EFFECTS OF PUBLIC EXPENDITURE ON SELECTED MACROECONOMIC VARIABLES IN NIGERIA; 1986 – 2012

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Abstract

The need to improve the welfare of Nigerian citizens via money spent by the government or public spending raises the need to evaluate the interaction and relationship between public expenditure and macroeconomic variables that determine the level of economic development in Nigeria. This study evaluates the effects of public expenditure on selected macroeconomic variables from 1986 – 2012. Public expenditure was disaggregated into two components; capital expenditure and recurrent expenditure, these were used as independent variables for each of the selected macroeconomic variables. Impulse Response Function from estimated Vector Error Correction model and Granger Causality test were used for analysis in the study. The findings showed that capital expenditure had positive impact on GDP growth rate and exchange rate, and negative impact on inflation and unemployment rate. On the other hand, recurrent expenditure had a positive impact on unemployment and exchange rate, and negative impact on inflation and GDP growth rate. The study concludes that though public expenditure is generally effective theoretically but it has some practical limitations that often undermine its effectiveness in Nigeria. Based on these findings, this study recommends that government should diversify and invest in the non – oil sector and focus on export driven commodities as this has the potential of increasing employment and output. Finally, that government should properly handle or manage capital expenditure and recurrent expenditure in order to control macroeconomic variables (inflation, unemployment, exchange rate and GDP) in a way that would ensure economic development in Nigeria.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Public expenditure occupies a strategic position in various economies of the world. It is an important instrument in public sector policy. No economy exists without incurring public spending for the benefit of its citizens and to stimulate economic activities. The difference is the focus and the efficiency of this spending in different countries. Public expenditure plays an important role in aggregate economy in multiple dimensions and has remained a crucial issue in economic development, and most especially in the less developing countries of Sub-Saharan Africa. The general view is that public expenditure either recurrent or capital expenditure, notably on social and economic infrastructure can be growth-enhancing. Therefore, the size and structure of public expenditure will determine the pattern and form of growth of the economy. In an underdeveloped country, public expenditure has an active role to play in reducing regional disparities, developing social overheads, creation of infrastructure of economic growth in the form of transport and communication facilities, education and training, growth of capital goods industries, basic and key industries, research and development and so on (Bhatia, 2002).

Nigeria is a developing country that has experienced dynamic changes in the trend of public expenditure policy over the years. Since the attainment of independence in 1960, government expenditure has increased considerably as a result of a deliberate policy of stimulating industrialization to raise the overall level of economic activity and diversify the economy (Okpara and Nwaoha, 2010). Beginning from 1981 Nigeria began to experience a serious fiscal crisis, which manifested in economic crisis. In 1986 the country adopted stabilization and

adjustment programmes which required considerable reduction in public expenditure so as to reduce high fiscal deficits and enhance economic growth. Two options were initially considered, first, revenue generating measure to reduce the fiscal deficit, and secondly expenditure reduction.

Public expenditure in Nigeria is categorized into two components parts namely capital expenditure and recurrent expenditure. Capital expenditure is incurred on the creation or acquisition of fixed assets (new or second-hand) while recurrent expenditure is incurred on the purchase of goods and services, payment of wages and salaries and settlement of depreciation on fixed assets. Available statistics show that total government expenditure and its components (capital and recurrent) have continued to rise in the last three decades. For instance, public expenditure increased from N16,223.7 million in 1986 to N701,059.40 million in 2000, further to N4,194,576.51 million in 2010 and N4,605,319.72 million in 2012 (CBN statistical bulletin, 2012). In the same manner, composition of government expenditure showed that both capital and recurrent expenditure increased during these years, with recurrent expenditure taking the larger proportion of the total expenditure than the capital expenditure.

Public expenditure and domestic price level has been theorized by the Keynesian mainstream economics who advocated the use of fiscal policy to tackle most economic problems such as depression, stagnation, and inflation. Inflation as a macroeconomic variable has received great attention in recent times. According to Kollmann (2010), an unexpected exogenous increase in government expenditure leads to a depreciation in the real exchange rate in one country, provided that labour supply is highly elastic. Exchange rate is a key variable in the context of general economic policy making as its appreciation or depreciation affects the performance of

other macroeconomic variables in any economy. Aubin *et.al.* (1988) expressed that the relation between unemployment and public expenditure may reflect some mechanical link between social transfers and the number of unemployed. The level of unemployment varies from one economy to another in accordance with the level of industrialization.

The direction of public expenditure in an economy could mirror the policy objective of the government. For instance, the way in which public expenditures are allocated could have significant effects on both economic growth and poverty alleviation. Thus, only outlays that are directly related to growth need to be protected from across-the-board spending cuts. With reduced or tightly controlled real public spending, there could be a need to ensure that scarce public funds are allocated to the highest priority areas and used very efficiently. This implies that before any meaningful public spending policy could be embarked upon, a thorough empirical analysis of the public expenditure is imperative.

Given the priority of making Nigeria one of the largest twenty (20) economies in the world by the year 2020, periodic changes in governance reflects the way public expenditure policy is determined. Nigeria is a market – driven economy with government assuming the role of creating enabling environment within which business can flourish and contribute to the growth of the economy. High rate of public expenditure is expected to increase investment, employment opportunities and sustain increase in productive capacity. In the process, higher productivity and increased incomes is attained in the economy (Islam, 2004).

1.2 Statement of the Problem

In Nigeria, like in most developing countries, there has been a continuous increase in government expenditure over the years, both in the recurrent and the capital expenditure. This could be attributed to huge receipts from the production and sale of crude oil and the increased demand for public goods like roads, education and health facilities, external and internal security given an ever increasing population.

Available statistics shows that total government recurrent expenditure increased from N7, 696.90million in 1986 to N124,491.30million in 1996, to N1,290,201.90million in 2006 and to N3,325,156.25million in 2012. For Capital expenditure, it increased from N8, 526.80million in 1986 to N212,926.30million in 1996, then to N552,385.80million in 2006 and to N874,762.27million in 2012. In 2012 recurrent expenditure accounts for about 71.5% of total expenditure whereas the about 28.5% is expended on capital expenditure (CBN statistical bulletin, 2012). The statistics above showed a declining quality of public expenditure, in view of the diminishing proportion of capital expenditure and the commensurate growth of recurrent expenditure.

The statistics on public expenditure in Nigeria revealed a major problem which shows that more emphasis has been placed on recurrent expenditure as opposed to capital expenditure which is expected to foster development. Meanwhile, there are challenges of mismanagement and misappropriation of public expenditure in the economy. This is manifested in inability to maximize the benefits associated with economic booms. Abu and Abdullahi 2010 indicated that Nigeria currency was overvalued; as such export was discouraged while import was encouraged,

with these are also poor business environment, neglect and decay of infrastructure, corrupt practices, and huge expenditure on maintenance of democratic institutions. Moreover Nigeria has not fared well in the last couple of years as manifested in fiscal imbalance running into large fiscal deficits (Onoh, 2007).

Thus, it is quite unfortunate that the quantity and quality of government expenditure has not translated to meaningful development or improvement in the welfare of the citizens. The standard of living of majority of Nigerians is low; many wallow in abject poverty, while more than 50 percent live on less than US$2 per day. Nigeria is among the poorest countries in the world despite the amount of public spending made by the government.

Giving the existing problems, it is therefore significant to investigate into the nature and effect capital and recurrent expenditure on macroeconomic variables so as to proffer solution to existing problem. Therefore, the attempt in this study is to empirically examine the impact or effects of public expenditure on selected macroeconomic variables in Nigeria.

1.3 Research Questions

In the light of the above, this research provides answers to the following questions;

i. What is the nature and magnitude of the effect of capital expenditure on macroeconomic variables in Nigeria?
ii. What is the nature and magnitude of the effect of recurrent expenditure on macroeconomic variables in Nigeria?

iii. What is the direction of causality between the components of public expenditure and macroeconomic variables in Nigeria?

1.4 Objectives of the Study

This research work primarily examined the effects of public expenditure on a set of macroeconomic variables (gross domestic product, inflation rate, unemployment and exchange rate). The objectives of this study are;

i. To examine the nature and magnitude of the effect of capital expenditure on macroeconomic variables in Nigeria.

ii. To examine the nature and magnitude of the effect of recurrent expenditure on macroeconomic variables in Nigeria.

iii. To determine the causality between the components of public expenditures and macroeconomic variables in Nigeria from 1986 – 2012.

1.5 Significance of Study

This study attempts to reveal the reality of the relationship between public spending and macroeconomic variables in Nigeria. The study justified how government spending stimulates investment and business activities in the Nigerian economy.

This study made analysis based on the disaggregated component of public expenditure namely; capital and recurrent expenditure in relation to macroeconomic variables which includes Inflation, Unemployment, Gross Domestic Product (GDP) and Exchange rate. It showed how the components of public expenditure affect the economy negatively or positively - in a way which

expands the productive capacity of the economy. This study would also encourage the government to see the need for a serious reconsideration of its policies. This will, in a way avoid wastages and best enhances citizens' well-being, which is hard to do or achieve in a rush.

Finally, it would aid individuals and institutions in assessing the efficiency of policy makers at allocating public expenditures for growth and development. And it serves as good information for policy managers in Nigeria and adds to knowledge by empirically evaluating the effects of public expenditure on some key macroeconomic variables.

1.6 Statement of Research Hypothesis

The study has research hypotheses as follows;

Hypothesis I

H_0: Capital expenditure has no significant effects on macroeconomic variables in Nigeria.

Hypothesis II

H_0: Recurrent expenditure has no significant effects on macroeconomic variables in Nigeria.

Hypothesis III

H_0: The components of public expenditure do not Granger – cause macroeconomic variables.

1.7 Scope and Limitation of the Study

This study will analyzed public expenditure and some selected key macroeconomic variables (inflation, unemployment, exchange rate and GDP growth rate) from 1986 - 2012. These macroeconomic variables were selected based on their usefulness in measuring the quality of

economic activities and standard of living of the in Nigeria. Difficulty in obtaining reliable data and finance were major limitations in this study.

1.8 Organization of the Study

This study consists of five chapters, chapter one consist of a general introduction and background of the study, statement of problem, objectives, justification, scope and limitation of the study. Chapter two contains a review of literature (conceptual, theoretical and empirical) and overview of public expenditure. Chapter three contains the methodology which includes the type and sources of data, the analytical framework, model specification, and estimation techniques of the data. Chapter four deal with presentation of result and analysis of findings. Finally, chapter five contains summary of the findings, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter consist of three sections; first the conceptual literature section where the concept of public expenditure was defined and explained, secondly the theoretical literature section where various theories of public expenditure were reviewed and lastly the empirical literature section where related literatures were reviewed.

2.1.1 Conceptual Literatures

Every economy is greatly influence by the level of public expenditure. This expenditure plays a crucial role in the economic growth of a country. By this, government achieves its goal of improving the living condition of the people.

(a) Public Expenditure

Anyanwu (1993) defined Public expenditure as the expenses which the government incurs for its own maintenance, for the benefit of the society, the economy, external bodies and for other countries. He simply put it as government spending from revenues derived from taxes and other sources. Public Expenditure is referred to as an outflow of resources from government to other sectors of the economy. Government spending can be classified into recurrent and capital expenditures.

Discussing the importance of government spending, Lindauer and Valenchik (1992) stated that government spending is used to meet rapid population economic growth and subsequent demographic transitions, increase in income and taste of the people of the country that had led to increase in demand for government goods and services, increase in technological requirements for industrialization, increase in urbanization, increase in inflation over time, balance in productivity growth between public and private sector, and the need to address natural disasters among other things (cited in Ijaiya *et.al*., 2003).

(b) Capital Expenditure

Capital expenditure has been defined as payment for non-financial assets used in production for more than one year while recurrent expenditures are payments for non-repayable transactions within a year (CBN, 2003). This is payment made by the government on the creation or acquisition of assets to be used for production for more than one year or for a long period of time. This includes payment on the acquisition of equipment, machineries, construction of roads and other infrastructural facilities. Capital expenditure has a lasting impact on the economy and helps provide a more efficient, productive economy.

(c) Recurrent Expenditure

This is a short time spending by the government which does not result in the creation or acquisition of fixed assets. It is the main spending on day to day running of government affairs. It includes government spendings on wages, salaries, interest payment, debt servicing. Most are usually non-refundable and the effect on the economy is simply a short-term one.

(d) Unemployment

Unemployment according to Briggs (1973) is the difference between the numbers of labour employed at current wage rates and working conditions, and the amount of labour not hired at these levels. However, Gbosi (1997) defined unemployment as a situation in which people who are willing to work at the prevailing wage rate are unable to find jobs. The International Labour Organization (ILO) defined an unemployed as a member of the economically active population, who are without work but available for and seeking for work, including people who have lost their jobs and those who have voluntarily left work (World Bank, 1998, culled from Akintoye, 2008).

(e) Exchange Rate

Exchange rate is the rate at which one currency exchanges for another (Jhingan, 2003). It refers to the cost of exchanging one country's currency for another. Exchange rate is said to depreciate if the amount of domestic currency required to purchase a foreign currency increases, while the exchange rate appreciates if the amount of domestic currency required to obtain a foreign currency reduces. Exchange rate can therefore be defined as the price of one country's currency in terms of another. It therefore, denotes the numerical value of the domestic currency of one country at any given time in relation that of either country with which it has trade links (Adelowokan, 2012). Today, many economy focuses attention on exchange rate policy for many reasons. As a tool of correcting internal and external imbalances as well as an instrument of improving the efficiency of resource allocation, government in many developing countries use exchange rate as an instrument for stabilization purposes.

(f) Inflation

Balami (2006) sees inflation as a situation of a rising general price level of broad spectrum of goods and services over a long period of time. Haslag (1997) is of the view that inflation is always and everywhere a monetary phenomenon; and can be produced only by a more rapid increase in quantity of money than output. He regarded inflation as "a destroying disease born out of lack of monetary control whose result undermined the rules of business, creating havoc in the market and financial ruin of even the products". Inflation can simply be defined as a general and continuous increase in prices of goods and services without a corresponding rise in the quantity of goods and services. Its effects on economic activities and ultimately on people's well-being is a primary concern of policymakers and has been the focus of many studies.

(g) Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is defined as the market value of all finished goods and services produce in a country during a certain period of time (Jochumzen, 2010). GDP can also be defined as the market value of all officially recognized finished goods and services produced within a country in a year, or other giving period of time. In the period 1988 – 1997 which constitutes the period of the structural adjustment and economic liberalization, the GDP responded to economic adjustment policies and grew at a positive rate of 4.0%. From 2005 Nigeria GDP growth rate averaged 6.8%, reaching 7.36% in 2011 and a low record of 6.5 in 2012 (NBS Economic Outlook, 2012).

(h) Regressive Expenditure

Regressive expenditure is a situation whereby the smaller the income of the recipient, the smaller the proportionate addition which is made to it through government programmes.

(i) Proportional Expenditure

Proportional expenditure is a situation where the proportionate addition remains the same regardless of the recipient's level of income.

(j) Progressive Expenditures

Progressive expenditure exist when the smaller the income of the recipient, the larger the proportionate addition which is made to it by the government expenditure.

In general, it may be said that progressive and proportional expenditure will serve to reduce income inequalities. The same will be true of regressive expenditure provided that the regression is mild. However, the greater the progression, the greater will be the equalizing effects.

2.2.0 THEORETICAL LITERATURE

2.2.1 Theories of Public Expenditure

Some of the theories in economic literature on public expenditure that have wide acceptability are the Wiseman and Peacock theory and that of Wagner's law of increasing state activities.

