaike info criterion	5.464718
Sum squared resid	349.3960	Schwarz criterion	5.559014
Log likelihood	-77.23841	Hannan-Quinn criter.	5.494251
F-statistic	41.85124	Durbin-Watson stat	1.864705
Prob(F-statistic)	0.000001		

Level, Trend and Intercept

Null Hypothesis: INTR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.653361	0.0000
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTR)
Method: Least Squares

Date: 01/22/19 Time: 13:23
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTR(-1)	-1.372097	0.179280	-7.653361	0.0000
C	8.084672	1.608293	5.026866	0.0000
@TREND("1987")	-0.204066	0.076144	-2.680007	0.0126

R-squared	0.692732	Mean dependent var	-0.005242
Adjusted R-squared	0.669096	S.D. dependent var	5.640972
S.E. of regression	3.244926	Akaike info criterion	5.289759
Sum squared resid	273.7682	Schwarz criterion	5.431204
Log likelihood	-73.70151	Hannan-Quinn criter.	5.334058
F-statistic	29.30837	Durbin-Watson stat	1.957874
Prob(F-statistic)	0.000000		

First Difference and Intercept

Null Hypothesis: D(INTR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.263341	0.0000
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:23
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTR(-1))	-2.633696	0.318720	-8.263341	0.0000
D(INTR(-1),2)	0.535992	0.172267	3.111403	0.0048
C	-0.095872	0.689028	-0.139141	0.8905

R-squared	0.897982	Mean dependent var	-0.044337
Adjusted R-squared	0.889481	S.D. dependent var	10.76908
S.E. of regression	3.580124	Akaike info criterion	5.493111
Sum squared resid	307.6149	Schwarz criterion	5.637093
Log likelihood	-71.15700	Hannan-Quinn criter.	5.535924

F-statistic	105.6264	Durbin-Watson stat	2.234957
Prob(F-statistic)	0.000000		

First Difference, Trend and Intercept

Null Hypothesis: D(INTR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.094620	0.0000
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:24
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTR(-1))	-2.634150	0.325420	-8.094620	0.0000
D(INTR(-1),2)	0.535859	0.175883	3.046681	0.0057
C	-0.319310	1.608065	-0.198568	0.8443
@TREND("1987")	0.013964	0.090373	0.154519	0.8785

R-squared	0.898088	Mean dependent var	-0.044337
Adjusted R-squared	0.884795	S.D. dependent var	10.76908
S.E. of regression	3.655228	Akaike info criterion	5.566148
Sum squared resid	307.2959	Schwarz criterion	5.758123
Log likelihood	-71.14299	Hannan-Quinn criter.	5.623232
F-statistic	67.56154	Durbin-Watson stat	2.236198
Prob(F-statistic)	0.000000		

Phillips-Perron (PP) Test

Variable: LOG_EXCR

Level and Intercept

Null Hypothesis: LOG_EXCR has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.906029	0.3250
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Residual variance (no correction)	0.002596
HAC corrected variance (Bartlett kernel)	0.001831

Phillips-Perron Test Equation
Dependent Variable: D(LOG_EXCR)
Method: Least Squares
Date: 01/22/19 Time: 13:24
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCR(-1)	-0.168600	0.086191	-1.956110	0.0609
C	0.770305	0.401634	1.917928	0.0658

R-squared	0.124126	Mean dependent var	-0.015101
Adjusted R-squared	0.091687	S.D. dependent var	0.055408
S.E. of regression	0.052807	Akaike info criterion	-2.977876
Sum squared resid	0.075291	Schwarz criterion	-2.883580
Log likelihood	45.17920	Hannan-Quinn criter.	-2.948344
F-statistic	3.826366	Durbin-Watson stat	1.651989
Prob(F-statistic)	0.060871		

Level, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.648629	0.2634
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Residual variance (no correction)	0.002333
HAC corrected variance (Bartlett kernel)	0.002576

