TIME SERIES MODELING OF THE EFFECTS OF SOME MACROECONOMIC INDICES ON ECONOMIC GROWTH IN NIGERIA

BY

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NSU/MSC/STA/0011/17/18

M.S.c. STATISTICS

JULY, 2019

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POST GRADUATE STUDIES, NASARAWA STATE UNIVERSITY, KEFFI IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF MASTERS OF SCIENCE (M.Sc.) IN STATISTICS

DEPARTMENT OF STATISTICS
FACULTY OF NATURAL AND APPLIED SCIENCES
NASARAWA STATE UNIVERSITY, KEFFI,
NIGERIA

JULY, 2019

DECLARATION

I hereby declare that this dissertation has been written by me and it is a report of my research work. It has not been presented in any previous application for Masters of Science (M.Sc.) Degree in Statistics. All quotations are indicated and sources of information specifically acknowledge by means of references.

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CERTIFICATION

The Dissertation(Statistical Modeling of the Effects of some Macroeconomic Indices on Economic Growth in Nigeria) meets the regulations governing the award of Master of Science (M.Sc.) Degree in Statistics of the School of Postgraduate Studies, Nasarawa State University, Keffi, and is approved for its contribution to knowledge.

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DEDICATION

This project work is dedicated to Almighty ALLAH who in HIS infinite mercy, grand me the privilege to carry out this research work. To HIM all praises.

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My sincere appreciation goes to Almighty Allah for the life and His protection throughout my academic program.

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ABSTRACT

The determinants of economic growth have attracted increasing attention in both theoretical and empirical research. In this dissertation, a Time Series Modeling of the effects of exchange rate, government expenditure and labour force on real gross domestic product (RGDP) was conducted. Data between 1992 to 2017 was obtained from Central Bank of Nigeria (CBN) Statistical Bulletin. Johansen Co-integration test show that one co-integrating equation exists among the variables under study, which indicated a long run relation among the variables. Vector Error Correction Model (VECM) was utilized to fit the long run model of the relationship among the macroeconomic variables. From the findings, exchange rate has a significant negative effect on economic growth in Nigeria in a long run, a unit increase in exchange rate corresponds to -0.53 decrease in economic growth while labour force and government expenditure has a significant positive effect on economic in Nigeria in the long run. A unit increase in labour force accounts 3.36 increases in economic growth, Also, a unit increase in government expenditure will cause an increase of 1.21 in economic growth. It is recommended that Nigerian government should increase its expenditure and establish empowerment programmes that create more jobs in order to further drive economic growth.

Keywords: exchange rate, government expenditure, labour force, economic growth, vector error correction model,

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

One of the objectives of a nation is to achieve higher economic growth. There is no doubt that Nigeria economy has experience a higher growth rate in the last decade. The economic development or growth of a country is measured by the increase in its gross domestic product (GDP). According to Jhingan (1997), economic growth occurs when an economy's productive capacity increases, which in turn is used to produce more goods and services. Crude oil production in Nigeria account for more than 80 percent of the total income earn by the country and there are other factors apart from crude oil in Nigeria that also contribute to economy growth these factors are; money supply, agricultural export, foreign private investment, federal government expenditure, interest rate, etc. (Charles, 2015). The impact of these factors cannot be overemphasize and this is based on the fact that apart from crude oil revenue that contribute a large part to the growth rate of the Nigeria, these factors are of important to the GDP.

Solow suggests that much of the growth in an economy is explained by changes in the amount of labour. The endogenous growth theorists emphasize the importance of knowledge capital (Romer, 1986), human capital (Lucas, 1988), learning by doing (Stokey, 1988), and research and development, and horizontal/vertical innovation (Aghion and Howitt, 1992) in the long-run growth of an economy. In addition, other schools have highlighted the significant role of non-economic factors such as institutional structures, legal and political systems, and socio-cultural factors in

economic growth (North and Thomas, 1973).

1.2 Statement of the Problem

One of the greatest problem Nigeria is currently facing is the problem of recession, very poor economy situation (Mustapha, et al, 2017). Nigeria has experience the period of boom (prosperity) in the past, recession and recovery. Today, Nigeria has gone through that cycle again and now in the period of recession (Mustapha, et al, 2017). The big question now is how did Nigeria get to where we are today and what should stakeholders do, especially the policy makers to take us out from this predicament, when will Nigeria beginning to recover and what should be done for Nigeria to begin the recovery process?

Over the years, a number of policies or programmes including the recent NPOWER scheme have been initiated by the Nigeria government aimed at improving the productivity of the country so as to achieve economic growth. It is known that one of the important economic growth indicator or one of the most important variables used in measuring economic wellbeing of any economy is the GDP of that nation but more importantly is the GDP per capita, which measure the real GDP of that nation. So, GDP per capita (RGDP) is used as a proxy for measuring the economic wellbeing of Nigeria. So, knowing the factors that can positively affect the real GDP is a major concern. All these put together, stimulated the impression of carrying out this research.

1.3 Research Questions

(i). What are the effects of exchange rate, government expenditure and labour

force on real gross domestic product in Nigeria?

(ii). Does cointegration exists among the exchange rate, government expenditure, labour force and real gross domestic product in Nigeria?

(iii). Is Error Correction Model (VECM) appropriate for modelling the relationship between exchange rate, government expenditure, labour force and real gross domestic product in Nigeria?

1.4 Objective of the Study

General Objective

To conduct a time series modeling of exchange rate, government expenditure, labour force and real gross domestic product in Nigeria.

Specific Objectives

The specific objectives are:

(i). To examine the effects of exchange rate, government expenditure, labour force on real gross domestic product in Nigeria.

(ii). To identify if cointegration exists among the exchange rate, government expenditure, labour force and real gross domestic product in Nigeria.

(iii). To fit a vector Error Correction Model (VECM) for exchange rate, government expenditure, labour force and real gross domestic product in Nigeria.

1.5 Statement of the Hypotheses

The following hypotheses were tested:

1. H_0: There are no effects of exchange rate, government expenditure, labour force and real gross domestic product in Nigeria.

H_1: There are effects of exchange rate, government expenditure, labour force and real gross domestic product in Nigeria.

2. H_0: Cointegration does not exist among the selected macroeconomic indices and real gross domestic product.

   H_1: Cointegration exists among the selected macroeconomic indices and real gross domestic product.