2.2.2 Wagner Law of Increasing State Activities

One of the earliest attempts to ascertain the growth of public expenditure was that of Adolph Wagner (1835-1917), a famous German political economist writing towards the end of the 19th century. He propounded the 'law of increasing public and particularly state activities - 1912', which is referred to as the 'law of increasing expansion of fiscal requirements'. His prognosis of increasing state activity states that the level of economic development is a causative factor for the growth of public expenditure. This law is the result of empirical observation in progressive countries in Western Europe. According to him an increase regularly takes place in the activity of both the central and local governments of such countries. The increase is both extensive and intensive, the central and local governments constantly undertake new functions, while they perform both old and new functions more efficiently and completely (Taiwo and Abayomi, 2011). That is, there is a functional relationship between the growth of an economy and the growth of government activities so that the government sector grows faster than the economy. Thus, all kinds of government irrespective of their levels, intensions (peaceful or warlike) and sizes indicate the same tendency of increasing public expenditure (Anyanwu, 1993). Wagner argued that social progress brought increasing state activity which in turn meant to more public expenditure. According to this hypothesis of increasing state activity, public expenditure can be divided into two viz.

(a) Expenditure for internal, external security- law and order and

(b) Culture and welfare – this involves participation in the material production of economic goods, including the provision of certain social products such as educational, monetary-banking arrangements in the face of market failure.

Government corporations must produce certain economic goods requiring large fixed investment, since private companies cannot undertake such investment on a profitable basis. Thus, apart from the traditional state function of expanding state activities, other forces behind the tendency of increasing public expenditures are rising population, urbanization and hence pressure on civic amenities, higher prices, the need to provide increasingly qualitative services, provision of welfare and social security measures, rising cost of servicing debt and debt repayments, and accepted ideals of planning and economic growth.

According to Peacock and Wiseman (1967), what Adolph Wagner argued was "that government expenditure must increase at an even faster rate than output." The symbolic statement of Wagner's law, according to this version, appears to be that E = f (GNP), where E stands for the level of government expenditure and GNP stands for gross national product, and the elasticity of public expenditure with respect to gross national product $[e_{E.GNP}]$ is greater than unity.

Frederic (1968) briefly stated, "Wagner asserted that in growing economies the share of public consumption expenditures in the national income increases." The symbolic statement of Wagner's law, according to this version, seems to be that C = $f(Y)$, where C stands for the level of government consumption expenditure and Y stands for national income, and the elasticity of government consumption expenditure with respect to national income $[e_{C.Y}]$ is greater than unity.

Goffman (1968) wrote that "essentially, Wagner argued that as a nation experiences economic development and growth, an increase must occur in the activities of the public sector and that the ratio of increase, when converted into expenditure terms, would exceed the rate of increase in

output per capita." Symbolically, Wagner's law, according to this version, is that E=□ $\left[\frac{\text{GNP}}{\text{P}}\right]$ where E stands for the level of government expenditure and $\frac{GNP}{P}$ stands for gross national product per capita, and that the elasticity of public expenditure with respect to gross national product per capita $\left[e_{\frac{E.GNP}{P}}\right]$ is greater than unity.

Musgrave (1969) wrote on the Wagner's law and state that, "ever since Adolph Wagner expounded his law of the expanding scale of activity, economists have speculated on its validity and the underlying causes. The proposition of expanding scale, obviously, must be interpreted as postulating a rising share of the public sector or ratio of public expenditure to GNP (in the context) of the development of a country from low to high per capita income". His version of the Wagner's law seems to assume a functional relationship of the form;

$\frac{\text{E}}{\text{GNP}} = \text{f}\left[\frac{\text{GNP}}{\text{P}}\right]$ and it appears that the validity of the law is established whenever the elasticity of public expenditure as a share of gross national product with respect to gross national product per capita $\left[\frac{e_E}{GNP}.\frac{GNP}{P}\right]$ is more than unity.

2.2.3 Peacock and Wiseman's Theory of Expenditure

Alan T. Peacock and Jack Wiseman's study is probably one of the best known analyses of the time pattern of public expenditures. They founded their analyses upon a political theory of public determination namely that governments like to spend more money and citizens do not like to pay taxes, and that government need to pay some attention to the wishes of their citizens.

Wiseman and Peacock in their study of public expenditure in UK (1961) for the period 1890-1955 revealed that public expenditure does not increase in a smooth and continuous manner, but in jerks or step like fashion. In other words, government fiscal activities rise step by step to successive new plateau, sometimes, some social or other disturbance takes place creating a need for increased public expenditure which the existing public revenue cannot meet (Anyanwu, 1993).

Peacock and Wiseman have considered the role of emergency such as war, in raising the level of public expenditure. In normal times, size of public expenditure is limited broadly by the level of taxation which the general public is prepared to tolerate. And this tolerable level cannot be high. But major disturbance like war, changes the tolerance limit. At some times catastrophic occurrences such as wars, famine, large scale social disturbances take place to induce the need for increased public expenditure over and above what the people had earlier regarded as acceptable level and are willing to accept a rise in taxes. During the period of crises or conflict they get so used to these new tax burdens that even if taxes are reduced in the immediate post-crises periods, the tax rates do not fall back to the pre-crisis levels. Hence the growth trend of revenue and expenditures is moved upward permanently. The result is a new higher level of government revenue and expenditure which displaces the old one (Nwezeaku, 2010). This movement has been termed as the 'displacement effect'. Their hypothesis indicates that in the absence of major disturbances like war government outlay would increase only gradually (Anyanwu, 1993). In a nutshell, the movement from the older level of expenditure and taxation by major economic disturbances to a new and higher level is the ‘Displacement Effect’.

The insufficiency of the revenue as compared with the required public expenditure creates an 'Inspection Effect' that is, war and other social disturbances force people and the government to seek solutions to important problems which previously had been neglected.

In addition, since each major disturbance cause the government to assume a large proportion of national economic activities, the net result is the 'Concentration Effect' or 'scale effect'. This refers to the apparent tendency for national government economic activity to grow faster than that of the state and the local governments when a society is experiencing economic growth. The concentration effects hold that the change in the division of responsibilities between layers of government, brought about by these major social disturbances, is always in favour of the higher organs of government.

2.2.4 The Keynesian Theory of Government Intervention

This was first presented by Keynes in his book, 'The General Theory of Employment, Interest and Money', published in 1936. The Keynes theory states that expansion of government expenditure accelerates economic growth. Keynes, assumes the aggregate supply function to be stable, he concentrates his entire attention upon the aggregate demand function to fight economic depression. Keynes submitted that the lingering economic depression was a result of failure on the part of the government to control the economy through appropriate economic policies (Iyoha et. al., 2003). Consequently, Keynes proposed the concept of government intervention in the economy through the use of macroeconomic policies (Torres, 2010). According to Keynes economics, when the economy is knocked off balance by serious economic shocks, the government can help restore normalcy by increasing demand through government spending. And

because the influx of government spending drives businesses to hire and consumers to spend, its impact is multiplied (Mankiw, 2010).

In summary, this theory holds that increase in government expenditure leads to increase in economic activities and higher economic growth. The Keynesian theory asserts that government expenditure especially deficit financing could provide short - term stimulus to help halt a recession or depression. During a recession, aggregate expenditure is deficient causing the underutilization of inputs (economic resources). Aggregate expenditure (AE) can be increased, according to Keynes, by increasing consumption spending (C), increasing investment spending (I), increasing government spending (G), or increasing the net of exports minus imports (X-M).

$$AE = C + I + G + (X-M)$$

For the sake of simplicity, this analysis holds that public spending measures have a direct impact on aggregate demand, which will stimulate the economy.

2.2.5 Critical-Limit Hypothesis

Collin Clerk (1943) in his critical-limit hypothesis argued that when the share of the government sector activity (represented by its expenditure) exceeds 25 per cent of the total economic activity of the country, inflation would be the natural result; and this would be so even when the country is operating under a balanced budget. Thus, when the government's share of the aggregate economic activity reaches the critical limit of 25 per cent, the income earners would be affected by reduced incentives (owing to apparent high tax incidence), and this would jeopardizes their level of productivity. The result is that they would produce less than their capabilities and

potentials can support. This would bring about reduced supply. On the other hand, the demand-effects to the government financing (that is expenditure) would become quite strong even when the budget remains balanced. This maladjustment between demand and supply would breed inflationary spirals in the economy as a net result. That is, when there is too much demand in an economy, an inflationary gap occurs. This excess level of demand will tend to lead to demand-pull inflation.

2.2.6 Public Choice Theory

James Buchanan and Gordon Tullock (1962) are credited with being the primary developers of Public Choice Theory. Public choice theory is a branch of economics that is developed from the study of taxation and public spending.

This theory is directed toward the study of politics based on economic principles. It uses modern economic tools to study problems that are generally in the realm of political science. Public choice seeks to understand and predict the behaviour of politicians and bureaucrats in the polity by utilizing analytical techniques developed from economics, based on the postulate of rational choice. In other words, public choice is an application of neoclassical economic tools (self-interest and utility maximization) to explain political behaviour.

In particular, it studies the behaviour of politicians and government officials as mostly self-interested agents and their interactions in the social system either as such or under alternative constitutional rules (Downs, 1957). James Buchanan in “Politics without Romance” claimed that public choice exerted major influence in providing a coherent understanding and interpretation of

what could be everywhere observed. The public directly sensed that collectivistic schemes were failing, that politicization did not offer the promised correctives for any and all social ills, that governmental intrusions often made things worse rather than better. More so, individuals are differently motivated when they are choosing 'for the public' rather than for themselves in private choice capacities.

This theory demonstrates that, while looking to government to fix things can often lead to more harm than good. Public choice theory has been the avenue through which a romantic and illusory set of notions about the workings of governments and the behavior of persons who govern has been replaced by a set of notions that embody more skepticism about what governments can do and what governors will do, notions that are surely more consistent with the political reality that we may all observe about us (Buchanan, 1977).

In a very real sense, public choice became a set of theories of governmental failures, as an offset to the theories of market failures that had previously emerged from welfare economics. In a narrow sense, public choice analysis is concerned with “state failures.” Manned by self-interested actors on a “political market,” the state is often incapable of correcting market failures or, at least, of correcting them at a lower price than the cost of the original market failures themselves. Although public choice has focused mostly on analyzing government failure, to streamline bureaucracies, Gordon Tullock and William Niskanen have recommended allowing several bureaus to supply the same service on the grounds that the resulting competition will improve efficiency. Thus, public choice theory shows that individuals are acting in a rational

fashion, focused on their own self-interests, leading to a very poor outcome for the nation as a whole.

Public choice takes the same principles that economists use to analyze people's actions in the marketplace and applies them to people's actions in collective decision making (Butler, 2012). This means that the public servants, politicians, bureaucrats and their colleagues tend to promote goals of their own even as they claim to be serving the public interest. In public choice theory, individuals, interest groups, bureaucrats, and politicians are assumed to seek their own self-interest as in the market place. Decisions made depend on the costs and benefits of an action taken whereby each group attempts to maximize their own net benefits. Benefits can take the form of monetary or non-monetary rewards and can includes ideologies, goals, and cultural values.

2.2.6 Canons or Principles of Public Expenditure

According to Bhatia (2008) there are four cannons of expenditure. These are;

a. Canon of Economy

Since resources are scarce relative to their needs, no wastage should be permitted. Thus, the process of public expenditure should not involve the use of resources more than what is just necessary. Utmost care must be taken to avoid wasteful usage of public funds. This includes avoiding delay in plan formulation, sanction and execution, especially when price are rising. In most cases, wastage is avoided by using the cost-benefit approach to evaluate projects.

b. Canon of Sanction

This requires that no public funds should be used without proper authorization and that fund must be used only for the purpose for which they have been sanctioned. This ensures the avoidance of unscrupulous and unwanted expenditures while checking misappropriation of funds.

c. Canon of Benefit

Authorities should spend public funds only if they are beneficial to the society. Thus, they should try to choose that combination of items for public expenditure which collectively maximizes the social benefit. In this way, the 'principles of maximum social advantage' is attained.

d. Canon of Surplus

Government should be prudent and aim at meeting its current expenditure needs out of its current revenue, and hence should achieve a moderate surplus. Moderate surplus during some years will take care of reasonable but unavoidable deficit during some other years.

2.2.8 The Role of Public Expenditure in Economic Growth

Public expenditure is used for allocation, stabilization, and distribution of resources (Musgrave and Musgrave, 1989). The allocation function becomes necessary so as to provide both private and, in particular, social goods in appropriate mix with available resources. Due to the special characteristics of social goods (spill-overs/externality, non-excludability/joint consumption, non-rivalry) they will not be produced at all or where they are produced the output will be inadequate and outrageously costly if left in the private sector (since they are non-market-priced). Hence, the government intervenes, using the instrument of public expenditure and other fiscal policy tools.

Stabilization function is that of maintaining high employment, a reasonable degree of price stability, and an appropriate rate of economic growth, with allowances for effects on trade and on the balance of payments. That is, the stabilization function is concerned with the attainment, by national economy of full (or high-level of) employment and capital utilization at stable prices, a good balance of international payments performance, and a satisfactory rate of growth in per capita income over a period of time.

According to Anyanwu (1997), the distribution function involves adjustment of the distribution of income and wealth to assure conformance with what society considers a "fair" or "just" state of distribution. This helps to bridge the income and wealth gap between the rich and the poor.
Public expenditure also shapes the course of development. It affects aggregate resource use and financing patterns and, together with other fiscal policy measures, monetary and exchange rate policies, influences the balance of payments, the accumulation of foreign debt, and the rate of inflation, interest, and exchange rate. Public expenditure also affects the behavior of producers and consumers and influences the distribution of income and wealth in the economy. Indeed, balance of payments crises and foreign debt problems are at least aggravated, and are often caused, by imprudent public expenditure. On the other hand, careless public expenditure austerity can lead to prolong recession, and can place a disproportionately heavy burden on the poor (World Bank, 1988).

Public expenditure, apart from being an essential tool for macroeconomic stabilization (controlling the inflation rates, the current account deficit, the growth of national debt, and the level of economic activity), also affects adjustment and growth by influencing the rates of

consumption, savings, and investment in both physical and human capital. At the microeconomic level, public expenditure encourages the production and consumption of some goods and discourages the production and consumption of others. Public expenditure policies in principle, affects all sectors of the economy, and they typically do so in developing nations as in developed ones.

Anyanwu (1997) emphasized that the role of public expenditure can be analyzed in terms of costs and benefits. The costs and benefits may be real or pecuniary, direct or indirect, tangible or intangible, final or intermediate, and inside or outside.

The real benefits of public expenditure are the benefits derived by the final consumers of the public expenditure. They reflect an addition to the community's welfare, to be balanced against the real cost of resource withdrawal from other uses. Pecuniary benefits and costs come about because of changes in relative prices which occur as the economy adjusts itself to the provision of the public service and the pattern of demand changes. The real benefits may be direct or indirect or, which is same; primary or secondary. Direct benefits and costs are those related closely to the main expenditure objective, whereas indirect benefits are in nature of by-products.

Tangible benefits and costs can be valued in the market, whereas others which cannot are known as intangible. Most social goods and social costs typically fall into the category of intangible. Another important distinction is that between public expenditure which brings about benefits to consumers directly (since they involve the provision of final goods) and public expenditure which enters into the production of other goods and are thus of an intermediate type.

Finally, a distinction exists between benefits and costs which accrue inside (internal) the jurisdiction in which the expenditure is undertaken and others which accrue outside (external or spillover costs and benefits).