Phillips-Perron Test Equation
Dependent Variable: D(LOG_EXCR)
Method: Least Squares
Date: 01/22/19 Time: 13:24
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXCR(-1)	-0.357381	0.138211	-2.585759	0.0157
C	1.697969	0.666628	2.547101	0.0171
@TREND("1987")	-0.003216	0.001879	-1.711342	0.0989

R-squared	0.212798	Mean dependent var	-0.015101
Adjusted R-squared	0.152244	S.D. dependent var	0.055408
S.E. of regression	0.051016	Akaike info criterion	-3.015648
Sum squared resid	0.067669	Schwarz criterion	-2.874204
Log likelihood	46.72689	Hannan-Quinn criter.	-2.971349
F-statistic	3.514193	Durbin-Watson stat	1.533019
Prob(F-statistic)	0.044578		

First Difference and Intercept

Null Hypothesis: D(LOG_EXCR) has a unit root
Exogenous: Constant
Bandwidth: 27 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.875979	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	

	10% level	-2.625121	

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

Residual variance (no correction)	0.002793
HAC corrected variance (Bartlett kernel)	0.000291

Phillips-Perron Test Equation
Dependent Variable: D(LOG_EXCR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:25
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_EXCR(-1))	-0.905205	0.187982	-4.815387	0.0001
C	-0.010830	0.010696	-1.012496	0.3206

R-squared	0.471415	Mean dependent var	0.001912
Adjusted R-squared	0.451085	S.D. dependent var	0.074020
S.E. of regression	0.054841	Akaike info criterion	-2.900014
Sum squared resid	0.078195	Schwarz criterion	-2.804856
Log likelihood	42.60019	Hannan-Quinn criter.	-2.870923
F-statistic	23.18796	Durbin-Watson stat	1.932475
Prob(F-statistic)	0.000055		

First Difference, Trend and Intercept

Null Hypothesis: D(LOG_EXCR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 27 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.357432	0.0000
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

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

Residual variance (no correction)	0.002793
HAC corrected variance (Bartlett kernel)	0.000292

Phillips-Perron Test Equation

Dependent Variable: D(LOG_EXCR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:25
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_EXCR(-1))	-0.905039	0.193644	-4.673719	0.0001
C	-0.010703	0.023550	-0.454500	0.6534
@TREND("1987")	-8.03E-06	0.001322	-0.006077	0.9952

R-squared	0.471416	Mean dependent var	0.001912
Adjusted R-squared	0.429129	S.D. dependent var	0.074020
S.E. of regression	0.055927	Akaike info criterion	-2.828587
Sum squared resid	0.078195	Schwarz criterion	-2.685850
Log likelihood	42.60021	Hannan-Quinn criter.	-2.784951
F-statistic	11.14809	Durbin-Watson stat	1.932716
Prob(F-statistic)	0.000346		

Variable: INF

Level and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.832183	0.0005
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Residual variance (no correction)	1.400440
HAC corrected variance (Bartlett kernel)	1.708315

Phillips-Perron Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 01/22/19 Time: 13:25
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.854915	0.178563	-4.787746	0.0001
C	2.365273	0.532004	4.445968	0.0001

R-squared	0.459162	Mean dependent var	0.063367
Adjusted R-squared	0.439131	S.D. dependent var	1.637641
S.E. of regression	1.226449	Akaike info criterion	3.312595
Sum squared resid	40.61277	Schwarz criterion	3.406891
Log likelihood	-46.03262	Hannan-Quinn criter.	3.342127
F-statistic	22.92251	Durbin-Watson stat	2.015291
Prob(F-statistic)	0.000054		

Level, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.248983	0.0011
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Residual variance (no correction)	1.246146
HAC corrected variance (Bartlett kernel)	1.155120

Phillips-Perron Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 01/22/19 Time: 13:25
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.913776	0.174755	-5.228899	0.0000
C	3.240743	0.706834	4.584872	0.0001
@TREND("1987")	-0.047799	0.026640	-1.794229	0.0844