3. H_0: The estimated Error Correction Model is not adequate.

   H_1: The estimated Error Correction Model is adequate.

1.6 Significance of the Study

This project work is of importance based on the fact that it establishes the major factors that contribute to economic growth in Nigeria over a period of time. The research identified the importance and contribution of each factor to economic growth in Nigeria which will aid policy makers and authorities to concentrate on manipulating and improving the relevant factors that determines Nigeria economic growth. It is also of importance to students and researchers who want to undertake research on factors that influence economic growth in Nigeria.

1.7 Scope of the Study

This study relied on numerical evaluation of exchange rate, government expenditure and labour force to establish the nature of the influence of these determinants of economic growth in Nigeria. The scope of the study covers the period of 1992-2017 (27 years).

1.8 Definition of Operational Terms and Acronyms

Economic Growth

Economic growth is defined as a long term rise in capacity of a country to supply increasing diverse economic goods to its population. Economic growth represents the expansion of a country GDP or outputs. Growth means an increase in economic activities.

Gross Domestic Product

The Gross Domestic Product (GDP) of a country is the country's income minus foreign investments. i.e., the total value of all goods and services produced within a country in a year, minus net income from investments in other countries.

RGDP – Real Gross Domestic Product

EXCR – Exchange Rate (amount of Naira per 1 US dollar)

An exchange rate is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency.

GEXP – Government Expenditure

Government expenditure refers to the funds and resources allocated by the government to social goods and services, such as health care, education and infrastructure

LABF – Labour Force

The labour force consists of all the people who are able to work in a country or area.

H0 – Null Hypothesis

A null hypothesis is a type of hypothesis used in statistics that proposes that no

statistical significance exists in a set of given observations. The null hypothesis attempts to show that no variation exists between variables or that a single variable is no different than its mean.

H1 – Alternative Hypothesis

The alternative hypothesis is the hypothesis used in hypothesis testing that is contrary to the null hypothesis. It is usually taken to be that the observations are the result of a real effect with some amount of chance variation superposed.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The developments in economic growth literature have been closely complemented by empirical studies. These studies initially focused on issues of economic convergence/divergence. However, focus shifted to factors determining economic growth following the seminal studies by Kormendi and Meguire (1985) and Grier and Tullock (1989), Barro (1991). Since then there has been burgeoning empirical literature on the determinants of economic growth. One reason why considerations of economic growth have been given much attention is that a sustained economic growth is essential for a country's long-term development and stability (Elias and Obi, 2015). Thus, it is the interests of economists and policy makers to explore factors driving economic growth. Like many developing countries, the Nigerian economy, has had a volatile "growth-history". For instance, in the period 1960-70, the Gross Domestic Product (GDP) recorded an annual growth of 3.1 per cent. During the oil boom era (1970-78), GDP grew positively by 6.2 per cent annually. However, negative growth rates were recorded in the 1980s. In the period 1988-1997 which constitutes the period of structural adjustment and economic liberalisation, the GDP grew at a positive rate of 4.0 (Ekpo and Umoh, 2004).

2.1 Conceptual Framework

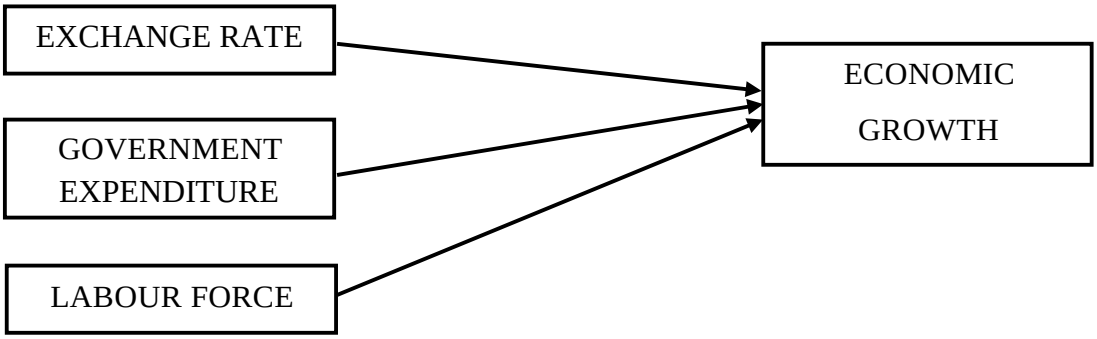

Figure 1: Conceptual framework

Source: Author

The conceptual framework (Figure 1) shows the relationship between the dependent variable and the independent variables. In this research, economic growth is the dependent variable, while exchange rate, government expenditure, and labour force are the independent variables.

2.1.1 Concept of Economic Growth

Economic growth is defined as a long term rise in capacity of a country to supply increasing diverse economic goods to its population. Economic growth represents the expansion of a country GDP or outputs. Growth means an increase in economic activities. The Gross Domestic Product (GDP) of a country is the country's income minus foreign investments. i.e., the total value of all goods and services produced within a country in a year, minus net income from investments in other countries.

2.1.2 Exchange Rate

Exchange rate is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency (Sullivan and Steven, 2003).

Exchange rates are determined in the foreign exchange market which is open to a wide range of different types of buyers and sellers, and where currency trading is continuous: 24 hours a day except weekends, i.e. trading from 20:15 GMT on Sunday until 22:00 GMT Friday. The spot exchange rate refers to the current exchange rate. The forward exchange rate refers to an exchange rate that is quoted and traded today but for delivery and payment on a specific future date (Marc, 2006).

In the retail currency exchange market, different buying and selling rates will be quoted by money dealers. Most trades are to or from the local currency. The buying rate is the rate at which money dealers will buy foreign currency, and the selling rate is the rate at which they will sell that currency. The quoted rates will incorporate an allowance for a dealer's margin (or profit) in trading, or else the margin may be recovered in the form of a commission or in some other way (Marc, 2006). Different rates may also be quoted for cash, a documentary form or electronically. The higher rate on documentary transactions has been justified as compensating for the additional time and cost of clearing the document. On the other hand, cash is available for resale immediately, but brings security, storage, and transportation costs, and the cost of tying up capital in a stock of banknotes (bills).