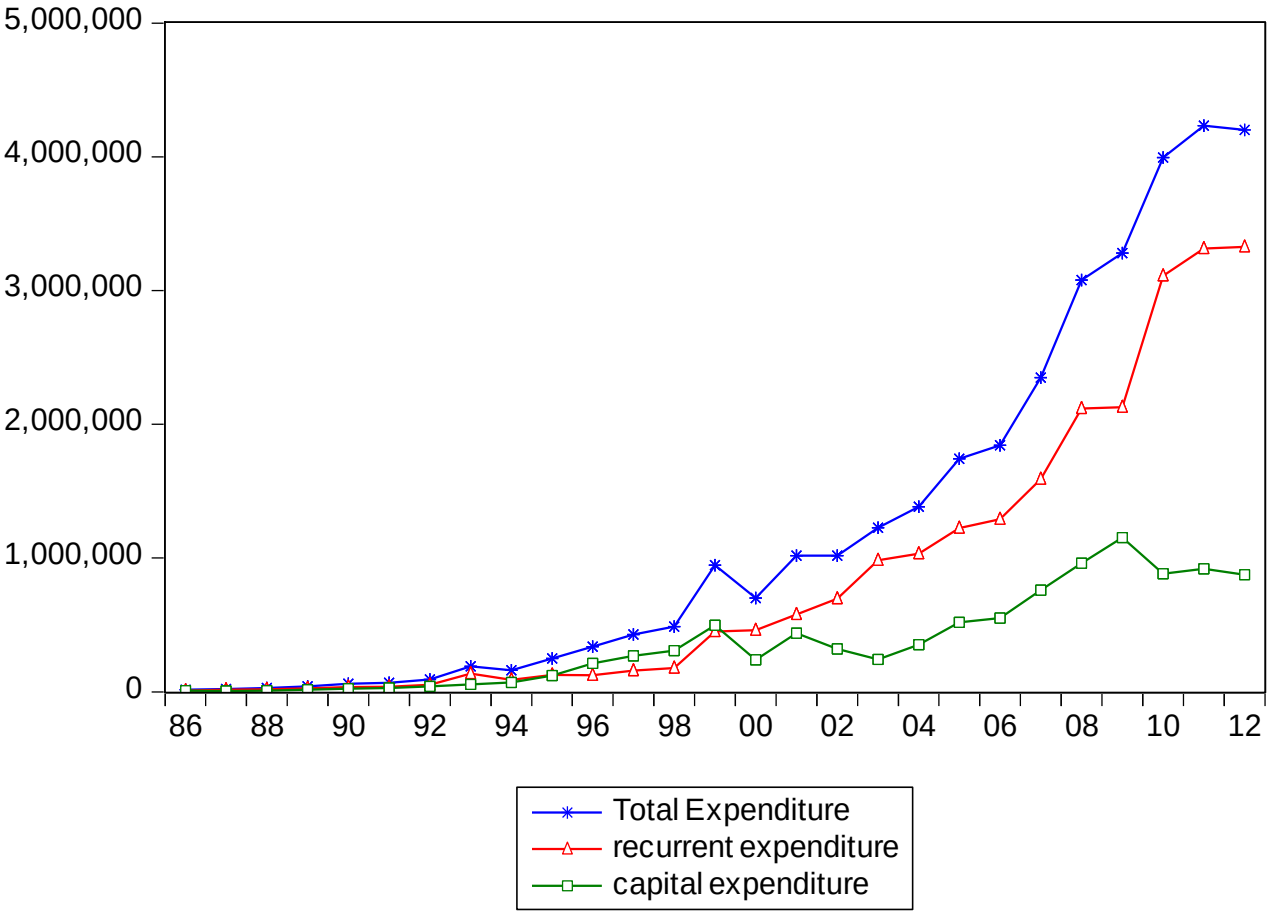


Figure 2.1: Public Expenditure Trend in Nigeria from 1986 - 2012

Source: Central Bank of Nigeria, 2012

Figure 2.1 showed that government expenditure has been inconsistent since the introduction of the Structural Adjustment Program (SAP) in Nigeria. The trend of government expenditure from 1986 to 2012 showed that capital expenditure was higher than recurrent expenditure between 1996 and 1999. Capital expenditure was N212, 926.3million in 1996 and N498, 027.6million in

1999. While recurrent expenditure was N124, 491.3million in 1996 and N449, 662.4million in 1999. In 2000 the capital expenditure fell below the recurrent expenditure, the caused may not be far from the cost of maintaining democracy. And since then, the recurrent expenditure has been increasing over and above the capital expenditure.

2.2.9 Trend of Selected Macroeconomic Variables in Nigeria

The introduction of the Structural Adjustment Programme (SAP) in 1986 had serious implications on macroeconomic variables in Nigeria. Theoretically, changes in public expenditure have clear implications for key macroeconomic variables. Expectedly the overall impact of public expenditure is the change in economic growth and overall changes in development indicators. Therefore, changes in the basic components of public expenditure – recurrent and capital – have consequences for macroeconomic variables such as inflation, exchange rate, unemployment and economic growth.

Table 2.1 showed unemployment rate declined from 7% in 1987 to 3.5% in 1998. In 1999 it rose to 17.5%. The statistics on unemployment in Nigeria shows that unemployment has been on the high side, ranging between 12.2 percent in 2002 to 23.9 in 2012.On table 2.1, inflation rate was 13.67 percent in 1986. The highest rate recorded throughout the period was 61.21, 61.26, 76.76 and 51.59 percent in 1988, 1993, 1994 and 1995 respectively, which was due to a number of factors, such as the initial substantial depreciation of the naira exchange rate and the lagged effect of upward adjustments in the prices of petroleum products in 1994. Inflation reduced to as low as 6.56 percent in 2007 and rose again to 12.0 percent in 2012. The Nigeria economy is highly prone to exchange rate change because of the nature of its largely uncompetitive

manufacturing industries. Exchange rate was 2.02 percent in 1986; it depreciated to 22.05 in 1993, it went further to 120.98 in 2002 and it stood at 155.76 in 2012. Lastly, in the period 1988 to 1997 which constitutes the period of structural adjustment and economic liberalization, the GDP responded to economic adjustment policies and grew at a positive rate, with the highest growth of 11.36 percent in 1990 and the lowest of 0.01 in 1991. From 2005 Nigeria GDP growth rate averaged 6 percent, reaching 7.98 percent in 2010 and 6.58 in 2012 respectively.

Table 2.1: Trend of Selected Macroeconomic variables in Nigeria

Year	Capital expenditure	Recurrent expenditure	Unemployment rate	GDP growth rate	Inflation rate	Exchange rate
1986	8,526.80	7,696.90	5.30	1.89	13.67	2.02
1987	6,372.50	15,646.20	7.00	-0.69	9.69	4.02
1988	8,340.10	19,409.40	5.10	7.58	61.21	4.54
1989	15,034.10	25,994.20	4.50	7.15	44.67	7.39
1990	24,048.60	36,219.60	3.50	11.36	3.61	8.04
1991	28,340.90	38,243.50	3.10	0.01	22.96	9.91
1992	39,763.30	53,034.10	3.50	2.63	48.8	17.3
1993	54,501.80	136,727.10	3.40	1.56	61.26	22.05
1994	70,918.30	89,974.90	3.20	0.78	76.76	21.89
1995	121,138.30	127,629.80	1.90	2.15	51.59	21.89
1996	212,926.30	124,491.30	2.80	4.13	14.31	21.89
1997	269,651.70	158,563.50	3.40	2.89	10.21	21.89
1998	309,015.60	178,097.80	3.50	2.82	11.91	21.89
1999	498,027.60	449,662.40	17.50	1.19	0.22	92.34
2000	239,450.90	461,600.00	13.10	4.89	14.53	100.8
2001	438,696.50	579,300.00	13.60	4.72	16.49	112.03
2002	321,378.10	696,800.00	12.60	4.63	12.17	120.98
2003	241,688.30	984,300.00	14.80	9.57	23.81	129.43
2004	351,300.00	1,032,700.00	13.40	6.58	10.01	133.5
2005	519,500.00	1,223,700.00	11.90	6.51	11.57	131.64
2006	552,385.80	1,290,201.90	12.30	6.03	8.55	127.38
2007	759,323.00	1,589,270.00	12.70	6.45	6.56	124.61
2008	960,900.00	2,117,400.00	14.90	5.98	15.06	117.69
2009	1,152,796.50	2,127,971.50	19.70	6.96	13.93	147.4
2010	883,874.50	3,109,378.51	21.40	7.98	11.8	148.81
2011	918,548.90	3,314,513.33	23.90	7.43	10.3	152.33
2012	874,762.27	3,325,156.25	23.90	6.58	12.0	155.76

Sources: CBN Statistical Bulletin, 2012 and National Bureau of Statistics Annual Report.

2.2.10 Types of Public Expenditure

It is conventional to classify public expenditure into various economic categories. Accounting classification enables the state executive to maintain an effective control and check over public expenditure and possible leakages and wastage, diversion and misappropriations. It may be departmental classification or classification according to heads of expenditure. Such a classification is good for auditing and for safeguarding against misappropriations, but it does not help us in understanding its effects. It is therefore, difficult to formulate an appropriate expenditure policy on this basis. In the same way, a distinction between obligatory (or legally committed) expenditure and optional expenditure can only highlight the constraints under which the government's budgetary policy has to work. It cannot bring out fully the possible effects of different expenditure policies. These days, however, an increasing need for useful and effective classification of public expenditure is felt. It is only through such classification that the economic effects of various state activities can be gauged and proper policies formulated. Here, however, we can take up the classifications of public expenditure, each of them indicating an area of possible effects on the economy.

a) **Capital Expenditure and Recurrent Expenditure**

Central Bank of Nigeria (CBN 2003), categorized Public expenditure into two components; capital expenditure and recurrent expenditure. Capital expenditure is the payment for non-financial assets use for production for more than one year. It refers to government spending on investment goods. This means spending on things that last for a long period of time. Such expenditure may be defined as any expenditure other than operating expenditure, that result in

the creation of assets with the benefits which extend over a period of time exceeding one year after their acquisition.

Recurrent Expenditure is spending that does not result in the creation or acquisition of fixed assets (new or second-hand). It is mainly spending on day to day-to-day running of government affairs. It consists mainly of expenditure on wages, salaries and supplements, purchases of goods and services and consumption of fixed capital (depreciation).

b) Transfer and Resource-Using Expenditures

Transfer expenditure or non-exhaustive expenditures take the form of outright grants of money to private citizens or private businesses. Transfer expenditure is a payment without corresponding receipt of goods and services by the State. That is, payment which is without corresponding transfer of real resources from the private sector or their use by the state. The government simply transfers the right or claim to use the goods and services to certain sections of the society. Examples are debt service (interest payments and capital repayments on internal and external debts), pensions and gratuities, external financial obligations such as annual subscriptions to international bodies (in Nigeria) while in other economies they include social security benefits, unemployment compensation, and other welfare payments.

Distributional Effects of Transfer Expenditure

Income transfer may be achieved in two ways. There may be a straightforward reduction in the inequality of money incomes or there may be an attempt to adjust the size of transfer to individual need.

The second approach makes the same impact as tax allowances and aims to reduce the income inequalities which arise as a result of special personal circumstances at different times of life. Many of the social security benefits of the welfare state are based on this principle, example old age pensions, unemployment and sickness benefits, family allowances, widows' pensions and supplementary benefits (national assistance). All these payments are equal regardless of individual income; therefore, the distributional effects are progressive.

The distributional effects of transfers will be weakened if they affect incentives, that is, if a relatively large transfer reduces the will to work, total income will be less than it might have been and vice-versa.

On the other hand, resource-using or exhaustive or absorptive expenditures are those that involve the transfer of funds from the government to the private sector in return for goods and services. Non transfer expenditure is that by which the state pays for its purchases or use of goods and services. Such non-transfer expenditures have effects that are allocational in nature unlike the transfer expenditure whose initial effect is on the distribution of income in the society. Their examples are expenditures on administration, economic, social and community services, defense, education and such like things are all of non-transfer expenditure.

In the case of transfer expenditure, the beneficiaries are to decide about the use of real resources, in the case of non-transfer expenditure, it is the State that uses the resources. Such a use of resources by the State may be for consumption purposes or for investment purposes.

Distributional Effects of Exhaustive Expenditure

Expenditure of this kind will remove resources from a wholly free use in the private sector of the economy in two ways.

i. **Effects of Subsidies.** These are likely to direct greater volume resources into selected use than would have been the case in a free market. A general subsidy on a commodity which is widely consumed, like foodstuffs and petroleum products, will be progressive to the extent that the commodity accounts for a significant proportion of the total expenditure of the lower income groups. A specific subsidy upon a commodity consumed by selected groups of people will be progressive to the extent that it gives a greater benefit upon the lower income groups. The distributional effects of subsidies will depend upon the beneficiary's ability to pay the subsidized price.

ii. **Collective services.** These will be provided by the direct employment of resources in the public sector or through the purchase of goods and services from the private sector. For example, educational expenditure has a distributional effect in favour of the poor since they receive a service which they would not otherwise enjoy and affords them the long term opportunity of raising their incomes. Health expenditure for similar reasons has effects which are progressively more favourable to the poor than the rich.

c) Productive and Unproductive Expenditures

This distinction emphasize that while some expenditures are in the nature of consumption, others are in the nature of investment and help the economy in improving its productive capacity. Under

the laissez-faire philosophy, the only productive public expenditures are those which are incurred to create and maintain social overheads. Expenditures on administration, defense, justice, law and order, and maintenance of state are unproductive. Adam smith believed that an economic added to its productive capacity in a long-run only through additions to its capital stock and production of tangible goods. If we extend this logic to public expenditure, it will follow that only those public expenditures are productive which create some tangible assets in the economy and enable it to produce more in future.

Some people would like to adhere to the usual classical thinking in which the government sector is considered as something foreign and alien to the economy proper. In this case, only those public expenditures are productive which add to the tangible assets of the government, or more precisely income-yielding tangible assets of government including public enterprises of commercial type. The government would be charging for the services of those enterprises to pay for them. Depending upon pricing policies and other factors, such public expenditures may be partially or fully, self-liquidated. They could even be a source of profit for the authorities.

According to Bhatia (2008) the foregoing analytical framework is totally unrealistic. Basically the government sector is a part and parcel of the economy as a whole and must be considered as such. Whether an asset is added to the ownership of the government or to that of the private sector, should not be a determining factor in deciding about the productiveness or otherwise of any public expenditure.

It then follows that, there are many assets which do not yield an income to the government, but which are really necessary for the productive efficiency of the economy. Such assets are termed productive even though on normal commercial considerations they are not. Parks, water-works and similar goods and services which add to the productive efficiency of the economy must be viewed as productive assets, and expenditure on their creation and maintenance as the productive expenditure. Such public expenditure is, therefore, also self-liquidating in an indirect manner.

It is also not necessary that the productive assets must be in some tangible form only such as building, machinery and the like. The productive power of the society can reside in the form of human capital, for instance education, training, health, better living conditions and better labour relations. There are other certain public expenditures without which the economy cannot live and cannot maintain its productivity. Rather in many cases such expenditures indirectly help the economy in attaining higher levels of productivity, examples are those of defense expenditure. Therefore, a precise distinction between productive and unproductive public expenditure is not an easy task. Each case has to be judged on its own merits.