R-squared	0.518749	Mean dependent var	0.063367
Adjusted R-squared	0.481730	S.D. dependent var	1.637641
S.E. of regression	1.178954	Akaike info criterion	3.264829
Sum squared resid	36.13822	Schwarz criterion	3.406273
Log likelihood	-44.34002	Hannan-Quinn criter.	3.309127
F-statistic	14.01294	Durbin-Watson stat	2.122294
Prob(F-statistic)	0.000074		

First Difference and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.32838	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Residual variance (no correction)	1.916498
HAC corrected variance (Bartlett kernel)	1.130993

Phillips-Perron Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 01/22/19 Time: 13:25
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-1.467376	0.165787	-8.850985	0.0000
C	0.014586	0.271706	0.053684	0.9576

R-squared	0.750814	Mean dependent var	-0.079296
Adjusted R-squared	0.741230	S.D. dependent var	2.824164
S.E. of regression	1.436635	Akaike info criterion	3.631234
Sum squared resid	53.66195	Schwarz criterion	3.726391
Log likelihood	-48.83728	Hannan-Quinn criter.	3.660325
F-statistic	78.33994	Durbin-Watson stat	2.398280
Prob(F-statistic)	0.000000		

First Difference, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.18482	0.0000
Test critical values:	1% level	-4.323979	

	5% level	-3.580623	
	10% level	-3.225334	

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

Residual variance (no correction)	1.895656
HAC corrected variance (Bartlett kernel)	1.112436

Phillips-Perron Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 01/22/19 Time: 13:26
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-1.477850	0.169331	-8.727595	0.0000
C	0.294224	0.600363	0.490077	0.6284
@TREND("1987")	-0.017998	0.034329	-0.524276	0.6047

R-squared	0.753524	Mean dependent var	-0.079296
Adjusted R-squared	0.733806	S.D. dependent var	2.824164
S.E. of regression	1.457098	Akaike info criterion	3.691728
Sum squared resid	53.07838	Schwarz criterion	3.834464
Log likelihood	-48.68419	Hannan-Quinn criter.	3.735364
F-statistic	38.21496	Durbin-Watson stat	2.408828
Prob(F-statistic)	0.000000		

Variable: LOG_GEXP

Level and Intercept

Null Hypothesis: LOG_GEXP has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.011350	0.7357
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Residual variance (no correction)	0.002929
HAC corrected variance (Bartlett kernel)	0.002215

Phillips-Perron Test Equation
Dependent Variable: D(LOG_GEXP)
Method: Least Squares
Date: 01/22/19 Time: 13:26
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GEXP(-1)	-0.012370	0.013371	-0.925089	0.3631
C	0.391204	0.327936	1.192927	0.2433

R-squared	0.030722	Mean dependent var	0.087987
Adjusted R-squared	-0.005177	S.D. dependent var	0.055948
S.E. of regression	0.056092	Akaike info criterion	-2.857161
Sum squared resid	0.084952	Schwarz criterion	-2.762864
Log likelihood	43.42883	Hannan-Quinn criter.	-2.827628
F-statistic	0.855789	Durbin-Watson stat	2.008058
Prob(F-statistic)	0.363115		

Level, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.292982	0.4243
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Residual variance (no correction)	0.002560
HAC corrected variance (Bartlett kernel)	0.003170

Phillips-Perron Test Equation
Dependent Variable: D(LOG_GEXP)
Method: Least Squares
Date: 01/22/19 Time: 13:26
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LOG_GEXP(-1)	-0.335220	0.167205	-2.004845	0.0555
C	7.853059	3.865924	2.031354	0.0526
@TREND("1987")	0.030147	0.015568	1.936495	0.0637

R-squared	0.152900	Mean dependent var	0.087987
Adjusted R-squared	0.087739	S.D. dependent var	0.055948
S.E. of regression	0.053437	Akaike info criterion	-2.922928
Sum squared resid	0.074243	Schwarz criterion	-2.781484
Log likelihood	45.38246	Hannan-Quinn criter.	-2.878629
F-statistic	2.346482	Durbin-Watson stat	1.695749
Prob(F-statistic)	0.115651		

First Difference and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.010635	0.0004
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Residual variance (no correction)	0.003129
HAC corrected variance (Bartlett kernel)	0.002345