2.1.3 Government Expenditure

Government expenditure is the fund by which government used in acquiring or purchasing goods and services over a period of time. It includes all government consumption, investment, and transfer payment (Robert and Vittorio, 1994). In national income accounting, the acquisition by governments of goods and services for current use, to directly satisfy the individual or collective needs of the community, is classed as government final consumption. Government acquisition of goods and services intended to create future benefits, such as infrastructure investment or research spending, is classed as government investment (government gross capital formation). These two types of government spending, on final consumption and on gross capital formation, together constitute one of the major components of gross domestic product.

Government expenditure can be classified into two main categories. These are:

- Government Recurrent
- Capital Expenditure

Recurrent expenditure refers to expenditure on purchase of goods and services, wages and salaries, operations as well as current grants and subsidies (usually classified as transfer payments). While **Capital expenditure** refers to the amount spent in the acquisition of fixed (productive) assets (whose useful life extends beyond the accounting or fiscal year), as well as expenditure incurred in the upgrade/improvement of existing fixed assets such as lands, building, roads, machines and equipment, etc., including intangible assets (Ogiogio, 1995).

2.1.4 Labour Force

Total labor force comprises people ages 15 and older who meet the International Labour Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and the unemployed. While national practices vary in the treatment of such groups as the armed forces and seasonal or part-time workers, in general the labor force includes the armed forces, the unemployed, and first-time job-seekers, but excludes homemakers and other unpaid caregivers and workers in the informal sector (Gujarati, 2004).

2.2 Empirical Review of Previous Studies

Ogiogio (1995) studied the impact of government expenditure on economic growth using time series data from 1970 to 1993. The study indicated that the recurrent expenditure has a significant impact on economic growth, while the capital expenditure does not have a significant influence on economic growth. The study further discovered a significant relationship between economic growth and government expenditure.

Ozumba (1996) examined the need to harness the potentials of oil and gas of Nigeria for effective economic development. He used analytical method to submit that the petroleum sector contributes to economic development by providing energy, the foreign exchange needs of the country, and government revenue. He however, regretted that the income from petroleum is not invested in diversifying the productive base of the Nigerian economy.

Essien (2001) studied the determinants of economic growth using what is known as the vector error correction model (VECM). The study was based on the data collected from 1970 to 1998. The study attempted to establish the contribution of capital stock to economic

growth, both in the short-run and the long-run, the impact of growth in the previous years on current growth and the impact of foreign exchange rate on economic growth. Other objectives were to assess the impact of inflation, liberalization policy and debt burden (ratio of debt to export) on the real GDP. The study concludes that there is a long-run relationship between capital stock and economic growth, and that the growth rate in the previous year"s impacts on the current growth rate negatively. The study also established that the impact of inflation on the GDP was negative because it causes uncertainty leading to a reduction of the effectiveness of price mechanism.

Masha (2002) studied the dynamics of money output and prices in Nigeria from 1980 to 2000. The study attempts to establish the long-run and short-run relationship between money supply, output, and inflation in Nigeria, using the vector error correction model (VECM). The study uses co-integration test, to confirm that there was a long run relationship between price level, nominal money supply, exchange rate and real output in Nigeria. Hence, in the static framework of long-run equilibrium relationship, nominal money affects real output positively, inflation is negatively correlated with real output. The impact of exchange rate on the GDP is positive. The short-run results show that there is a negative relationship between nominal money stock and real output. The price level had no impact on the real output but the exchange rate had.

Oyeranti (2003) studied the impact of foreign investment in economic development of the country. He reviewed empirical Studies in this area and submitted that the impact of foreign private investment on economic growth and development can be remarkable. The need for developing countries maximizes the benefits derivable from foreign private investment.

Ahsan et al. (2010) In their investigation of the aggregate growth profile of India, findings showed a negative relationship. they argue that higher employment is not usually associated with higher per capita GDP. The study was carried out on poverty rates, employment, and the working-age population and observed over ten-year periods corresponding to the years 1983–93 and 1993–2003.

The work of Hameed and Ume (2011) focused on the impact of Monetary Policy on GDP. In their words, GDP, no doubt, is affected by the Monetary Policy of the state. They studied the research papers of various authors in this regard to prove the Hypothesis and after in depth analysis by applying Regression Analysis technique, they observed that the relationship between the two exists. They used the past 30 years data of Pakistan for driving the conclusion. Their study proved that the interest rate has weak relationship with GDP but the Growth in Money Supply greatly positively affects the GDP of an economy, obviously various unknown factors also affects the GDP. Growth in Money Supply has a huge impact on GDP. Their research study can further be used for developmental projects for the Growth of Economy, Quality improvements, Household production, the underground economy, Health and life expectancy, the environment, Political immunity and ethnic justice.

Elias and Obi (2015) investigates the determinants of economic growth in Nigeria through the application of the Johansen co-integration technique and an error correction model. The results of the co-integrating technique suggest that there is long run relationship among domestic savings, expenditures on education and health, openness to trade, foreign direct investment, public infrastructure, and financial deepening with growth of real GDP per capital. The result of the ECM reveals that domestic savings, expenditure on education and

health, foreign direct investment and openness are determinants of economic growth in Nigeria. Elias and Obi (2015) further concluded that exception of the expenditure on health, and foreign direct investment, the other aforementioned variables have negative impacts on growth either in the initial period or lagged period. While foreign direct investment has a negligible positive effect on growth, public infrastructure does not drive economic growth in Nigeria.

Charles (2015) investigated the factors that contribute to economic growth in Nigeria between 1981 and 2012 using Vector Error Correction Mechanism framework. The long run estimation shows that, government expenditure and oil revenue promotes economic growth, while interest rate and inflation rate have a significant negative effect on economic growth in Nigeria. The short run estimates, however, show that oil revenue does not promote economic growth. The result confirms the existence of oil resource curse for Nigeria. Also, both interest rate and inflation rate have a short run negative effect on economic growth in Nigeria, while foreign private investment and foreign exchange rate have neither short-run nor long-run effect on economic growth in Nigeria.

Eugene (2016) examined the relationship between financial intermediary development and economic growth in Nigeria over the period 1981–2011 using the auto-regressive distributed lag (ARDL) approach to co-integration analysis. The results show that the relationship between financial development and economic growth in Nigeria is not significantly different from what has been observed generally in oil-dependent economies. The relationship between financial intermediary development and economic growth in Nigeria is found to be insignificantly negative in the long-run and significantly negative in the short-run.