Basically, we may take the position that all spending that is necessary and relevant, and hence being in the nature of investment and helping to improve the productive capacity of the economy, is productive expenditure. On the other hand, unproductive expenditures will be those that are wasteful and avoidable. When talking about capital and recurrent expenditures, capital expenditure can be regarded as productive and recurrent expenditure as consumption spending which is not very productive.

d) Plan and Non-Plan Expenditures

Plan expenditure is a well-organized and coordinated government spending on projects and schemes. Once a plan scheme is fully operative, or a plan project is completed, its maintenance and operational expenses are shifted to non-plan budget. Non-plan portion of expenditure tends to increase. Non-plan expenditure includes spending on interest payments and subsidies.

2.2.11 Review of Public Expenditure Policy from 1986 to 2012

The inability of the budgetary instrument in Nigeria's social-economic history to translate into politically desired and expected goals or at least to attain the primary goals of its development plan, led to various Public Expenditure Management (PEM) reforms. Public Expenditure Policy (PEP) system is the process through which government or the political system evolve an instrument (budget) that is expressed in figures for the pursuance, monitoring and evaluation of its goals.

The dwindling oil resources, macroeconomic policy distortions and the increasing need to diversify the productive base of the economy led to the adoption of the Structural Adjustment Programme (SAP) in 1986. With the introduction of the Structural Adjustment Programme which marked the post liberalization era, strict measures were put in place to curb government expenditure; reduction in wage bills, and reduction in government subsidies. However, the period 1990-1995 saw the regime's efforts to combat inflation hence large budgetary deficits were avoided which made government expenditure more cost-effective consistent with the nations resources. The latter 1990s to 2000s witnessed a restrictive fiscal policy with the introduction of a modified value added tax and also subsidizing local industries (Louis, 2012).

In the early 2000s, a comprehensive economic reform programme was initiated to fast - track economic growth. This includes the establishment of Excess Crude Account (ECA) which was created to moderate expenditures by the three tiers of government against the backdrop of liquidity overhang. Monetization of the benefits of the public servants and "Due Process" in the procurement of goods and services were institutionalized. The Budget Monitoring and Price Intelligence Unit (BMPIU), which was the office in charge of the Due Process, though now changed to the Bureau of Public Procurement (BPP), (2005) defined "Due Process" as a mechanism for ensuring strict compliance with the openness, competition and cost accuracy rules and procedures that should guide contract award within the Federal Government of Nigeria. The "Due Process Policy" was introduced into the nation's procurement system via Treasury Circular by the Federal Ministry of Finance No.TRY/F15775 of 27th June, 2001, Federal Republic of Nigeria, (2002). The ultimate goal is to reduce waste and fiscal deficits so as to achieve macroeconomic stability, a necessary condition for attaining internal and external stability.

In 2003 Obasanjo noted that, budgeting in Nigeria has been undisciplined and uncoordinated. It lacks rigour at bureaucratic level, lacks clear vision and functional cooperation at the political level, with very little involvement of the civil society except for consultation with the organized private sector in the entire planning process, and suffers from ill-equipped and inefficient bureaucracy (Ukwu *et. al.*, 2003).

With the persisting negative growth rate, the Obasanjo regime in 2003, initiated further Public Expenditure Management framework under a new development plan captioned National

Economic Empowerment and Development Strategy (NEEDS). The new budget system under NEEDS is a performance oriented Public Expenditure Policy aimed at the closure of supply and efficiency gap in the Nigerian economy.

Central to the reforms was the Medium Term Expenditure Framework (MTEF), 2003 – 2005, which provide a macroeconomic framework to strengthen fiscal management and improve the planning and budgeting of public expenditure to curtail abuse and misallocation of resources. The MTEF is a crucial component of public financial management reforms as it requires the adoption of a multi-year perspective in budgeting to allocate public resources on a rolling basis over the medium-term. The MTEF also serves as the basis for the preparation of the estimates of revenue and expenditure for the Annual Federal Budget.

Government passed the Fiscal Responsibility Act, 2007 (FRA) to provide for prudent management of the nation's resources and ensure long-term macroeconomic stability of the Nigerian economy. The FRA requires that the Minister of Finance prepare the MTEF which should include a macroeconomic framework, fiscal strategy and Medium-Term Fiscal Framework (MTFF). The Act establishes the Fiscal Responsibility Council (FRC) to promote and enforce the nation's development objectives; it also institutionalizes the Medium Term Expenditure Framework as a tool of fiscal management. In the same vein, government passed the Public Procurement legislation in 2007, under the President Umaru Musa Yar'Adua administration which is now called "Public Procurement Act" 2007. Prior to 2007, Nigeria was among the few African countries without legislation on Public Procurement. The Public Procurement Act highlights the guidelines for the award of contracts and services, but a lot of

questions, misconceptions, doubts, criticisms and cynicism have been trailing its implementation to enhance the due process mechanism in public procurement and improve the efficiency and transparency of the system. Following this Act, government established the Bureau of Public Procurement as a policy making and monitoring institution. The policy is aimed at enforcing compliance with established guidelines in budgeting, procurement and expenditure by all Federal spending entities. It is not only based on open and competitive process but that contract costs are authentic, reasonable and comparative to national, regional or international costs. The ultimate goal is that all spending by Government should be appropriately geared to the realization of set priorities and targets that were generated from medium range strategic plans at the most cost effective and cost efficient basis (BMPIU Manual, 2005).

2.3.0 EMPIRICAL LITERATURE

2.3.1 Introduction

This section provides empirical studies conducted on the effect of or relationship between public expenditure on/and economic growth and development. Researchers in this area of study reported results such as; positive effect or negative effect. There is a sizeable literature focusing on government expenditure and its aggregate economic effects. Some of these studies are Amin (1998), Taiwo and Abayomi (2011), Stephen (2012) and Oni *et.al.* (2014). While others like Ekpo (1995), Ogiogio (1995), Odusola (1996), Joseph (2003), Odior (2011), Loto (2011), Modebe (2012) and Olabisi and Oloni (2012)conducted a disaggregated analysis. Some studies like Olaiya *et.al.* (2012), Louis (2012), Ansari *et. al.,* (1997) and Dapendra (1998) analyzed whether there is causality or no causality between government expenditure and economic growth among other objectives. And other studies observed mixed results on various macroeconomic

ariables include Giordano *et.al.* (2005), Ahmad and Qayyum (2009), Okpara and Nwaoha (2010) and Banuso and Odior (2012).

2.3.2 Effects of Public Expenditure on Economic Growth

In assessing the role of public spending in sustainable growth in Nigeria, Stephen (2012) carried out an empirical study and assessed the efficiency of policy makers in allocating public expenditures. He examined the growth implications of public spending in Nigeria. The study employed Ordinary Least Square multiple regression model, for the data analysis. He used 1975 – 2008 period for the study. The study found that the increase in government expenditure did not contribute to sustainable growth in Nigeria. The findings of the study demonstrated that, the allocation of public expenditures did not fulfill the pareto - optimal criterion. The study suggested the need for the government to adopt public spending strategy that is capable of helping the poor countries to break out of their poverty trap and to join the global economy and establish the basis for private-sector-led diversified investment and economic growth.

Ahmad and Qayyum, 2009 studied role of public expenditures and macroeconomic uncertainty in determining private investment in large scale manufacturing sector of Pakistan. They applied the cointegration approach, test of stability such as CUSUM and CUSUM of Squares, and also developed the stable dynamic private investment function for the large scale manufacturing sector. It was found that most of the series are non-stationary and there was one cointegrating relationship between the private investment, public consumption expenditures, public development expenditures and size of market. The dynamic private investment function was estimated through error correction mechanism (ECM). The dynamic error correction mechanism

(ECM) model of private investment indicates that public development expenditures enhance the private investment whereas non-development expenditures and macroeconomic uncertainty negatively affect private investment. The results of the study supported the proposition that public development expenditures lead to enhance private investment in large scale manufacturing and public non-development expenditures have considerable negative effect on private investment. The study also showed that economic instability and uncertainty tends to depress the private investment in large-scale manufacturing. The study also supported that; the larger the size of market, higher will be the private investment.

Blanchard and Perotti (2002) resorted to a structural VAR specification to analyze the dynamic effects of shocks in government expenditure and taxes on economic activity in USA, during the post second world war period. The use of VAR was defended on grounds that it was better suited for fiscal policy studies as fiscal variables moved for many reasons (apart from output stabilization) and there were exogenous fiscal shocks; furthermore, decision and implementation fiscal policy lags ensured that the discretionary response of fiscal policy (within a quarter) to unexpected contemporaneous movements in output would be very rare. Their results consistently showed that positive innovations in public spending and in taxes respectively had a positive and a negative impact upon output; they also found that both positive shocks in spending and taxes had a strong negative effect upon private investment spending. Blanchard and Perotti showed that government spending does not react to other contemporaneous macroeconomic variables automatically and so government spending shocks can be identified by a recursive ordering with government spending ordered first in a Vector Autoregression (VAR).

Loto (2011) investigated the effect of government expenditure on economic growth in Nigeria over the period of 1980 to 2008, with a particular focus on sectoral expenditures. Five key sectors were chosen (security, health, education, transportation and communication and agriculture). The variables were tested for stationarity and cointegration analysis was also carried out using the Johansen co-integration technique. Error correction test was also performed. These techniques were used is to identify the interactions between government spending on these sectors (education, health national security, transportation and communication and agriculture) and economic growth in Nigeria. The result showed that in the short-run, expenditure on agriculture was found to be negatively related to economic growth. The impact of education, though also negative was not significant. The impact of expenditure on health was found to be positively related to economic growth. Though expenditures on national security transportation and communication were positively related to economic growth, the impacts were not statistically significant.

Olabisi and Oloni (2012) analyzed the relationship between the compositions of public expenditure and economic growth in Nigeria from 1960 to 2008.Government expenditure was expected to be a means of reducing the negative impacts of market failure on the economy. They analyzed the relationship between public expenditure compositions on economic growth using the Vector Autoregressive Models (VAR). They found that expenditure on education had failed to enhance economic growth due to the high rate of rent seeking in the country as well as the growing rate of unemployment. And that expenditure on health and agriculture has positive contributions to growth while on water and education is negatively related with growth.

Taiwo and Abayomi (2011) examined the trends as well as effects of government spending on the growth rates of real GDP in Nigeria over the last decades (1970-2008) using econometrics model with Ordinary Least Square (OLS) technique. The presence of stationary between the variables was tested using Dickey – Fuller Unit root test. The result revealed absence of serial correlation and that all variables incorporated in the model were non-stationary at their levels. In an attempt to establish long-run relationship between public expenditure and economic growth, the result also revealed that the variables are cointegrated at 5% and 10% critical level. The findings of the study showed that there is a positive relationship between real GDP as against the recurrent and capital expenditure.

Odior (2011) analyzed the dynamic direct and indirect effects of government policy on health and its relation to the cyclical economic growth in the long run. He provided a brief structure of government expenditure on health in Nigeria. The paper used an integrated sequential dynamic Computable General Equilibrium (CGE) model to examine the potential impact of increase in government expenditure on health in Nigeria. The model was calibrated with a 2004 Social Accounting Matrix (SAM) data of the Nigerian economy. The result showed that the re-allocation of government expenditure to health sector is significant in explaining economic growth in Nigeria and will in the long-run lead to substantial growth of the economy.

Similarly, Louis (2012), analyzed the relationship and the direction of causality between government expenditure and economic growth in Nigeria using annual data from 1961-2009. The variables of government expenditure are total government expenditure at the aggregate level and total recurrent expenditure, total capital expenditure, administration, social and community

services, economic services and transfers at the disaggregate level. He adopted the augmented level VAR with integrated and cointegrated processes developed by Toda and Yamamoto (1995) used by Jamshaid *et.al.* (2010). First from the Augmented Dickey-Fuller (ADF) test, found that the variables were non-stationary at levels, but stationary in their first differences. Secondly, according to the Toda-Yamamoto causality test the study found that there is a unidirectional causality running from total government expenditure to economic growth, which supported the Keynesian hypothesis. Moreover, at the disaggregate level, results showed that all the variables except total recurrent expenditure cause economic growth implying that government expenditure promotes growth in Nigeria.

Dapendra (1998) investigated the causal link between government expenditure and economic growth in Malaysia employing augmented Granger causality test between the two sets of variables. Evidence from the result showed that there is no reverse causality between the variables under consideration.

Ansari *et. al.,* (1997) attempted to determine the causality between government expenditure and national output for three African countries; Kenya, Ghana and South Africa by employing Granger causality test procedure and the Holmes Hutton (1990) causality test which tends to be a modified version of the Granger test. The results of the study depicts that there is no long run relationship among the variables in the countries under consideration.

Oni *et. al.,* (2014) investigated the joint effects of capital and recurrent expenditures of government on the economic growth of Nigeria using the ordinary least square method for

estimating multiple regression models covering 1980-2011 time periods. The regression results showed that both capital and recurrent expenditures impacted positively on economic growth during the period of study. The recurrent expenditure had a stronger and more accelerating effect on growth than capital expenditure. This was attributed to the fact that capital expenditure which is not meant for immediate consumption is more prone to misuse and embezzlement, and also could make it to be less growth enhancing.

Modebe *et. al.,* (2012) examined the impact of government expenditure (disaggregated into recurrent and capital expenditure) on economic growth from 1987 to 2010. Three variable multiple regression model was adopted while recurrent expenditure and capital expenditure were used as independent variable and gross domestic product growth rate as dependent variable. The result emanating from the study revealed that while recurrent government expenditure had positive and non-significant impact on economic growth, capital expenditure had negative and non-significant impact on economic growth thus, re-echoing the need for increase and encouragement of private sector investment which have proven over the years as a more efficient utilization of resources compared to public sector.

Olowononi (1981) examined the growth pattern of public expenditure in old Kwara state between 1968 – 1976. His findings, with the use of descriptive statistics, showed that the growth of public expenditure was due to direct government involvement in the state activity such as health, education and housing and community services. He discovered that there has been increase in the growth of public expenditure in the state due to government commitment to administration, social and economic services. His findings revealed that government expenditure

in the state tends to rise at a faster rate than GDP, and that social sector – spending rise faster than the average of other items of government expenditure.

Ohwofasa (2008) carried out a study on public expenditure and economic growth in Nigeria between 1986 – 2005. He used simple regression model and granger causality to assess how fiscal policy influences economic growth in Nigeria and determined which components of government functional expenditure enhances growth and identified those that do not. The study revealed that government expenditure on administrative sector and economic sector were significant in explaining growth in Nigeria, while that of social sector and transfer sector were not. The study also established a strong and positive relationship between the GDP and administrative sector, economic sector and social sector while negative and weak correlation existed between GDP and transfer sector.

Amin (1998) examined the effects of public expenditures on growth of the Cameroon's economic activities. Using an aggregate production function, he discovered a positive relationship between the two, even though the relationship could not be statistically established.

Riasat *et. al.*, (2011) empirically investigated the impact of education expenditures on economic growth of Pakistan over a period of 1972 to 2010, using bounds testing approach. The bounds test allows a mixture of I(1) and I(0) variables as regressors, that is, the order of integration of appropriate variables may not necessarily be the same. The empirical results showed that education expenditures had a positive and significant impact on economic growth in the long

run. The elasticities of the model suggest that if there is a one percent increase in education expenditures, it increases up to 0.039 percent in output in the long run.