Phillips-Perron Test Equation
Dependent Variable: D(LOG_GEXP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:26
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GEXP(-1))	-1.015458	0.202230	-5.021307	0.0000
C	0.089444	0.021343	4.190809	0.0003

R-squared	0.492322	Mean dependent var	-0.002483
Adjusted R-squared	0.472796	S.D. dependent var	0.079952
S.E. of regression	0.058052	Akaike info criterion	-2.786195
Sum squared resid	0.087622	Schwarz criterion	-2.691037
Log likelihood	41.00672	Hannan-Quinn criter.	-2.757104
F-statistic	25.21352	Durbin-Watson stat	1.925426
Prob(F-statistic)	0.000032		

First Difference, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.022410	0.0020
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

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

Residual variance (no correction)	0.003050
HAC corrected variance (Bartlett kernel)	0.002718

Phillips-Perron Test Equation
Dependent Variable: D(LOG_GEXP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:27
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GEXP(-1))	-1.028169	0.204196	-5.035215	0.0000
C	0.107782	0.031241	3.450012	0.0020
@TREND("1987")	-0.001109	0.001371	-0.808603	0.4264

R-squared	0.505261	Mean dependent var	-0.002483
Adjusted R-squared	0.465682	S.D. dependent var	0.079952
S.E. of regression	0.058443	Akaike info criterion	-2.740583
Sum squared resid	0.085389	Schwarz criterion	-2.597847
Log likelihood	41.36817	Hannan-Quinn criter.	-2.696947
F-statistic	12.76584	Durbin-Watson stat	1.944925
Prob(F-statistic)	0.000151		

<u>Variable: GDP</u>

Level and Intercept

Null Hypothesis: GDP has a unit root
Exogenous: Constant

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.399499	0.0017
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Residual variance (no correction)	14.42521
HAC corrected variance (Bartlett kernel)	14.81484

Phillips-Perron Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 01/22/19 Time: 13:27
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.835876	0.190556	-4.386508	0.0002
C	5.113865	1.383800	3.695522	0.0010

R-squared	0.416108	Mean dependent var	-0.040303
Adjusted R-squared	0.394483	S.D. dependent var	5.058420
S.E. of regression	3.936209	Akaike info criterion	5.644785
Sum squared resid	418.3311	Schwarz criterion	5.739082
Log likelihood	-79.84939	Hannan-Quinn criter.	5.674318
F-statistic	19.24145	Durbin-Watson stat	1.906927
Prob(F-statistic)	0.000158		

Level, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.092713	0.0016
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Residual variance (no correction)	12.35505
HAC corrected variance (Bartlett kernel)	12.35505

Phillips-Perron Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 01/22/19 Time: 13:27
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.984028	0.193223	-5.092713	0.0000
C	8.800868	2.196272	4.007185	0.0005
@TREND("1987")	-0.184898	0.088586	-2.087209	0.0468

R-squared	0.499902	Mean dependent var	-0.040303
Adjusted R-squared	0.461433	S.D. dependent var	5.058420
S.E. of regression	3.712228	Akaike info criterion	5.558839
Sum squared resid	358.2965	Schwarz criterion	5.700283
Log likelihood	-77.60316	Hannan-Quinn criter.	5.603137
F-statistic	12.99492	Durbin-Watson stat	1.961715
Prob(F-statistic)	0.000122		

First Difference and Intercept

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-17.92540	0.0001
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Residual variance (no correction)	21.64454
HAC corrected variance (Bartlett kernel)	1.868678

Phillips-Perron Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:27

Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.351793	0.180450	-7.491218	0.0000
C	-0.208741	0.912408	-0.228780	0.8208

R-squared	0.683384	Mean dependent var	-0.191330
Adjusted R-squared	0.671206	S.D. dependent var	8.419857
S.E. of regression	4.827991	Akaike info criterion	6.055487
Sum squared resid	606.0470	Schwarz criterion	6.150645
Log likelihood	-82.77682	Hannan-Quinn criter.	6.084578
F-statistic	56.11835	Durbin-Watson stat	2.407759
Prob(F-statistic)	0.000000		