Mustapha, et al, (2017) in a study on the effects of macroeconomic indicators on economic growth of Nigeria using data on the six World Development Indicators (total import, official exchange rate, broad money, inflation rate, total natural resources rent and foreign direct investment) between 1970-2015, The dynamic weighted least square (DWLS) was used rather than the dynamic ordinary least square (DOLS). The result of the analysis shows that imports of goods and services positively affect RGDP of Nigeria significantly, while other explanatory variables negatively affect RGDP significantly.

2.3 Literature Gap

The reviewed literature has proven effort to identify the factors that contribute to economic growth in Nigeria. None of the previous studies have put together Exchange rate, labour force and government expenditure all together. This research is most current since it included data up to 2017.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This study employed cointegration and vector error correction model to model the relationship between exchange rate, government expenditure, labour force and gross domestic product. There was evidence of co-integration among the variables, hence the model was transformed into Error Correction Model (VECM). The VECM detect the long run of economic growth and the selected macroeconomic indices.

3.2 Nature and Source of Data

The data used in this research was obtained from World Bank Data Portal at http://data.worldbank.org/country/nigeria and Central Bank of Nigeria (CBN) Statistical Bulletin 2017 publication. The dataset consists Nigerian gross domestic product (GDP) growth rate (%), Exchange rate, government expenditure (in Billion) and labour force (number of employed personnel).

3.3 Technique for Data Analysis and Model Specification

3.3.1 Model Specification

In this study, long-run relationship between exchange rate, government expenditure, labour force and real gross domestic product was examined using vector error correction model (VECM). The real gross domestic product (RGDP) was considered as dependent variable while exchange rate, government expenditure and labour force were considered as independent variables. The functional model is:

$$RGDP=f(EXCR,GEXP,LABF) \quad (1)$$

The equation is thus of the form:

$$RGDP = \beta_0 + \beta_1 EXCR + \beta_2 GEXP + \beta_3 LABF + \varepsilon_t \quad (2)$$

Since these variables are not in the same units, it become necessary to take the log transform of the equation. Thus the model becomes:

The long run model thus become:

$$Log(RGDP) = \beta_0 + \beta_1 Log(EXCR) + \beta_2 Log(GEXP) + \beta_3 Log(LABF) + \varepsilon \quad (3)$$

3.3.2 Estimation Procedure

In order to investigate the long run impacts of the included macroeconomic indices on real gross domestic product, the theory of co-integration and error correction modeling were employed. The first step is to test for stationarity in the variables after which the existence of co-integration amongst the included variables was examined. If co-integration exists among variables, the error correction model shall be estimated.

3.3.3 Unit Root Test

The critical step in any time series analysis is the identification of the order of integration for the variables. In this research, the Augmented Dickey-Fuller (ADF) unit root test was employed. The test includes intercept and trend for a variable Y_t and are respectively specified as follows:

$$\Delta Y_t = k + at + \emptyset_i Y_{t-i} + \sum^n{}_{i=1} \propto_i \Delta Y_{t-i} + E_t \quad (4)$$

Where Y is a variable under study,

Δ is the first difference operator,

t caapture any time trend,

E_t is a white noise, n is the maximum lag length,

k, $\emptyset$ and $\propto$ are the parameter to be estimated.

The unit root test hypothesis are as follows:

H_o: $\emptyset = 0$ No Unit Root

H_o: $\emptyset \neq 0$ There is Unit Root

3.3.4 Co-integration

Co-integration refers to the existence of a long-run equilibrium between two or more time series variables which are individually non-stationary at their level form (Gujarati, 2004). After testing for unit root, the next step is to test for long run relationship among the study variables. Todaro (1992) recommend estimation with Johansen maximum likelihood procedure. Hence, this study employed Johansen and Juselius (1990) maximum likelihood co-integration technique which test both the existence and number of co-integration vectors. The multivariate co-integration test can be expressed as:

$$Y_t = K_o + K_1 \Delta Z_{t-1} + K_2 \Delta Z_{t-2} + \ldots + K_{p-1} \Delta Z_{t-p} + \pi Z_{t-p} + U_t \quad (5)$$

Where

$Y = (EXCR, GEXP, LABF)$,

EXCR = exchange rate,

GEXP = government expenditure,

LABF = labour force,

t is a vector of variables that are integrated at order one that is I(1)

K = matrix coefficients

$\pi =$ Matrix of parameter

$U_t =$ a vector of normally and independently distributed error term.

If *r* is a co-integrating vectors between the element of Y it shows that π is of rank (0 < r < 3).

In estimating the number of co-integrating vectors, Johansen developed two likelihood ratio tests as follows

1: Trace test (π_{trace}) = T_r (r)= $-T \sum_{i=r+1}^{n} ln \quad (1 - \hat{\pi} i \ )$ (6)

2: Maximum eigenvalue (π_{max}) = π_{max} (r, r + 1) =$T ln \ (1 - \hat{\pi} r+1 \ )$ (7)

3.3.5 Vector Error Correction Model (VECM)

The third step involves estimating the error correction model. This model rests on Granger's representation theorem and helps to model the long-run steady state relationship among variables. However, when Y_t and X_t are found to be co-integrated, then an associated Error Correction Mechanism (ECM) denoted by z_{t-1} will take the form:

$$\Delta Y_t = \beta_0 + \sum_{i=0}^{n} \beta_i \Delta X_{t-i} + \sum_{i=1} \alpha_i \ \Delta Y_{t-i} + z_{t-1} \mu_t \quad (8)$$

Where Δ is the first difference operator,

ECM(z_{t-1}) is the estimated residual from the co-integrating regression,

n is the number of lag lengths,

Y_t is the dependent variable and *X* is the vector of the exogenous variables.

3.4 Justification of the Methods of Analysis

Modern econometricians point out a method to establish the relational model among economic variables in a nonstructural way. They are vector autoregressive model (VAR) and vector error correction model (VEC).

The VAR model is established based on the statistical properties of data. In the VAR model, each endogenous variable in the system is considered as the lagged value of all endogenous variables in the system; thus the univariate autoregressive model is generalized to the "vector" autoregressive model consisting of multivariate time series variables. In 1980, Sims (Christopher Sims) introduced VAR model into economic field and promoted the widespread application in dynamic analysis of economic system.