2.3.3 Relationship between Public Expenditure and Selected Macro Variables

Okpara and Nwaoha (2010), in a study to examine the relationship between government expenditure, money supply, prices and output in Nigeria, built a set of simultaneous equation and it was found to be over identified under the order condition for identification. The two stage least squares method was employed to estimate the system. The reduced form of the growth model was singled out for long run cointegration and causality test and no evidence of cointegration was eventually detected. The results revealed that money supply is a positive and significant function of prices and also granger causes prices with no reverse or feedback effect. The stock of money exerts a positive and significant influence on the growth of the economy while prices are found to have a significant reducing effect on the real GDP growth. They concluded that the expenditure decision of the government is significantly determined by government revenue and one-year lag of government expenditure.

Pyraee *et. al*., (2010) used a real business cycle model to analyses the impact of stochastic shocks of government spending on macroeconomic variables by application of dynamic stochastic general equilibrium model. The model was estimated by the maximum-Likelihood method using data from Iran. Estimation results point out that a negative response of consumption and following a government spending shock. Other macroeconomic variables like private investment, capital, employment, wages, and output are caused by a positive response to government spending shock. They concluded that, increased government spending increase

productivity and reduce production costs of private sector, stimulate the private sector to increase investment and production and increase consumption in long-term. The results also showed that more government spending stimulates other variables and increases them.

Joseph (2012) adopted Ordinary least square multiple regression to carry out analysis on the relationship that exist between public expenditure and industrial sector productivity. The regression results showed that both government expenditure on administration and government expenditure on economic services have negative relationships with industrial productivity. The impact of each independent variable either negative or positive on industrial productivity is insignificant. This finding revealed some fundamental reasons why Nigeria economy remains underdeveloped; despite the huge amount spend every year since her political independence. Generally, the research discovered that the public expenditure process in Nigeria as a whole is marred with mismanagement, misallocation of resources and lack of leadership focus.

Momodu and Ogbole (2014) examined public sector activities and macroeconomic variables in Nigeria within a period of forty years (1970-2010). Special focus was made on the effectiveness in the period of regulation (1970-1985), and deregulation (1986-2010) of the Nigerian economy. A test of causal relationships between government expenditure (GE) and other explanatory variables- GDP, unemployment (UER), inflation (IFR) Balance of payments (BOP) was examined using the following statistical tools – Augmented Dickey Fuller (ADF) stationarity test, Johansen's co-integration test, OLS, multiple regression analysis and Granger causality test. The time series data were found to be stationary in the short-run and a number of co-integrating equations were found to establish long-run relationships among the variables of study. The

revealed that public sector was more effective though marginally in stimulating economic growth (measured by GDP) in the period of regulation and more effective in reducing unemployment and enhancing BOP in the period of regulation. With respect to maintaining price stability, the public sector was significantly more effective in the period of deregulation. They therefore concluded that though public sector is generally effective theoretically, yet it has inherent practical limitations (Social, Political, Cultural, Economic and Geographical) that sometimes tend to minimize its effectiveness.

Creel *et.al.,* (2005) estimated a structural VAR model of the French economy, based on the Fiscal Theory of the Price Level (FTPL); they found econometric evidences to reject the predictions of FTPL that fiscal shocks and interest rates should cause an important impact upon prices while at the same time their results agreed with most of conventional Keynesian effects of fiscal policy. Thus, they emphasized the immediate negative impact of a positive surplus shock on output although they acknowledged that the favorable impact of an expansionary and discretionary fiscal policy on product would deploy its effects after a time; they also found that negative wealth effects (due to sharp public debt reductions) played a key role in the long lasting decrease in gross domestic product.

Mohammadi *et. al.,* (2012) studied the effect of governmental expenditure composition on the economic development of Economic Cooperation Organization countries (ECO) in the period 1995-2009. The study emphasized on three types of public expenditure, health expenditure, education and defense. Dynamic panel data method & generalized method of moments (GMM) was used as the tool of analysis. They used the Sargan test for accuracy of applied moments to

shows the accuracy of used methods. The findings showed that the health expenditure by government has statistical Significance and negative effect on growth, educational expenditure by government has statistical significance and positive effect, also the government defense expenditure has statistical significant and positive effect on the economic development of ECO countries.

Ogiogio (1995) examined the growth impact of recurrent, capital and sectoral expenditures over the period 1970 - 1993. He observed the existence of long-run relationship between economic growth and government expenditures. Meanwhile, contemporaneous government recurrent expenditures have more significant effect than the capital expenditures while five year lags of capital expenditures are more growth inductive. The study, thus argued that for effective assessment of the effect of capital investment programmes on economic growth, one would require a five – year planning horizon. And lastly, the study also indicates that government investment programmes in socio-economic infrastructure provide a conducive environment for private-sector-led growth.

Ekpo (1995) regressed the disaggregated components of government capital expenditures on private investment, using ordinary least squares approach with annual data for 1960 – 1990. The findings showed that capital expenditures on transport and communication, agriculture, health and education positively influenced private investments in Nigeria, which invariably enhanced the growth of the overall economy. Also, government capital expenditures on construction and manufacturing crowded out private investments.

Odusola (1996) adopted a simultaneous equations model to capture the interrelationship between military expenditures and economic growth in Nigeria. It was observed from the study that aggregate military expenditure is negatively related to growth at 10 percent significant level. And when decomposed into recurrent and capital military expenditures, the former was more growth retarding than the latter. The study, therefore recommended that resource diversification away from military spending will have a positive impact on the economy.

Ojeka (2002) examined the separate effects of various categories of federal government expenditure on private investment using the ordinary least square regression method. He demonstrated that while capital expenditure significantly complemented private investment. Further that government expenditure on infrastructure, education and health complemented private investment. He also found that while fiscal deficit had negative effect, inflation rate had positive effects on private investment. He concluded that effective expenditure management, more public investment in education, health and infrastructure and macroeconomic stability, as well as a reduction in external debt services will enhance private investment.

Okpara (1988) in his study on government expenditure, money supply and prices in Nigeria, found a very poor and insignificant relationship between government expenditure and prices. Nevertheless, through exerting a strong influence on money supply (via high powered money) government expenditure influences prices. He established a strong relationship between government expenditure and money supply through the stock of high-powered money. According to him, as government expenditure increases the stock of high-powered money

increases and leads to increase in the money supply, which strongly affects the price level. He concluded that inflation in Nigeria is a monetary phenomenon.

Olaiya *et. al.*, (2012) examined the causal relationships among economic growth, government expenditure and inflation rate in Nigeria over the period 1970 to 2010. The study used both the Augmented Dickey-Fuller (ADF) and the Philip Perron (PP) tests to examine the properties of the variables. It was observed that the variables were found to be stationary, though not in their level form but in their first difference. In addition, the Johansen and Juselius (JJ) co-integration technique indicated the presence of co-integration among the variables while the tri-variate Vector Error Correction Model (VECM) showed the presence of bi-directional causality between government expenditures and economic growth both in the short run and in the long run. Also, it was revealed that in the short run a unidirectional causality existed from economic growth and government expenditure to inflation rate while no feedback from inflation rate was observed. The implication of this result is that both government spending and economic growth also influence inflation rate in Nigeria.

Perotti (2004) used a structural VAR model in order to analyze the effects of fiscal policy (per capita real public spending and net taxes) on gross domestic product, inflation and interest rates in five Organisation for Economic Cooperation and Development (OECD) countries since 1960 to 2001. He found that both the effects of spending shocks and tax cuts upon product and its components had become substantially weaker or negative over time, particularly on private investment. As regards the other variables, it is only in the post-1980 period that Perotti found

evidence of positive effects of government spending on long term interest rates whereas, under plausible price elasticity values, expenditure had a small influence on inflation.

Kamps (2005) resorted to the VAR methodology in order to assess dynamic effects of public capital in 22 OECD countries for the period 1960-2001 and used the following variables: public capital net stock, private capital net stock, real output and employment. In short, Kamps' results yielded proofs that shocks to public capital spending tended to have significant positive effects upon output although no evidence was found of the former's supernormal returns as was normally the case in production function approaches; in another striking result, Kamps found that public and private capital were – for most of the countries analyzed complementary in the long run while for the short run they were substitute in some countries and complementary in others. Finally, the study showed that neither the long run response of employment to innovations in public capital were statistically significant nor evidences that employment could be boosted by additional public capital.

Banuso and Odior, (2012) addressed the effects of macroeconomic volatility on Government Consumption Expenditure (GCE) in Nigeria as well as the burdens and challenges it has been imposing on public welfare. They used a dynamic macroeconometric stochastic model to analyze the nature of the impacts, where government consumption expenditure (GCE) is presumed to depend upon changes in various indicators of macroeconomic performances. The relationship between government consumption expenditure (GCE) and the macro economy was modeled with a hybrid model that employs reduced form coefficients of simultaneous equation models, to capture the dynamic interactions among the data and a structural economic model to describe the

contemporaneous relationship between the variables. The Structural Vector Auto-Regression (SVAR) process including the government consumption expenditure (GCE), real exchange rate, general price level (inflation rate), unemployment rate and debt service obligation, was estimated over the period 1980-2008. They found that, the government consumption expenditure (GCE) response to structural one innovation appears to be greater in inflation than other endogenous and exogenous variables that is, an economic shock to inflation effect is stronger on the government consumption expenditure (GCE) at longer horizon. Also, inflation innovations played a larger role in explaining government consumption expenditure forecast error variance in the short run than they did in the long run and this generates negative net effects on public welfare in the short run than long run.

The estimates revealed that, variability in exchange rate appears to be less sensitive to shocks than other variables and it appear not to be very important in explaining government consumption expenditure in either the short or long run, because the magnitude of the coefficient is considered to be relatively too small. In summary, the principal findings of this paper is that, government consumption expenditure appeared to be less sensitive to one innovation or shock of unemployment and debt service obligations than inflation.

Giordano *et. al.*, (2005) used a structural Vector Auto-regression model for analyzing the impact of fiscal variables on product, inflation and interest rates, resorting in this case to Italian quarterly cash data corresponding to the period 1982:1 - 2003:4; for the estimation of impulse response functions fiscal variables were separated into real government spending on goods and services, real government wages and real net taxes. He concluded that while a shock to

government purchases had a sizeable and robust positive impact on both private consumption and investment (despite its low persistence) innovations in public wages did not have any significant short run effect upon output and employment but a negative effect after two years. With regard to inflation and interest rates, the response to public purchases and public wages was positive but short lived in the first case and positive and larger in the second one. Finally, negligible effects were reported on all variables' response to net revenue shocks.

2.3.4 Gaps in Literature

Several studies on public expenditure and macroeconomic variables have been conducted in Nigeria. Okpara (1988) analyzed total government expenditure along with money supply and prices in Nigeria; Okpara and Nwaoha (2010) in their study, used aggregate government expenditure, money supply, price and output; Banuso and Odior (2012), used government consumption expenditure (recurrent expenditure), inflation rate, unemployment rate, real exchange rate and debt service obligation. This study makes analysis based on the disaggregated component of public expenditure namely; capital and recurrent expenditure in relation to macroeconomic variables which include Inflation, Unemployment, Gross Domestic Product (GDP) and Exchange rate.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Empirical Framework

Time series data collected must be stationary before conducting a meaningful econometric analysis. Stationarity test was done to ensure that the time series has a stationary trend. This test was done using the Augmented Dickey-Fuller test (ADF). It is a parametric test that takes care of possible serial correlation in the error term by adding the lagged different terms of the regressand. The lag length was selected based on Akaike's Information Criterion (AIC) and Schwarz's Information Criterion (SIC). The Johansen co-integration test was done to know whether there exists a long run relationship or equilibrium among the variables. This study used the multiple regression analysis to ascertain the effects of capital and recurrent expenditure on the selected macroeconomic variables. Regression analysis was used here because of its ability to determine the variation in one variable (dependent variable) associated with variation in another variable(s) (independent variables). The Ordinary Least Squares (OLS) estimation method is a simple estimation technique among others; it is used to fit the coefficients chosen to minimize the sum of squares of residual errors. The OLS remains one of the most commonly used methods in econometric investigations involving large models. The OLS was also carried out on the data to test the type of relationship between the variables whether positive or negative and to find out if the variables are statistically significant or not.

The Vector Error Correction (VEC) technique was used to determine the impulse response of each component of public expenditure on each of the selected macroeconomic variables. In addition, the Granger causality test will be applied in this study as a means of ascertaining

causality between the components of public expenditure and macroeconomic variables in Nigeria.

3.2.1 Model Specification

Econometric models used in this research work include the Regression Analysis and the Vector Auto-regression (VAR) Model. The choice of multiple regression models is based on the use of more than single independent variables in a regression model.

3.2.2 Linear Regression Models

Public expenditure has implication for key macroeconomic variables such as inflation, unemployment, exchange rate and economic growth rate (GDP). In this study, changes in the selected macroeconomic variables are conceptually a function of changes in public expenditure (recurrent expenditure and capital expenditure). We have therefore, chosen a combination of deductive and inductive analytical framework to achieve the objective of the study. Thus, this study conceptualizes the relationship between public expenditure (defined in terms of recurrent expenditure R_E and capital expenditure K_E) and the key macroeconomic variables listed above as follows;

MEV = f(PEX) ---------- (3.1)

Where,

MEV = Macroeconomic Variables

PEX = Public expenditure

Note that:

MEV is defined as inflation rate, unemployment rate, exchange rate and GDP growth rate.

PEX is defined as recurrent expenditure and capital expenditure (that is R_E and K_E)

Thus, MEV = $f(R_E + K_E)$ ----------(3.2)

Therefore,

$$dMEV = \frac{\partial MEV}{\partial R_E}(dR_E) + \frac{\partial MEV}{\partial K_E}(dK_E) \text{ ---------- (3.3)}$$

From equation 3 above changes in MEV is caused by changes in R_E and K_E

If $dR_E = 0$

$$\text{Then} dMEV = \frac{\partial MEV}{\partial K_E}(dK_E) \text{ ---------- (3.4)}$$

From equation 4 above, we can specify an econometric model of the form:

$dMEV = \alpha_0 + \alpha_1 dK_E + \mu_t$ ---------- (3.5)

Where, α_0 and α_1 are parameters to be estimated.

If $dR_E \neq 0$ the model will be

$dMEV = \beta_0 + \beta_1 dK_E + \beta_2 R_E + \mu_t$ ----------(3.6)

Where, β_0, β_1, and β_2 are parameters to be estimated.

If we transform equation 5 and 6 into linear regression models we have

$MEV = \alpha_0 + \alpha_1 K_E + \mu_t$ ---------- (3.7)

$MEV = \beta_0 + \beta_1 K_E + \beta_2 R_E + \mu_t$ ---------- (3.8)

Recall that MEV = inflation rate, unemployment rate, exchange rate and GDP growth rate.

We can therefore specify a linear regression model in respect of each of the macroeconomic variables as follows:

$I_R = \alpha_0 + \alpha_1 K_E + \alpha_2 R_E + \mu_t$ ---------- (3.9)

$U_R = \beta_0 + \beta_1 K_E + \beta_2 R_E + \mu_t$ ---------- (3.10)

$E_R = a_0 + a_1 K_E + a_2 R_E + \mu_t$ ---------- (3.11)

$G_R = b_0 + b_1 K_E + b_2 R_E + \mu_t$ ---------- (3.12)

Where;

I_R = Inflation Rate,

U_R = Unemployment Rate,

E_R = Exchange Rate and

G_R = GDP growth Rate

K_R and R_E are as defined above.

$\alpha_0 - \alpha_2 > 0$

$\beta_0 - \beta_1 > 0$

$a_0 - a_2 > 0$

$b_0 - b_2 > 0$, are parameters to be estimated.