First Difference, Trend and Intercept

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-18.12751	0.0000
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

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

Residual variance (no correction)	21.63830
HAC corrected variance (Bartlett kernel)	1.713096

Phillips-Perron Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 01/22/19 Time: 13:27
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.351413	0.184052	-7.342573	0.0000
C	-0.360365	2.013478	-0.178976	0.8594
@TREND("1987")	0.009782	0.115207	0.084912	0.9330

R-squared	0.683475	Mean dependent var	-0.191330
Adjusted R-squared	0.658153	S.D. dependent var	8.419857

S.E. of regression	4.922895	Akaike info criterion	6.126628
Sum squared resid	605.8723	Schwarz criterion	6.269364
Log likelihood	-82.77279	Hannan-Quinn criter.	6.170263
F-statistic	26.99136	Durbin-Watson stat	2.408856
Prob(F-statistic)	0.000001		

Variable: INTR

Level and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.395064	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Residual variance (no correction)	12.04814
HAC corrected variance (Bartlett kernel)	21.99432

Phillips-Perron Test Equation
Dependent Variable: D(INTR)
Method: Least Squares
Date: 01/22/19 Time: 13:28
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTR(-1)	-1.216133	0.187987	-6.469254	0.0000
C	4.452053	0.959658	4.639207	0.0001

R-squared	0.607850	Mean dependent var	-0.005242
Adjusted R-squared	0.593326	S.D. dependent var	5.640972
S.E. of regression	3.597303	Akaike info criterion	5.464718
Sum squared resid	349.3960	Schwarz criterion	5.559014
Log likelihood	-77.23841	Hannan-Quinn criter.	5.494251
F-statistic	41.85124	Durbin-Watson stat	1.864705
Prob(F-statistic)	0.000001		

Level, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.409443	0.0000
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

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

Residual variance (no correction)	9.440282
HAC corrected variance (Bartlett kernel)	11.63330

Phillips-Perron Test Equation
Dependent Variable: D(INTR)
Method: Least Squares
Date: 01/22/19 Time: 13:28
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTR(-1)	-1.372097	0.179280	-7.653361	0.0000
C	8.084672	1.608293	5.026866	0.0000
@TREND("1987")	-0.204066	0.076144	-2.680007	0.0126

R-squared	0.692732	Mean dependent var	-0.005242
Adjusted R-squared	0.669096	S.D. dependent var	5.640972
S.E. of regression	3.244926	Akaike info criterion	5.289759
Sum squared resid	273.7682	Schwarz criterion	5.431204
Log likelihood	-73.70151	Hannan-Quinn criter.	5.334058
F-statistic	29.30837	Durbin-Watson stat	1.957874
Prob(F-statistic)	0.000000		

First Difference and Intercept

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

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-19.41060	0.0001

Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Residual variance (no correction)	15.44147
HAC corrected variance (Bartlett kernel)	5.209370

Phillips-Perron Test Equation
Dependent Variable: D(INTR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:28
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTR(-1))	-1.713562	0.137088	-12.49973	0.0000
C	-0.046751	0.770732	-0.060658	0.9521

R-squared	0.857334	Mean dependent var	-0.186465
Adjusted R-squared	0.851846	S.D. dependent var	10.59450
S.E. of regression	4.077901	Akaike info criterion	5.717791
Sum squared resid	432.3611	Schwarz criterion	5.812948
Log likelihood	-78.04907	Hannan-Quinn criter.	5.746881
F-statistic	156.2433	Durbin-Watson stat	2.767562
Prob(F-statistic)	0.000000		

First Difference, Trend and Intercept

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

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-19.02118	0.0000
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

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

Residual variance (no correction)	15.43775
HAC corrected variance (Bartlett kernel)	5.192479

Phillips-Perron Test Equation
Dependent Variable: D(INTR,2)
Method: Least Squares
Date: 01/22/19 Time: 13:28
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTR(-1))	-1.713604	0.139787	-12.25868	0.0000
C	-0.163675	1.700355	-0.096259	0.9241
@TREND("1987")	0.007544	0.097283	0.077544	0.9388