Engle and Granger combined cointegration and error correction models, to establish the trace error correction model. As long as there is a cointegration relationship between variables, the error correction model can be derived from the autoregressive distributed lag model. And each equation in the VAR model is an autoregressive distributed lag model; therefore, it can be considered that the VEC model is a VAR model with cointegration constraints. Because there is a cointegration relationship in the VEC model, when there is a large range of short-term dynamic fluctuation, VEC

expressions can restrict long-term behavior of the endogenous variables and be convergent to their cointegration relation.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Data Presentation

The data used in this study is a secondary data that was collected from Central Bank of Nigeria (CBN) and World Bank Website. Annual data from 1992 to 2017 was collected on exchange rate, government expenditure, labour force and real gross domestic product. The data is presented in Table 1 in the Appendix of this work.

4.2 Data Analysis and Results

4.2.1 Descriptive Statistics

Table 2: Descriptive statistics of Nigeria exchange rate, government expenditure, labour force and real gross domestic product

Statistic	Variable			
	EXCR	GEXP	LABF	RGDP
N	27	27	27	27
Mean	116.13	2,872.46	48,399,002	74,155.74
Median	127.23	1,624.15	42,301,095	19,795.64
Mode	21.89	N/A	N/A	N/A
Maximum	305.80	1,3301.0	190,900,000	1,125,000
Minimum	17.30	92.8	31,110,400	909.80
Sum	3019.32	74,683.96	12,58,374,060	1,928,049.23
Std. Dev.	73.29	3,229.89	30,089,638.27	216,791.34
Jarque-Bera	3.672171	2.079181	1.552292	1.826179
P-value	0.159440	0.353599	0.460176	0.401282

Table 2 shows the descriptive statistics of the Nigerian exchange rate, government expenditure, labour force and economic growth. There are 27 observations consisting of data from 1992 to 2017. Average exchange rate over the period is 116.13 naira per US dollar. The mean expenditure by the Nigerian government over the period is 2,872.46. The

expenditure has a minimum value of 92.8 million at 1992. There is high variation in government expenditure over the study period. Mean labour force and RGDP are 48,399,002 and 74155.74 respectively. The Jarque-Bera is a test statistic for testing whether the series is normally distributed. From table 3, the P-value indicates that the Nigerian exchange rate, government expenditure, labour force and RGDP series over the period (1992-2017) are normally distributed.

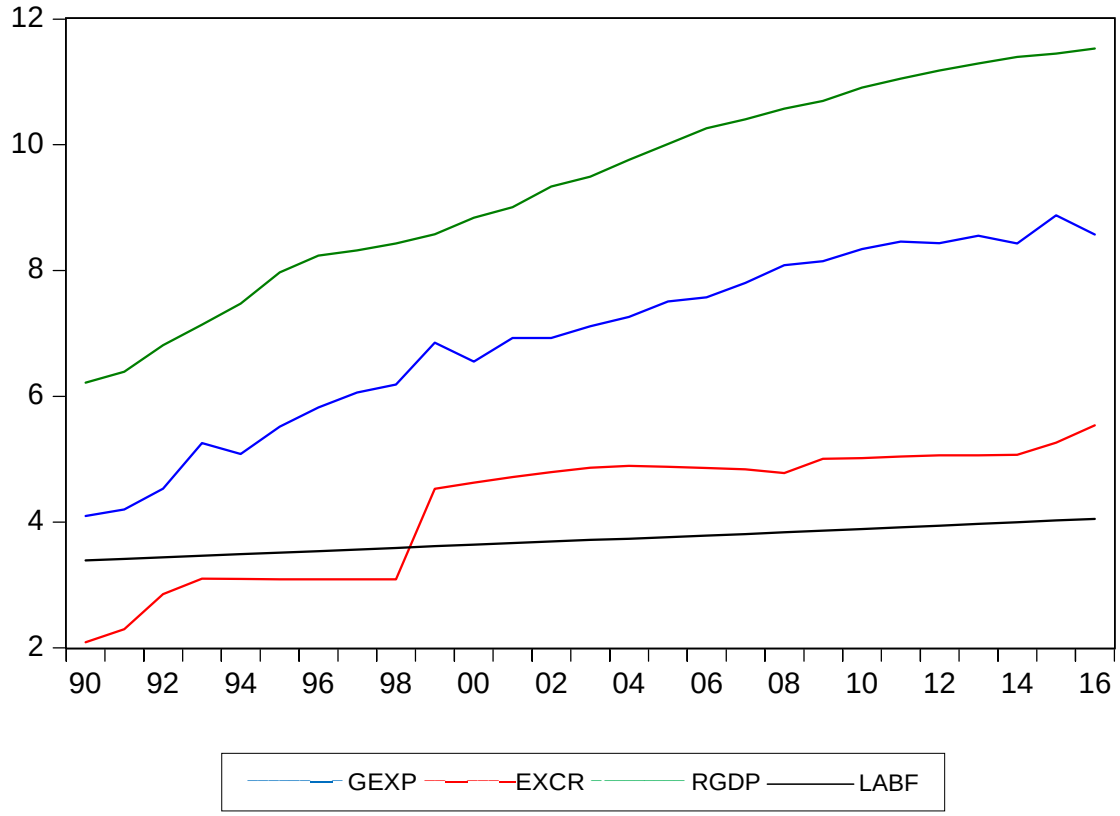

Figure 2: Plot of exchange rate, government expenditure, labour force and RGDP

Figure 2 is a plot of the natural log of the variables. It shows a positive growth and slight fluctuation in exchange rate, government expenditure, labour force and RGDP in Nigeria over the period (1992-2017).

4.2.1 Test for Unit Root

Table 3: Augmented Dickey Fuller Test of Nigeria exchange rate, government expenditure, labour force and real gross domestic product

Variable	t-statistic	P-value	Remark
RGDP	-1.8662	0.6416	Not stationary
D(RGDP)	-4.4345	0.0088	Stationary
EXCR	-1.8243	0.3610	Not stationary
D(EXCR)	-4.6767	0.0011	Stationary
GEXP	-1.9038	0.6213	Not stationary
D(GEXP)	-6.4985	0.0001	Stationary
LABF	3.2282	1.0000	Not stationary
D(LABF)	-3.9557	0.0244	Stationary

Table 3 shows that the variables under investigation are not stationary at initial i.e. I(0), but are stationary at first difference. Appendix II shows the Augmented Dickey Fuller Test (ADF) test for individual variable.