In order to measure the rate of variation in each of the macroeconomic variables above in response to absolute unit change in public expenditure, we transformed equation 3.9 – 3.12 into double – log models in the following forms;

Log with lagged endogenous various

$$LogI_R = \alpha_0 + \alpha_1 LogK_E + \alpha_2 LogR_E + \alpha_3 logI_{Rt-1} + \mu_t \text{ ---------- (3.13)}$$

$$LogU_R = \beta_0 + \beta_1 LogK_E + \beta_2 LogR_E + \beta_3 logU_{Rt-1} + \mu_t \text{ ---------- (3.14)}$$

$$LogE_R = a_0 + a_1 LogK_E + a_2 LogR_E + a_3 logE_{Rt-1} + \mu_t \text{ ---------- (3.15)}$$

$$LogG_R = b_0 + b_1 LogK_E + b_2 LogR_E + b_3 logG_{Rt-1} + \mu_t \text{ ---------- (3.16)}$$

The effect of public expenditure on the selected macroeconomic variables was tested using equation 9, 10, 11 and 12. The rate of effects was tested using equations 3.13, 3.14, 3.15 and 3.16.

3.2.3 Testing of Research Hypothesis

The focus of this study is to evaluate the effects of public expenditure on selected macroeconomic variables. In other words, changes in macroeconomic variables depend on changes in public expenditure. Thus, Macroeconomic Variable (MEV) depends on Public Expenditure (PEX).

MEV = f(PEX)

H_0: $\alpha = 0$

H_1: $\alpha \neq 0$

At 5% level of significance

Note: H_0 is the null hypothesis that the parameter of public expenditure is not significant and H_1 is the alternative hypothesis that the public expenditure parameter influences changes in macroeconomic variables.

3.2.4 Variables in the VAR Model

This research adopts the econometric approach of Vector Auto-regression (VAR) Model of the form;

$$U\ (VAR) = (U_R, I_R, G_R, E_R, K_E, R_E) \text{ ---------- } (3.17)$$

Where:

I_R – Inflation Rate,

U_R – Unemployment Rate,

G_R – GDP growth rate,

E_R – Exchange Rate,

K_E – Capital Expenditure

R_E – Recurrent Expenditure

We assumed that the economy is described by a system of equations where:

$Y_t = (U_R, I_R, G_R, E_R, K_E, R_E)$

3.3 Sources of Data

Secondary data was obtained for this study. The data was collected from Central Bank of Nigeria (CBN) Statistical Bulletin, and various issues of National Bureau of Statistics (NBS) annual reports. The data is a time series data covering period 1986 to 2012. Variables of interest in

which were collected are capital expenditure, recurrent expenditure, total expenditure, unemployment rate, inflation rate, exchange rate and gross domestic product (GDP). The data gathered were subjected to various econometric tests using Eviews versions 8.0.

3.4 General Form of a Multiple Regression Model

The regression model here consists of or involves more than two variables. This means the dependent variable or regressand depends on two or more explanatory variables or regressors.

The general form for a multiple regression analysis is given in the form below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \cdots + \beta_i X_i + \mu_i \quad \text{---------- (3.18)}$$

Where;

Y = dependent variable – represents either I_R U_R G_R and E_R in each corresponding model

β_0 = equation constant

$X_1 = K_E$ – Capital expenditure

$X_2 = R_E$ – Recurrent expenditure

β_1 = coefficients of K_E

β_2 = coefficient of R_E

μ = error term

3.5 Vector Autoregressive Model (VAR)

VAR technique is used in this study as a diagnostic tool due to its dynamic ability to determine the magnitude of the relationship among the variables and also to check causality among the variables. The data are found to be I(1) and longrun or equilibrium relationship exist among the variables, therefore, we resort to using Vector Error Correction Mechanism (VECM). It is also a

system of equations that enable the estimation of interdependence amongst variables without necessarily holding the impacts of any of the variables constraint. It incorporates both the longrun dynamics of a variable and the shortrun effects simultaneously, that is, the method also captures the contemporaneous and lagged responses of the variables simultaneously.

VAR is a simultaneous equation modeling in which we consider several endogenous variables together. But each endogenous variable is explained by its lagged or past values and the lagged values of all endogenous variables in the model. Usually there are no exogenous variables in the model.

The VAR can be expressed more explicitly as;

$Y_{1t} = m + A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + \ldots + A_j Y_{t-j} + \varepsilon_{1t}$ ---------- (3.19)

Where:

m is a k x 1 vector of constants,

Y_t = vector of endogenous variables at time t,

A_i' = ($i = 1 \ldots j$) are k x k matrices of coefficients of vectors (Y_{t-j}),

Y_{t-j} is the corresponding lag term for each of the variables.

j – number of lag length,

ε_t's is a vector white noise process, representing the unexplained movements in the variables, reflecting the influence of exogenous shocks (that is, shocks that arise outside the assumed model). With $E(\varepsilon_t) = 0$ for all t and $E(\varepsilon_t \varepsilon_s') =$ Variance.

This system of equations encompasses a number of structural models in an unrestricted way. The residuals represent a composite of the various exogenous shocks affecting the endogenous variables in the underlying structural model.

3.6 Unit Root Test

Given the non-stationarity characteristics of most macroeconomic variables, testing the properties of these variables has become relevant to avoid spuriousness of empirical result. In this view this study commenced its econometric analysis by conducting the stationary properties of the variables using the Augmented Dickey-Fuller tests.

The ADF test is based on estimating the equation below:

$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{n} \alpha i \Delta Y_{t-1} + \mu_t$ ---------- (3.20)

Where,

μ_t is pure white noise error; n is the maximum lag length on dependent variable to ensure that μ_t is the stationary random error.

$\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$ and so on.

Note; that the number of lagged difference terms to include is often determined empirically, the idea is to include enough terms so that the error term is serially uncorrelated. And the ADF unit root test null hypothesis $\delta = 0$ is rejected if the t – statistics associated with the estimated coefficient exceeds the critical values of the test.

3.7 Cointegration Test

Given that the empirical model specified in the study is a multivariate model, the Engle – Granger (1987) co-integration test is inappropriate for testing co-integration among the variables.

This is because the Engel – Granger approach is based on the assumption that there exist only one co-integrating vector that connect the variables and since our model is multivariate there is the possibility of having more than one cointegration vector. In the light of the above weakness the Johansen cointegration test was applied. Johansen and Juselius (1990) test proposes the use of two likelihood ratio tests namely, the trace test and the maximum eigen-values test. The trace statistic for the null hypothesis of cointegrating relations is computed as follows:

Γ_{trace} (r\k) = - T $\sum_{i=r+1}^{m}$ log(1- λ_t) ---------- (3.21)

Where k is the number of endogenous variables, for r = 0, 1, . . . , k - 1.

Maximum eigen-value static tests the null hypothesis of r cointegrating relation against r + 1 cointegrating relations and is computed as follows:

Γ_{max} (r|r + 1) = - Tlog (1- λ_r + 1) ---------- (3.22)

= Γ_{trace} (r|k) - Γ_{trace} (r + 1|k) ---------- (3.23)

for r = 0, 1, . . . , k - 1.

The Error Correction Mechanism (ECM) from the cointegrating equations, is obtain by including the lagged error-correction term obtain from residual of the long run static model. This process helps in capturing the long-run information that might have been probably lost during the differencing. For the result to be consistent with theory, the coefficient of the error term should be negative and range between zero and one in absolute term. The error-correction term to be estimated represents the short-run to long-run adjustment equilibrium trends. It is a measure of the speed of adjustment of the short run relation to unexpected shocks. It is measured as the effects of residual from the long run model.

3.8 Granger Causality Test

The Granger causality approach measures the precedence and information provided by a variable (X) in explaining the current value of another variable (Y). It says that Y is said to be granger-caused by X if X helps in predicting the value of Y. In other words, the lagged values of X are statistically significant. If otherwise, then one concludes that X does not granger-cause Y. To determine whether causality runs in other direction, from X to Y, one simply repeats the experiment, but with X and Y interchanged. The null hypothesis H_0 tested is that X does not granger-cause Y and Y does not granger cause X. The test involves estimating the following pairs of regressions:

$$MEV_t = \sum_{i=1}^{n} \alpha_1 PEX_{t-I} + \sum_{i=1}^{n} \alpha_2 MEV_{t-i} + u_{1t} \quad \text{---------- (3.24)}$$

$$PEX_t = \sum_{i=1}^{n} \beta_1 MEV_{t-i} + \sum_{i=1}^{n} \beta_2 PEX_{t-i} + u_{2t} \quad \text{---------- (3.25)}$$

Where: α_1, α_2, β_1 and β_2 are parameter to be estimated.

From equation (1) a certain component of PEX is said to granger cause a selected MEV if the coefficient of the lagged values of the selected PEX is significantly different from zero. Feedback relationship occurs, when PEX granger cause MEV and MEV granger cause PEX. The hypothesis that either capital expenditure or recurrent expenditure granger cause a given macroeconomic variable, if supported by the data, should imply that the null hypothesis should be rejected.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Unit Root Test

The Augmented Dickey Fuller (ADF) test was engaged to test for the stationarity of the time-series data used in this study. Further, the Johansen co-integration test and the error correction modeling were employed to find out the long run equilibrium convergence and the speed of disequilibrium adjustment respectively. Table 4.1 shows the result of the stationarity test on the data series. The table showed that not all the variables are stationary at levels. Thus, another test was conducted and all the variables were stationary at first difference I(0).

Table 4.1: ADF Statistics for Testing Unit Roots in the Variables

Variables*	Level with trend and intercept	First difference intercept with no trend	Order	Remark
K_E	-1.152924	-5.588690	I(1)	Stationary
R_E	-3.385740	-7.686224	I(1)	Stationary
I_R	-4.163077	-7.328451	I(1)	Stationary
E_R	-1.951086	-5.136207	I(1)	Stationary
U_R	-2.293585	-5.632658	I(1)	Stationary
G_R	-3.817026	-7.899693	I(1)	Stationary
Critical values: 1%	-4.356068	-3.724070		
5%	-3.595026	-2.986225		
10%	-3.233456	-2.632604		

Source: Eviews8result * All the variables are expressed in log forms.

Table 4.1 shows the result of Augmented Dickey Fuller (ADF) test, engaged to test for the stationarity of the time-series data used in this study. In the table above, only G_R and I_R are stationary at levels (5% and 10% critical levels). Thus, the test was conducted at first difference, and all the variables are stationary at first difference. After the first difference, the ADF test statistics were found to be greater than the critical values at 5% level of significance in absolute terms. Thus, we reject the null hypothesis that there is presence of unit root in the series.

4.2 Cointegration Test

The main theoretical argument of cointegration analysis is that even if individual variable is non-stationary, the group of variables may drift together. This means that a linear combination of two or more series can be stationary, even if they are not individually. Since the variables under study are integrated of the same order I(1), there is the need to test for cointegration relationships, this is because a long-run relationship may exist among them. To establish the existence of long run relationship among the variables, a cointegration test was performed using the Johansen's cointegration test. This is reported in table 4.2 below. Table 4.2 below is divided into four (4) sections; this is because we have four (4) lines of linear regression models to work with, each model representing one macroeconomic variable.

Table 4.2: Summary of Cointegration Test Result

A Series: LU_R LK_E LR_E							
Hypothesized	Eigenvalue	Trace	0.05 Critical	Prob.**	Max-Eigen	0.05 Critical	Prob.**

No. of CE(s)		Statistics	Value		Statistic	Value	
None	0.671905	44.81717*	29.7907	0.0005	27.86128*	21.13162	0.0049
At most 1	0.332374	16.95589*	15.49471	0.0299	10.10067	14.26460	0.2054
At most 2	0.239827	6.855219*	3.841466	0.0088	6.855219*	3.841466	0.0088
B Series: LI_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.522409	32.69748*	29.79707	0.0225	18.47501	21.13162	0.1131
At most 1	0.330933	14.22247	15.49471	0.0770	10.04677	14.26460	0.2089
At most 2	0.153824	4.175695*	3.841466	0.0410	4.175695*	3.841466	0.0410
C Series: LG_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.546521	34.92741*	29.79707	0.0117	18.18852	21.13162	0.1230
At most 1	0.441337	16.73888*	15.49471	0.0323	13.39080	14.26460	0.0684
At most 2	0.135470	3.348087	3.841466	0.0673	3.348087	3.841466	0.0673
D Series: LE_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.746697	49.50499*	35.19275	0.0008	34.32927*	22.29962	0.0007

At most 1	0.276871	15.17573	20.26184	0.2165	8.104195	15.89210	0.5353
At most 2	0.246376	7.071531	9.164546	0.1227	7.071531	9.164546	0.1227

Source: Eviews8 result

From Table 4.2, the Trace statistics, Max-Eigen value and MacKinnon-Haug-Michelis (1999) probability values showed that the null hypothesis of no cointegration was rejected in favour of the alternative hypothesis at 0.05 level of significant in all the sections.

In section A the Trace statistics showed that the null hypothesis of at most one co-integrating equation and at most two co-integrating equations among the variables were rejected in favour of the alternative hypothesis at 0.05 level of significant. Their values, as indicated in the table are greater than the critical values at 0.05 level. This clearly showed that, there exists long run relationship among the variables (LU_R, LK_E, and LR_E). The Trace test indicates three co-integrating equations while the Max-Eigen test indicates one co-integrating equation. However, in this study the indication of the Trace test is followed.

In section B the Trace statistics indicated that the null hypothesis of at most one cointegrating equation among the variables was rejected in favour of the alternative hypothesis at 0.05 level of significant. The value (32.69748) as indicated in the table is greater than the critical values at 0.05 level (29.79707). This indicates a long run relationship among the variables. The Max-Eigen test on the other hand indicates no cointegration among the variables.

Empirical results in section C showed that only the trace tests statistics have values greater than the critical values at 5 percent level of significance. Therefore, the null hypotheses of no co

integration against the specific alternatives are clearly rejected. There is cointegration at most none and at most one, with at least one co integrating equation. It is a clear evidence to say that there are long run equilibrium relations among the three variables ($LG_{R,}$ $LK_{E,}$ and LR_{E}).

The section D of table 4.2 showed the Trace and the Max-Eigen test statistics of the variables (LE_R LK_E LR_E). Both tests statistics showed that there is at most one cointegrating equation among the variables. The null hypothesis of no cointegrating equation among the variables was rejected and the alternative hypothesis was accepted at 0.05 level. The values, as indicated in the table are greater than the critical values at 0.05 level. This clearly showed that, there exists long run relationship among the variables (LU_R, LK_E, and LR_E).

Table 4.3: Long run Normalized Cointegration Estimates of the models

A. Log Likelihood 7.914149		
Normalized cointegrating coefficients (standard error in parentheses)		
LU_R	LK_E	LR_E
1.000000	6.322468 (1.34051)	-4.012964 (1.18968)
B. Log Likelihood -29.48868		
Normalized cointegrating coefficients (standard error in parentheses)		
LI_R	LK_E	LR_E
1.000000	1.037318	0.190292

	(0.78376)	(0.72071)
C. Log Likelihood -37.50985		
Normalized cointegrating coefficients (standard error in parentheses)		
LG_R	LK_E	LR_E
1.000000	-0.274209 (0.42650)	-0.286396 (0.37628)
D. Log Likelihood 6.931904		
Normalized cointegrating coefficients (standard error in parentheses)		
LE_R	LK_E	LR_E
1.000000	0.915632 (4.11378)	3.390782 (3.89952)

Source: Eviews8 result

The long run equation result in table 4.3 shows that the variables in the model are significant at 0.05 level in the equation. In section A the equation shows that K_E has a positive relationship with U_R, while R_E is negatively related to U_R. This implies that in the long run, the sizes of capital expenditure have positive impact on the level of unemployment, while the sizes of recurrent expenditure have negative impact on the level of unemployment. The results for R_E is consistent with a priori, contrary to the above, the result for K_E is not in line with a priori expectation. The degree of impact shows that 1% change in capital expenditure results in 6.32% change in the level of unemployment. Further, 1% change in recurrent expenditure will result in 4.01% change in the level unemployment in the economy.