R-squared	0.857368	Mean dependent var	-0.186465
Adjusted R-squared	0.845957	S.D. dependent var	10.59450
S.E. of regression	4.158159	Akaike info criterion	5.788979
Sum squared resid	432.2571	Schwarz criterion	5.931715
Log likelihood	-78.04570	Hannan-Quinn criter.	5.832615
F-statistic	75.13806	Durbin-Watson stat	2.768230
Prob(F-statistic)	0.000000		

APPENDIX 9: GRANGER CAUSALITY TEST

Pairwise Granger Causality Tests
Date: 01/25/19 Time: 13:43
Sample: 1987 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause LOG_EXCR	28	0.37544	0.6911
LOG_EXCR does not Granger Cause INF		2.54148	0.1006
LOG_GEXP does not Granger Cause LOG_EXCR	28	1.91752	0.1697
LOG_EXCR does not Granger Cause LOG_GEXP		2.84025	0.0790
GDP does not Granger Cause LOG_EXCR	28	0.00442	0.9956
LOG_EXCR does not Granger Cause GDP		1.40991	0.2645
INTR does not Granger Cause LOG_EXCR	28	0.40976	0.6686
LOG_EXCR does not Granger Cause INTR		4.11780	0.0296
LOG_GEXP does not Granger Cause INF	28	1.56686	0.2302
INF does not Granger Cause LOG_GEXP		0.28575	0.7541
GDP does not Granger Cause INF	28	3.52857	0.0461
INF does not Granger Cause GDP		0.47973	0.6250
INTR does not Granger Cause INF	28	1.35328	0.2782
INF does not Granger Cause INTR		8.53424	0.0017

GDP does not Granger Cause LOG_GEXP	28	2.04882	0.1518
LOG_GEXP does not Granger Cause GDP		2.17493	0.1364
INTR does not Granger Cause LOG_GEXP	28	0.39711	0.6768
LOG_GEXP does not Granger Cause INTR		3.30026	0.0549
INTR does not Granger Cause GDP	28	1.84680	0.1804
GDP does not Granger Cause INTR		6.72272	0.0050

APPENDIX 10: JOHANSEN CO-INTEGRATION TEST

Date: 01/25/19 Time: 13:48
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments
Trend assumption: Linear deterministic trend
Series: LOG_EXCR INF LOG_GEXP GDP INTR
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.932952	132.2418	69.81889	0.0000
At most 1 *	0.693309	59.27861	47.85613	0.0030
At most 2	0.515615	27.36689	29.79707	0.0930
At most 3	0.214652	7.795236	15.49471	0.4876
At most 4	0.045993	1.271279	3.841466	0.2595

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.932952	72.96323	33.87687	0.0000
At most 1 *	0.693309	31.91173	27.58434	0.0130
At most 2	0.515615	19.57165	21.13162	0.0814
At most 3	0.214652	6.523958	14.26460	0.5469
At most 4	0.045993	1.271279	3.841466	0.2595

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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

LOG_EXCR	INF	LOG_GEXP	GDP	INTR

8.125833	-1.473869	0.684475	0.057094	0.245015
5.124426	-0.519982	-2.263225	-0.113850	-0.814026
5.519582	-0.026882	-1.272778	-0.725907	0.055673
-23.22153	-0.311047	-1.108013	0.483693	0.625556
-10.70805	-0.444270	-0.006261	0.068855	0.066193

Unrestricted Adjustment Coefficients (alpha):

D(LOG_EXCR)	-0.029349	0.005896	0.003689	-0.003315	0.006186
D(INF)	0.481986	0.571029	-0.350341	0.175174	0.047851
D(LOG_GEXP)	-0.018992	0.014525	0.031182	0.001721	0.003601
D(GDP)	-0.274965	0.155974	1.571751	-0.385494	0.447788
D(INTR)	-1.129599	0.003193	-0.173763	-0.869110	-0.194102

1 Cointegrating Equation(s): Log likelihood -17.26984

Normalized cointegrating coefficients (standard error in parentheses)