4.2.2 Test for Co-integration

Table 4: Johansen Cointegration Test of Nigeria exchange rate, government expenditure, labour force and real gross domestic product

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.701644	65.80659	47.85613	0.0005
At most 1 *	0.541949	35.56990	29.79707	0.0097
At most 2 *	0.410197	16.05051	15.49471	0.0412
At most 3	0.107790	2.851340	3.841466	0.0913

Trace test indicates 3 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 *	0.701644	30.23668	27.58434	0.0223
At most 1	0.541949	19.51939	21.13162	0.0828
At most 2	0.410197	13.19917	14.26460	0.0731
At most 3	0.107790	2.851340	3.841466	0.0913

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

Table 4 shows Trace test and Maximum Eigenvalues, where Trace test indicated 3 co-integrating equations at 5% level and Maximum Eigenvalue revealed 1 cointegrating equation at 5% level. This means that the variables are cointegrated hence there is long run relationship among them.

Table 5: Order Selection Criteria of the relationship between Nigeria exchange rate, government expenditure, labour force and real gross domestic product

Endogenous variables: RGDP EXCR GEXP LABF
Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	10.97045	NA	6.58e-06	-0.580871	-0.384529	-0.528781
1	182.9198	272.2531*	1.53e-11*	-13.57665*	-12.59494*	-13.31620*
2	193.2272	12.88427	2.80e-11	-13.10227	-11.33519	-12.63346
3	212.2234	17.41318	3.14e-11	-13.35195	-10.79950	-12.67478

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

Table 5 above show that lag one is the optimal lag for the VEC model using AIC.

4.2.3 Long Run Relationship

Table 6: VECM Long Run Estimate of Nigeria exchange rate, government expenditure, labour force and real gross domestic product

Dependent variable: RGDP

Variable	Coefficient	Standard Error	t-statistic	Remark
EXCR	-0.5313	0.0887	-5.9884	Significant
GEXP	1.2133	0.1236	9.8187	Significant
LABF	3.3559	0.7048	4.7614	Significant
C	-9.0530			

Table 6 shows the estimate of the long run coefficients of the variables. It shows that all variables are significantly related to RGDP. it also shows that a unit increase in exchange rate corresponds to -0.5313 decrease in economic growth, a unit increase in government expenditure will cause an increase of 1.2133 in economic growth. And for a unit increase in labour force accounts 3.3559 increases in economic growth.

The long run model equation is thus,

$$RGDP = -9.0530 - 0.5313EXCR + 1.2133GEXP + 3.3559LABF + \varepsilon$$

4.2.4 Model Diagnostic Check

Table 7: Test for Multicollinearity

Variance Inflation Factors ; Included observations: 25

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.125110	562.6925	NA
D(RGDP (-1))	0.052719	13.14763	2.736390
D(EXCR(-1))	0.003315	1.556689	1.316161
D(GEXP(-1))	0.005620	2.269747	1.345352
D(LABF(-1))	164.5456	477.6035	1.490508
ECM(-1)	0.100338	2.438272	2.437890

From table 7, the centered VIF shows there is a no multicollinearity between the variables since all VIF are less than 10.

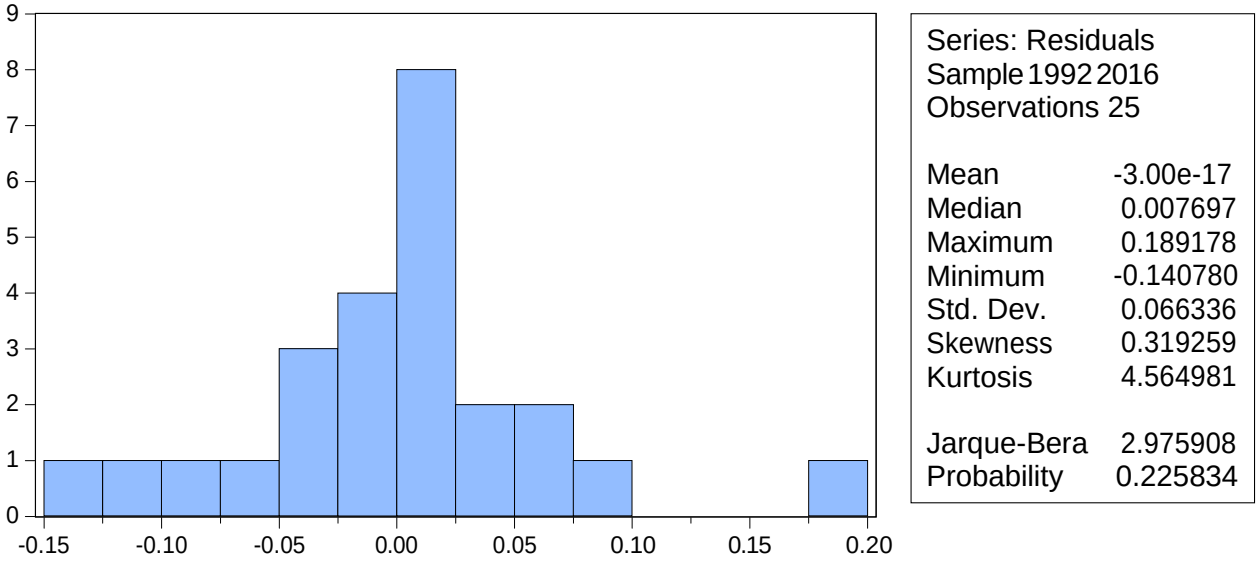

Figure 3: Histogram and descriptive statistics of residuals

Figure 3 shows the histogram of residuals of the model. It shows the residuals has a shape of normal distribution. The information on the right hand side shows the descriptive statistics of the residuals. The mean of residuals is close to 0 (approximately -3.0×10^{-17}) and the standard deviation 0.066, which is close to 0, indicates that the residuals do not deviate from the mean. Also, Jarque-Bera test indicates that the residuals are normally distributed since the P-value is 0.2258 is greater than 0.05.

Table 8: Test for Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.120063	Prob. F(1,18)	0.7330
Obs*R-squared	0.165649	Prob. Chi-Square(1)	0.6840

Table 8 shows that there is no serial correlation in the residuals of the model. Since the P-value 0.7330 is greater than 0.05.