4.3.1 Inflation Rate

An inverse relationship between the components of public expenditure and inflation rate was shown in table 4.4 below;

Table 4.4: Inflation Rate Model

Dependent Variable: $D(I_R)$

Method: Least Squares

Date: 08/30/14 Time: 03:39

Sample (adjusted): 1987 2012

Included observations: 26 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	2.896706	4.575553	0.633083	0.5332
$D(LOG(K_E))$	-8.279113	10.78368	-7.767887	0.4507
$D(LOG(R_E))$	-6.236224	11.74862	-0.530805	0.6009
ECM(-1)	-0.500867	0.198141	-2.527835	0.0192
R^2 = 0.30Adjusted R^2 = 0.21 F-statistic = 3.19 DW Stat = 2.0 prob.(F-Statistics) = 0.04				

Source: Eviews8 result

The coefficients of the components of public expenditure are; capital expenditure = -8.279113 and recurrent expenditure = -6.236224. The effect of both capital and recurrent expenditure on inflation rate (I_R) is not significant as there P-values (K_E = 0.4507) and (R_E = 0.6009) are greater than (0.05). The result satisfies a priori condition, this is because if public expenditure is channel

to productive activities in order to create jobs and increase output of goods and services to satisfy both domestic and external demand, or channel to stimulate the private sector into productive and investment actions, the desired effects of public expenditure on inflation will be beneficial to the economy. The ECM equation is negative and significant as shown by the probability value, this also holds that 50% of the discrepancy between the long-term and short-term inflation rate is corrected within a year. The R^2 shows that 30% variation in the dependent (I_R) variable is explained by the explanatory variables (K_E, R_E). The Durbin-Watson statistics is greater than R^2 0.302734 indicating that the model is non-spurious (meaningful). Finally, the joint significance of the explanatory variables are found to be significant with a probability (F-statistics) is 0.04 which is less than 0.05 properly implies that at least one of the parameter is statistically significant.

4.3.2 Unemployment Rate

Table 4.5 below, shows that the capital expenditure K_E (-0.575232) has a negative relationship with unemployment rate and it statistically insignificant as shown by it probability value of 0.7520 > 0.05. This indicates that a 1% change in capital expenditure generates a 57% change in unemployment rate in opposite direction. This relationship is in line with theoretical expectation that as capital expenditure increase the level of unemployment rate drops. On the other hand, recurrent expenditure (R_E = 4.576592) is positively related to unemployment rate.

Table 4.5: Unemployment Rate Model

Dependent Variable: D(U_R)

Method: Least Squares

Date: 08/30/14 Time: 04:06

Sample (adjusted): 1987 2012

Included observations: 26 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	-0.257816	0.746090	-0.345555	0.7330
D(LOG(K_E))	-0.575232	1.797381	-0.320039	0.7520
D(LOG(R_E))	4.576592	1.866160	2.452412	0.0226
ECM(-1)	-0.473006	0.188649	-2.507337	0.0200
R-Squared 0.397053	Adjusted R-squared 0.314833		F-statistic 4.829151	
Durbin-Watson Stat 2.079022	Prob.(F-Statistic) 0.009893			

Source: Eviews8 result

This is contrary to theoretical expectation. It is expected that as public expenditure on infrastructure and productive activities increase more jobs will be created and this will in turn boost the private sector investment. This suggests that the increases in public expenditure may have been mismanaged or misappropriated to non-productive sectors or non-growth ventures which have failed to create expected jobs but worsen unemployment conditions. The R^2 shows that the regressors account for 40 percent of the total variation in the unemployment rate. The overall probability (F-statistics) is 0.009893 which is less than 0.05 properly explains the significance of components of public expenditure on unemployment rate in Nigeria within the period under study and this implies that at least one of the parameter is statistically significant.

Moreover, the DW value, greater than 2 suggests no autocorrelation. The ECM is rightly signed and significant (probability less than 0.05). It shows 47.3 percent disequilibrium in unemployment in the previous year (since the data are annual) is corrected in the current year.

Table 4.6: Exchange Rate Model

Dependent Variable: $D(E_R)$

Method: Least Squares

Date: 08/30/14 Time: 04:50

Sample (adjusted): 1987 2012

Included observations: 26 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	0.962391	3.904012	0.246513	0.8076
$D(LOG(K_E))$	1.821000	8.616170	0.211347	0.8346
$D(LOG(R_E))$	19.97236	10.03146	1.990972	0.0590
ECM(-1)	-0.065013	0.093597	-0.694604	0.4946
$R^2 = 0.19$ Adjusted $R^2 = 0.08$ F-statistic = 1.75 DW Stat = 1.914468				

Source: Eviews8 result

4.3.3 Exchange Rate

In table 4.6, the coefficients of capital and recurrent expenditure (1.821000 and 19.97236 respectively) shows that these components of public expenditure have a positive relationship with exchange rate, but are statistically insignificant as there probability values are greater than 0.05 critical level. This is an indication that increase in the components of public expenditure leads to increase in exchange rate, especially the recurrent expenditure. It also indicates the fact that Nigeria is an economy that depends so much on import particularly during the period under consideration. The result of error correction model showed that the coefficient of ECM is correctly signed, that is, it is negative. Therefore, the ECM is able to correct any deviations from

the long run equilibrium relationship at 6.5% speed of adjustment between exchange rate and the explanatory variables. The value of the Durbin-Watson (DW) at 1.914468 indicates absence of autocorrelation. Finally, the relatively low value of the standard error of the regression is a clear evidence of the goodness of fit of the equation.

Table 4.7: GDP Growth Rate Model

Dependent Variable: $D(G_R)$

Method: Least Squares

Date: 08/30/14 Time:04:35

Sample (adjusted): 1987 2012

Included observations: 26 after adjustments

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	0.362487	0.769247	0.471223	0.6421
$D(LOG(K_E))$	0.146931	1.729872	0.084937	0.9331
$D(LOG(R_E))$	-0.626233	1.981603	-0.316023	0.7550
ECM(-1)	-0.812763	0.217526	-3.736387	0.0011
R-Squared 0.392364	Adjusted R-squared 0.309505		F-statistic 4.735295	
Durbin-Watson Stat 1.992157	Prob.(F-Statistic) 0.010721			

Source: Eviews8 result

4.3.4 GDP Growth Rate

As revealed from table 4.7, the impact of recurrent government expenditure is negative and non-significant (coefficient of R_E = -0.626233, t-stat = -0.316023). This indicates that recurrent

government expenditure has negative and not significant impact on the growth rate of the Nigerian economy (G_R). The probability value of 0.07550 > 0.05 confirms non-significance of the impact. Again as revealed from the table the impact of capital government expenditure was positive and non-significant (coefficient of K_E = 0.146931, t-value = 0.084937). This indicates that government capital expenditure has positive but non-significant impact on the growth of the Nigerian economy. The probability value of 0.9331 > 0.05 again confirms non-significance of the impact. The coefficient of determination as revealed by R-square (R^2) indicates that 39% of the variations observed in the dependent variable gross domestic product growth rate were explained by variations in the independent variable (capital and recurrent expenditure). On the whole, the overall probability (F-statistics) is 0.01 which is less than 0.05 properly explains the significance of government expenditure on growth rate of GDP or economic growth in Nigeria within the period under study. The above table also includes the one period lagged value of the ECM whose coefficient is negative and statistically significant to support the existence of cointegration. The ECM induces about 81% adjustment per period in this equation.

4.4 Implication of Lag Dependent Variable

In the models that follows, this study further includes the first lag of the dependent variable in each of the four models above in order to determine the rate of effects of the lagged value of the dependent variable on the current value of the selected macroeconomic variables, and also to determine whether the previous or past value of the dependent variable has effect on policy formulation on the current behavior of the dependent variable. However, since the model is in the double-log form, the coefficient estimated is interpreted in terms of elasticity.

Table 4.8: Implication of Dynamic Inflation Rate Model

Dependent Variable: D(Log(I_R))

Method: Least Squares

Date: 08/30/14 Time: 03:45

Sample (adjusted): 1988 2012

Included observations: 25 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	0.705881	0.355206	1.987246	0.0608
D(LOG(KE))	-1.884304	0.950972	-1.981451	0.0615
D(LOG(RE))	-1.464086	0.925771	-1.581477	0.1295
D(LOG(IR(-1)))	-0.054553	0.210276	-0.259438	0.7979
ECM(-1)	-0.015822	0.014705	-1.075970	0.2947
R–squared 0.420402 Adjusted R-Squared 0.304482 F-statistic 3.626665				
Prob.(F-statistic)0.022264 Durbin – Watson stat 1.993157				

Source: Eviews8 result

Table 4.8 above still maintains an inverse relationship between the components of public expenditure and inflation rate. The coefficients of the components of public expenditure are; capital expenditure = -1.9 and recurrent expenditure = -1.5. This means that 1% change in these components of public expenditure generate a more than proportionate change in inflation rate. The explanatory variables are not statistically significant as documented by their P-values. The coefficient of the lagged value of the dependent variable is inelastic (0.05). This means that 1% change in previous inflation rate will cause a less than proportionate change in current inflation

rate. This is an indication that policymakers in Nigeria are not only concerned about current inflation rate, but also consider the past behaviour of the variable in making current inflation policies. This helps to minimize the rate of increase in inflation rate. The ECM equation is negative and significant as shown by the P – value. The R^2 shows that 42% variation in the dependent (I_R) variable is explained by the explanatory variables. Durbin Watson statistics is 1.9 showing the absence of serial correlation. Probability (F-statistics) is 0.022264 which is less than 0.05 properly explains the significance of the model.

Table 4.9: Implication of dynamic Unemployment Rate Model

Dependent Variable: DLog(U_R)

Method: Least Squares

Date: 08/30/14 Time: 04:15

Sample (adjusted): 1988 2012

Included observations: 25 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	-0.029144	0.108823	-0.267811	0.7916
D(LOG(KE))	-0.171624	0.319786	-0.536684	0.5974
D(LOG(RE))	0.534310	0.264231	2.022130	0.0567
D(LOG(UR(-1)))	-0.071556	0.265272	-0.269744	0.7901
ECM(-1)	-0.044891	0.025134	-1.786061	0.0893
R^2 = 0.300087 Adjusted R^2 = 0.160104 F-statistic = 2.143744 Durbin Watson Stat = 2.150592 Prob.(F-Statistics) = 0.112874				

Source: Eviews8 result

Table 4.9 above shows that the coefficients of the components of public expenditure range between zero and one in relation to unemployment rate. Capital expenditure (-0.17) and recurrent expenditure (0.53), this means that 1% change in these components of public expenditure will generate a less than proportionate change in unemployment rate. The probability values of the explanatory variables are all greater than 0.05 as stated by their P-values and therefore not statistically significant. The coefficient of the lagged value of the dependent variable is inelastic (-0.07). This also means that 1% change in previous unemployment rate generates a less than proportionate change in current unemployment rate. This suggests that public expenditure policy that would make unemployment to reduce more than the reduction in the previous period should be adopted by policy makers. This will drastically minimize unemployment rate in the long run if the policies are adhere to. The ECM equation (-0.044891) is negative and but not statistically significant as shown by the probability value (0.0893). The R^2 shows that the regressors account for 30 percent of the total variation in the unemployment rate. The overall probability (F-statistics) is 0.112874 which is greater than 0.05, explains the insignificance of all the independent variables. However, the DW value, greater than 2 to suggest no autocorrelation.

Table 4.10: Implication of Dynamic Exchange Rate Model

Dependent Variable: DLog(E_R)

Method: Least Squares

Date: 08/30/14 Time: 03:57

Sample (adjusted): 1988 2012

Included observations: 25 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.

C	9.57E-05	0.083236	0.001149	0.9991
D(LOG(KE))	0.103121	0.189057	0.545448	0.5915
D(LOG(RE))	0.602189	0.195770	3.076000	0.0060
D(LOG(ER(-1)))	0.001754	0.182986	0.009585	0.9924
ECM(-1)	-0.002385	0.001717	-1.389088	0.1801
R^2 = 0.426541Adjusted R^2 = 0.311849S.E. = 0.256607 F-statistic = 3.719021 Durbin-Watson Stat = 2.305706 Prob.(F-Statistics) = 0.020251				

Source: Eviews8 result

The coefficients of capital and recurrent expenditure (0.10 and 0.60 respectively) are positively related to exchange rate as shown in table 4.10 above, but only recurrent expenditure is statistically insignificant as the probability values of the other independent variables are greater than 5% critical level of significance. But the coefficient of the lagged exchange rate variable is close to zero, and this can be seen in the probability value (> 0.05), that the previous value of the exchange rate does not have significant effect on the current exchange rate value. The result of error correction model showed that the coefficient of ECM is negative but not statistically significant, because it is close to zero too. So the speed of adjustment of the ECM equation is slow. The value of the Durbin-Watson (DW) statistics 2.305706 is very high and greater than 2 indicating the absence of negative autocorrelation. Finally, the standard error of the regression is low a clear indication of the goodness of fit of the equation. Even though R^2 =0.426541 (42%) and R^2 adjusted = 0.311849 (31%), the Durbin-Watson statistics 2.3057061 is greater than R^2 0.426541 indicating that the model is non-spurious (meaningful). The F-statistics 3.71902140, which is a measure of the joint significance of the explanatory variables, is found to be

statistically significant at 5 percent level as indicated by the corresponding probability value 0.020251. This implies that at least one of the parameter is statistically significant.

Table 4.11: Implication of Dynamic GDP Growth Rate Model

Dependent Variable: DLog(G_R)

Method: Least Squares

Date: 08/30/14 Time: 04:46

Sample (adjusted): 1990 2012

Included observations: 23 after adjustments.

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	-0.151356	0.352196	-0.429751	0.6725
D(LOG(KE))	0.102299	0.831878	0.122973	0.9035
D(LOG(RE))	1.078199	0.987238	1.092137	0.2892
D(LOG(GR(-1)))	-0.408781	0.147545	-2.770549	0.0126
ECM(-1)	-0.479664	0.113997	-4.207700	0.0005
R^2 = 0.673669Adjusted R^2 = 0.601151S.E. = 1.252873 F-statistic = 9.289676 DW Stat = 2.060991 Prob.(F-Statistics) = 0.000296				

Source: Eviews8 result

Table 4.11 shows the coefficient of capital expenditure as (0.10) and recurrent expenditure as (1.08). This means a 1% change in capital expenditure and recurrent expenditure will lead to 10% and 108% in GDP growth rate respectively. Both coefficients are not statistically significant as shown by their probability values. The coefficient of the lagged GDP growth rate and the ECM are less than one (1) and are statistically significant. So the speed of adjustment of the ECM equation is 47%. The value of the Durbin-Watson (DW) statistics 2.060991 is greater than

2 indicating the absence of autocorrelation. Finally, the standard error of the regression is low a clear indication of the goodness of fit of the equation. The R^2 = 0.673669 (67%) meaning that 67% change in the dependent variable is accounted for by changes in the explanatory variables. The F-statistics 9.289676, which is a measure of the joint significance of the explanatory variables, is found to be statistically significant at 5 percent level as indicated by the corresponding probability value 0.000296. This implies that at least one of the parameter is statistically significant.