LOG_EXCR	INF	LOG_GEXP	GDP	INTR
1.000000	-0.181381	0.084234	0.007026	0.030153
	(0.01407)	(0.02444)	(0.00570)	(0.00735)

Adjustment coefficients (standard error in parentheses)

D(LOG_EXCR)	-0.238483
	(0.06706)
D(INF)	3.916542
	(2.01000)
D(LOG_GEXP)	-0.154327
	(0.10515)
D(GDP)	-2.234319
	(6.59601)
D(INTR)	-9.178929
	(4.44496)

2 Cointegrating Equation(s): Log likelihood -1.313978

Normalized cointegrating coefficients (standard error in parentheses)

LOG_EXCR	INF	LOG_GEXP	GDP	INTR
1.000000	0.000000	-1.109442	-0.059351	-0.398855
		(0.21866)	(0.05017)	(0.06546)
0.000000	1.000000	-6.581056	-0.365957	-2.365235
		(1.23146)	(0.28253)	(0.36869)

Adjustment coefficients (standard error in parentheses)

D(LOG_EXCR)	-0.208270	0.040190
	(0.07793)	(0.01268)
D(INF)	6.842739	-1.007310
	(1.90804)	(0.31042)
D(LOG_GEXP)	-0.079892	0.020439
	(0.11898)	(0.01936)
D(GDP)	-1.435044	0.324159
	(7.78848)	(1.26710)
D(INTR)	-9.162568	1.663220
	(5.25502)	(0.85493)

3 Cointegrating Equation(s):	Log likelihood	8.471847		

Normalized cointegrating coefficients (standard error in parentheses)

LOG_EXCR	INF	LOG_GEXP	GDP	INTR
1.000000	0.000000	0.000000	-0.156232	0.121833
			(0.03467)	(0.04083)
0.000000	1.000000	0.000000	-0.940642	0.723414
			(0.21242)	(0.25019)
0.000000	0.000000	1.000000	-0.087324	0.469324
			(0.05677)	(0.06687)

Adjustment coefficients (standard error in parentheses)

D(LOG_EXCR)	-0.187907	0.040091	-0.038128
	(0.08925)	(0.01259)	(0.02163)
D(INF)	4.909004	-0.997892	-0.516554
	(1.95908)	(0.27639)	(0.47481)
D(LOG_GEXP)	0.092218	0.019601	-0.085561
	(0.10427)	(0.01471)	(0.02527)
D(GDP)	7.240367	0.281908	-2.541700
	(7.77614)	(1.09709)	(1.88466)
D(INTR)	-10.12166	1.667891	-0.559247
	(6.04022)	(0.85218)	(1.46393)

4 Cointegrating Equation(s):	Log likelihood	11.73383		

Normalized cointegrating coefficients (standard error in parentheses)

LOG_EXCR	INF	LOG_GEXP	GDP	INTR
1.000000	0.000000	0.000000	0.000000	-0.063851
				(0.01333)
0.000000	1.000000	0.000000	0.000000	-0.394551
				(0.08197)
0.000000	0.000000	1.000000	0.000000	0.365538
				(0.04064)
0.000000	0.000000	0.000000	1.000000	-1.188512
				(0.26696)

Adjustment coefficients (standard error in parentheses)

D(LOG_EXCR)	-0.110925	0.041122	-0.034454	-0.006628
	(0.20609)	(0.01277)	(0.02327)	(0.00706)
D(INF)	0.841199	-1.052380	-0.710649	0.301552
	(4.39811)	(0.27244)	(0.49655)	(0.15069)
D(LOG_GEXP)	0.052248	0.019065	-0.087469	-0.024541
	(0.24186)	(0.01498)	(0.02731)	(0.00829)
D(GDP)	16.19213	0.401815	-2.114568	-1.360863
	(17.8756)	(1.10729)	(2.01819)	(0.61246)
D(INTR)	10.06039	1.938226	0.403738	-0.359103
	(12.7835)	(0.79186)	(1.44328)	(0.43799)