Table 11: Test for Heteroskedasticity of the Long Run Estimate

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.114121	Prob. F(5,19)	0.0106
Obs*R-squared	12.99614	Prob. Chi-Square(5)	0.0234
Scaled explained SS	13.38039	Prob. Chi-Square(5)	0.0201

Table 11 show that there is evidence of heteroscedasticity since the P-value is 0.0106 which is less than 0.05.

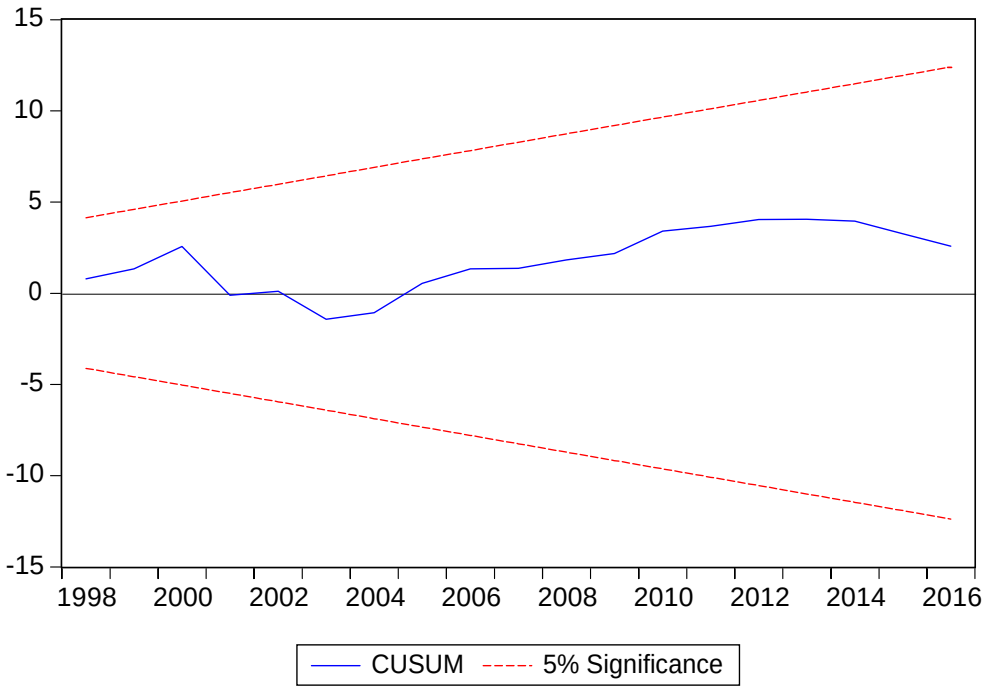

Figure 4: CUSUM chart

The CUSUM chart (Figure 3) plots the cumulative sum of deviations from the target for individual measurements, it monitors small shifts in the process mean. From figure 3, the estimated model is stable over time.

4.3 Discussion of Findings

The results of this project work showed that exchange rate has a significant negative effect on economic growth. This is in line with the findings of Masha (2002) on the dynamic of money output and prices in Nigeria from 1980 to 2002. Where he observed negative effect of the Exchange on real output of the economy. Also, Mustapha, et al, (2017) in a study on the effects of macroeconomic indicators on economic growth of Nigeria using data on the six World Development Indicators between 1970-2015, using Dynamic Weighted Least Square (DWLS). Their result shows that imports of goods and services positively affect RGDP of Nigeria significantly, while other explanatory variables (total import, official

exchange rate, broad money, inflation rate, total natural resources rent and foreign direct investment) negatively affect RGDP significantly.

In the present study, government expenditure has a positive and significant effect on economic growth. This agrees with the work of Ogiogio (1995) when he studied the impact of government expenditure on economic growth using time series data from 1970 to 1993. His work indicated that the recurrent expenditure has a significant impact on economic growth, while the capital expenditure does not have a significant influence on economic growth. He further discovered a significant relationship between economic growth and government expenditure.

Labour force in this work has a significant positive effect on economic growth in Nigeria. However, Ahsan et al. (2010) argue that higher employment is not usually associated with higher per capita GDP. In their investigation of the aggregate growth profile of India, findings showed a negative relationship.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This project work examined the effect of exchanges rate, labor force, government expenditure, on economic growth in Nigeria using data from 1992 to 2017. Data on exchange rate, government expenditure was obtained from CBN statistical bulletin while labour force was sourced from world bank data portal. The variables were stationary at first deference. Johansen Cointegration test showed that cointegrating exists among the variables. Vector Error Correction Model (VECM) was employed to estimate the long run model. Exchange rate was found to have a negative impact on economic growth while government expenditure and labour force have positive impact on economic growth. The residual diagnostic check showed the model is adequate and no presence of serial correlation among the variables. Also, there was no multicollinearity in the residuals.

5.2 Conclusion

Long run relationship exist between exchange rate, government expenditure labour force and real gross domestic product. A unit increase in exchange rate corresponds to -0.5313 decrease in economic growth, a unit increase in government expenditure will cause an increase of 1.2133 in economic growth. And for a unit increase in labour force accounts 3.3559 increases in economic growth.

Breusch-Godfrey Serial Correlation LM test showed there is no serial correlation in the residuals of the model (p-value = 0.7330, greater than 0.05). Jarque-Bera test indicates that the residuals (p= 0.2258).

5.3 Recommendations

The following recommendations that:

i. The Nigerian government should increase its expenditure in order to further drive economic growth since it has a positive and significant impact on RDGP in Nigeria.

ii. Government should focus on empowerment programmes in order to create jobs.

5.4 Limitation of the study

This study only examined the effect of exchange rate, government expenditure and labour force on economic growth using Vector Error Correction Model (VECM). Thus, other econometric variables were not considered, and may have impact on economic growth. The study utilized data from 1992 to 2017 which did not include 2018 the most recent observed year.

5.5 Suggestion for Further Studies

Future researchers should consider Autoregressive Distributed Lag (ARDL) Model to examine the relationship between economic growth and the variables considered in this work. Also, Causality test should be carry out among the variables to check for the cause effect.

5.6 Contribution to Knowledge

This study contributed to the body of knowledge by examine the long run relationship existing among exchange rate, government expenditure, labor force and economic growth in Nigeria. Charles (2015) discovered that in the long run, government expenditure and oil revenue promotes economic growth, while interest rate and inflation rate have a significant negative effect on economic growth in Nigeria. Charles did not include labour force and

exchange rate, which are important in measuring the economic wellbeing of a nation. This study identified government expenditure and labour force to have a positive and significant impact on economic growth in Nigeria, while exchange rate has a negative impact on economic growth in Nigeria.

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APPENDIX I

Nigerian Exchange rate, government expenditure, labour force and RealGross Domestic Product (1992-2017)

YEAR	EXCR (₦ per $)	GEXP (₦ Billion)	LABF (number of personnel)	RGDP (Million)
1992	17.3	92.8	31,110,400	909.8
1993	22.07	191.23	31,890,080	1,259.07
1994	22	160.89	32,702,470	1,762.81
1995	21.9	248.77	33,550,650	2,895.20
1996	21.88	337.22	34,358,960	3,779.13
1997	21.89	428.22	35,213,880	4,111.64
1998	21.89	487.11	36,103,050	4,588.99
1999	92.34	947.69	37,044,270	5,307.36
2000	101.7	701.06	37,986,000	6,897.48
2001	111.23	1,018.03	38,932,680	8,134.14
2002	120.58	1,018.16	39,925,510	11,332.25
2003	129.22	1,225.97	40,906,810	13,301.56
2004	132.89	1,426.2	41,748,450	17,321.30
2005	131.27	1,822.1	42,853,740	22,269.98
2006	128.65	1,938	43,907,800	28,662.47
2007	125.81	2,450.9	45,036,270	32,995.38
2008	118.55	3,240.82	46,230,560	39,157.88
2009	148.9	3,452.99	47,480,440	44,285.56
2010	150.3	4,194.58	48,780,750	54,612.26
2011	153.86	4,712.06	50,068,830	62,980.40
2012	157.5	4,605.39	51,415,820	71,713.94
2013	157.31	5,185.32	52,823,720	80,092.56
2014	158.55	4,578.06	54,261,140	89,043.62
2015	192.44	7,184.39	55,789,430	94,144.96
2016	253.49	9,735	57,352,350	101,489.49
2017	305.80	13,301	58,959,311	1,125,000.0

Source: CBN statistical bulletin 2017, World bank data portal

APPENDIX II

Augmented Dickey-Fuller Test

Null Hypothesis: RGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.866217	0.6416
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

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

Null Hypothesis: D(RGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.434525	0.0088
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

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

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.824280	0.3610
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.676713	0.0011
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

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

Null Hypothesis: GEXP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.903873	0.6213
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

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

Null Hypothesis: D(GEXP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.498513	0.0001
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

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

Null Hypothesis: LABF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.228213	1.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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

Null Hypothesis: D(LABF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.955734	0.0244
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

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

APPENDIX III

Vector Error Correction Estimates

Date: 04/24/19 Time: 00:31
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
RGDP (-1)	1.000000
EXCR(-1)	0.531289 (0.08872) [5.98840]
GEXP(-1)	-1.213299 (0.12357) [-9.81874]
LABF(-1)	-3.355922 (0.70482) [-4.76142]
C	9.253000

Error Correction:	D(Y)	D(EXCR)	D(GEXP)	D(LABF)
CointEq1	0.332499 (0.12269) [2.71010]	0.076105 (0.46272) [0.16447]	0.310007 (0.28107) [1.10296]	-0.005719 (0.00155) [-3.69385]
D(RGDP (-1))	-0.257764 (0.31087) [-0.82918]	-0.828068 (1.17243) [-0.70629]	0.180380 (0.71217) [0.25328]	0.007609 (0.00392) [1.93981]
D(EXCR(-1))	0.044138 (0.07183) [0.61450]	0.034030 (0.27090) [0.12562]	-0.056115 (0.16455) [-0.34102]	0.000808 (0.00091) [0.89097]
D(GEXP(-1))	0.135122 (0.10558) [1.27981]	-0.023588 (0.39819) [-0.05924]	-0.462909 (0.24187) [-1.91385]	-0.003220 (0.00133) [-2.41695]
D(LABF(-1))	18.11420 (17.8117)	-3.767937 (67.1766)	-1.133057 (40.8050)	-0.244088 (0.22476)

	[1.01698]	[-0.05609]	[-0.02777]	[-1.08601]
C	-0.231391	0.398948	0.261516	0.030575
	(0.43404)	(1.63698)	(0.99435)	(0.00548)
	[-0.53311]	[0.24371]	[0.26300]	[5.58260]
R-squared	0.517379	0.057510	0.506229	0.574948
Adj. R-squared	0.390374	-0.190514	0.376289	0.463092
Sum sq. resids	0.147235	2.094284	0.772727	2.34E-05
S.E. equation	0.088030	0.332002	0.201668	0.001111
F-statistic	4.073674	0.231872	3.895874	5.140074
Log likelihood	28.70905	-4.477661	7.985352	138.0239
Akaike AIC	-1.816724	0.838213	-0.158828	-10.56192
Schwarz SC	-1.524194	1.130743	0.133702	-10.26939
Mean dependent	0.205496	0.129671	0.174923	0.025466
S.D. dependent	0.112745	0.304280	0.255355	0.001516
Determinant resid covariance (dof adj.)		1.72E-11		
Determinant resid covariance		5.74E-12		
Log likelihood		181.6596		
Akaike information criterion		-12.29277		
Schwarz criterion		-10.92763		

APPENDIX IV

Short Run Relationship and ECM

Dependent Variable: D(RGDP)
Method: Least Squares
Date: 04/24/19 Time: 00:40
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.349446	0.353709	-0.987947	0.3356
D(RGDP (-1))	1.177468	0.229607	5.128188	0.0001
D(EXCR(-1))	0.102890	0.057576	1.787035	0.0899
D(GEXP(-1))	-0.064629	0.074968	-0.862091	0.3994
D(LABF(-1))	12.17175	12.82753	0.948877	0.3546
ECM(-1)	-1.333687	0.316763	-4.210369	0.0005

R-squared	0.653813	Mean dependent var	0.205496
Adjusted R-squared	0.562711	S.D. dependent var	0.112745
S.E. of regression	0.074556	Akaike info criterion	-2.148976
Sum squared resid	0.105613	Schwarz criterion	-1.856446
Log likelihood	32.86220	Hannan-Quinn criter.	-2.067841
F-statistic	7.176722	Durbin-Watson stat	1.879378
Prob(F-statistic)	0.000634		