4.5.1 Vector Error Correction Mechanism

To examine the long run effect of public expenditure on macroeconomic variables, we consider our previous cointegration test above. The trace value in all the models points out that the null hypothesis of no co-integration among the variables is rejected in favor of the alternative hypothesis that at least one co-integrating equation exist at 5% significant level. This means that there is at least one cointegrating equation, implying that a unique long-run relationship exists among the variables. Therefore, this implies that the model to be used is Vector Error Correction Mechanism (VECM) and not VAR.

Vector Error Correction Mechanism (VECM) incorporates both the long run dynamics of variables (Feasel et. al., 2001) and short run effect simultaneously. Base on the fact that the variables are non-stationary and are cointegrating, the estimates from VECM are compared with the ordinary least square or orthodox estimates to determine the more efficient estimate. The VECM has two parts. In the first part, the estimates of the long run effects are presented while

the second part contains the estimates of the short run dynamic interaction among the variables. The Second part is also linked with first part (long run relation) by the ECM.

Table 4.12: Vector Error Correction Model

Variables	Dependent variables			
	$D(logI_R)$	$D(logU_R)$	$D(logE_R)$	$D(logG_R)$
Constant	0.063362 (0.16408)	0.145084 (1.20201)	0.109345 (0.76331)	-0.227232 (0.46365)
$D(LogK_E(-1))$	-0.956170 (-0.96687)	0.058118 (0.18802)	0.056990 (0.15535)	1.204988 (0.96008)
$D(LogR_E(-1))$	1.183708 (1.02838)	0.010672 (0.02966)	0.354885 (0.83113)	-1.067550 (-0.73079)
ECM(-1)	-0.466346 (-246402)	-0.042106 (0.59973)	-0.040328 (-0.68172)	-0.109679 (-0.45662)
R^2	0.576065	0.085418	0.148871	0.621162
R^{-2}	0.378228	-0.341387	-0.248323	0.444372
F-Statistics	2.911823	0.200133	0.374807	3.513544

Source: Eviews8 result

The estimate in table 4.12 suggests that the speed of adjustment (error correction mechanism) to the long run is high, 47%. This implies that about 47% of the disequilibrium error which occurred in the previous year is corrected in the current year. The result showed that past changes in K_E was negatively related to current changes in I_R and positively related to current U_R, E_R, and G_R, though all the coefficient are not statistically significant. On the other hand, R_E is

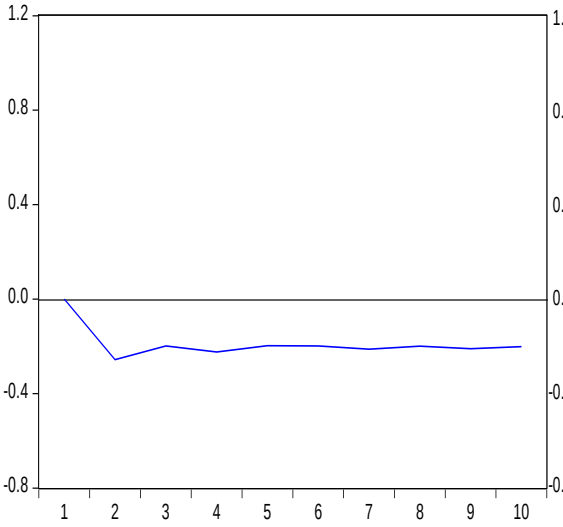
positively related to $I_{R,}$ U_R and, $E_{R,}$ but negatively related to G_R only, but none of all the coefficients of R_E was statistically significant.

The result showed that in the short run, an increase in recurrent expenditure in the previous period is followed by an increase inflation rate in the current period. This may not be unconnected to mismanagement of recurrent expenditure which may lead to increase in volume of money supply in the current period. The negative relationship between capital expenditure and inflation rate may be that, capital expenditure is being used for executing capital projects and also for the further production of goods and services. The lagged coefficients of the components of public expenditure showed a positive relation with current unemployment rate in the equation. The table showed that R-squared value of 58% and 62% variation in I_R and G_R are explained by the explanatory variables. While 9% and 15% R^2 value for E_R and U_R respectively implies that the predictive power of the model is low. Given the low predictive power of the model the study proceeded to estimate impulse response function (IRF). This is because impulse response function (IRF) sums up all the dynamics.

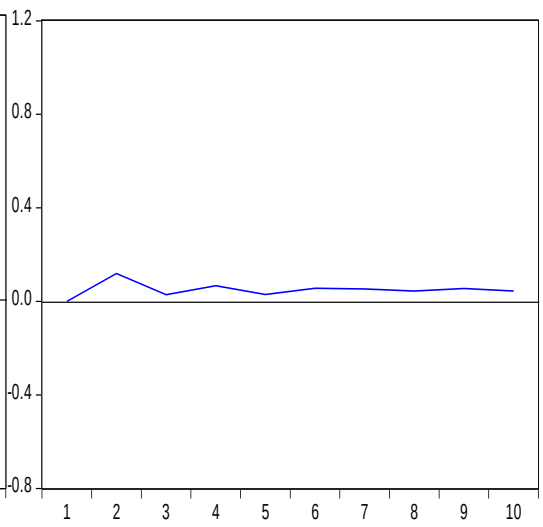
4.5.2 Impulse Response Function

Due to statistical insignificance of most coefficient estimates from the VECM this study resort to the use of impulse response as a better way of analyzing the contribution of policy variables to macroeconomic variables in the model.

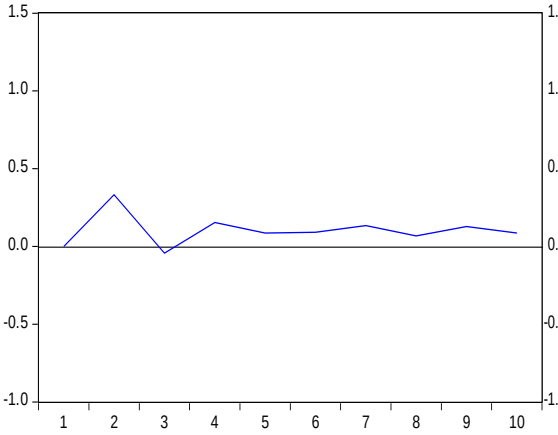
Response of LOGIR to LOGKE



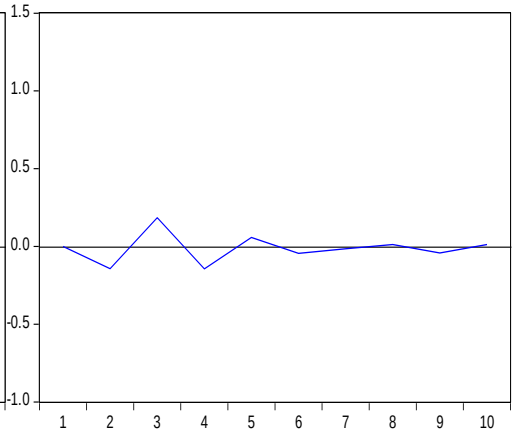
Response of LOGIR to LOGRE



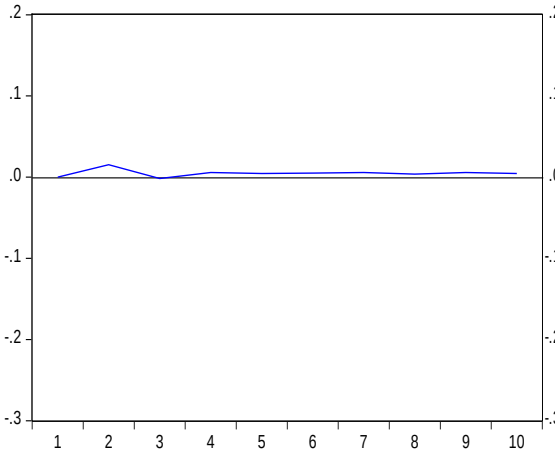
Response of LOGGR to LOGKE



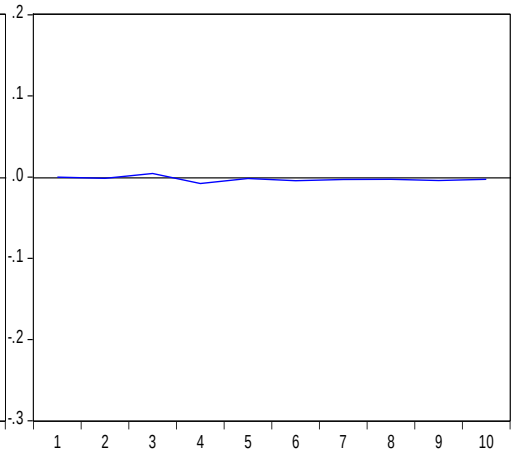
Response of LOGGR to LOGRE



Response of LOGER to LOGKE



Response of LOGER to LOGRE



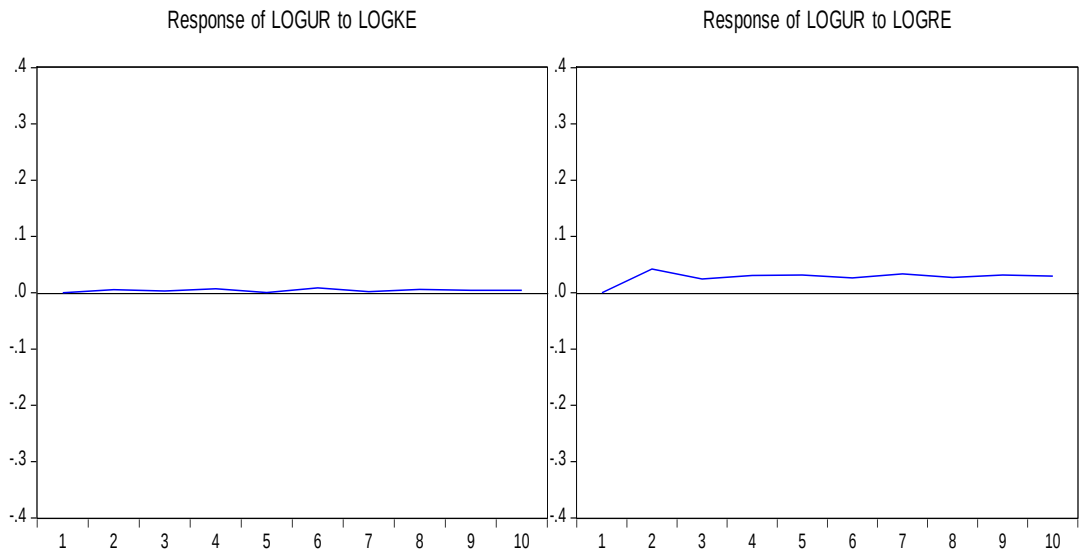


Figure 4.1: Impulse Response to One-S.D Innovations

4.5.3 Analysis of Impulse Response Function

Figure 4.1 above shows that a structural one standard deviation on K_E had a negative effect on $I_{R.}$ The impact was relatively high, last up to the third period and stabilized after the third period. R_E however, had a positive impact on I_R. This positive impact fluctuated but stabilized after the fifth period. The reason is not different from the one discussed under table 4.4. Also a structural one standard deviation change on K_E and R_E showed both negative and positive impact on G_R at various periods. The impact of K_E was stable and remained positive after the fourth period, while R_E was stable and negative after the fifth period. The figure further showed that K_E had a low positive impact on E_R up to period three (3), suggesting that the capital expenditure on imported capital goods have small impact on exchange rate, while R_E impact on E_R was negative in all periods. The result also suggests that K_E and R_E had very little but positive impact on U_R, even though R_E impacts more than $K_{E.}$ This suggests that the capital projects executed with K_E are few and therefore, have very small impact on unemployment rate in Nigeria.

4.6 Granger Causality Test

The Granger causality test is apply in this study as a means of ascertaining causality between capital expenditure, recurrent expenditure and the selected macroeconomic variables in Nigeria.

The Granger causality tests results are contained in table 4.13 below. It revealed that there is unilateral causal relationship from inflation rate (I_R) to capital expenditure as the probability values are less than 5% level of significance, we reject the null hypotheses that I_R does not granger cause capital expenditure and then accept the alternative hypotheses that I_R granger cause capital expenditure because the p-value showed that the estimated results is statistically significant. The result showed that no causal relationship from capital expenditure to Inflation rate. There is also no causal relationship between inflation rate and recurrent expenditure as the probability values were greater than 5% level of significance.

There is a unilateral causal relationship running from capital expenditure and recurrent expenditure to GDP, as the result showed a statistically significant probability value (less than 0.05). On the other hand, there is no causal relationship running from GDP growth rate to capital and recurrent expenditure.

The table also shows a bidirectional causal relationship between capital expenditure and unemployment rate as the probability values are less than 5% level of significance. This means that unemployment rate could lead to the allocation of more fund to capital expenditure component. On another hand, when this capital expenditure is not utilized for its purpose could lead to increase in unemployment rate.

Table 4.13:Result of Granger Causality

Pairwise Granger Causality Tests
Date: 08/30/14 Time: 18:55

Sample: 1986 2012

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGKE does not Granger Cause LOGIR	25	1.84172	0.1844
LOGIR does not Granger Cause LOGKE		6.99160	0.0050
LOGRE does not Granger Cause LOGIR	25	1.41169	0.2670
LOGIR does not Granger Cause LOGRE		0.45000	0.6439
LOGKE does not Granger Cause LOGGR	23	3.94701	0.0379
LOGGR does not Granger Cause LOGKE		0.18509	0.8326
LOGRE does not Granger Cause LOGGR	23	4.99944	0.0188
LOGGR does not Granger Cause LOGRE		3.30534	0.0599
LOGKE does not Granger Cause LOGER	25	2.34572	0.1216
LOGER does not Granger Cause LOGKE		9.02079	0.0016
LOGRE does not Granger Cause LOGER	25	0.37520	0.6919
LOGER does not Granger Cause LOGRE		1.72594	0.2035
LOGKE does not Granger Cause LOGUR	25	5.42430	0.0131
LOGUR does not Granger Cause LOGKE		11.0139	0.0006
LOGRE does not Granger Cause LOGUR	25	2.74099	0.0887
LOGUR does not Granger Cause LOGRE		0.91390	0.4171

Source: Eviews8 result

The causal relationship between exchange rate and capital expenditure in the table above, suggest that there is a causal one-way relationship from exchange rate to capital expenditure. This relationship is statistically significant with a probability value of 0.0016.

4.7 Findings Compared with Previous Studies

The result of this study revealed that capital expenditure has a positive relationship with GDP growth rate, while recurrent expenditure has a negative relationship with GDP growth rate. Both relationships are not significant. Study by Taiwo and Abayomi (2011) and Oni et. al., confirmed that capital expenditure have a positive relationship with GDP growth rate. Our result for recurrent expenditure is also in line with the result of the study done by Louis (2012), which holds that recurrent expenditure has a negative relationship with GDP and does not promote economic growth. Modebe et. al., (2012) has a different result which shows that recurrent expenditure has a positive impact on economic growth, while capital expenditure has a negative and non-significant impact on economic growth. The result of this study shows that capital and recurrent expenditure influence inflation rate negatively. Study by Perotti, 2004 and Olaiya, et. al., also confirm that government expenditure influence inflation. Our result on causality holds that there is a unidirectional causal relationship running from capital and recurrent expenditure to GDP growth rate. Louis, 2012 confirms the result of unidirectional causality running from government expenditure to economic growth. On the other, Olaiya et. al., (2012) found a bi-directional causality between government expenditure and economic growth.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Major Findings

This study investigated the effects of public expenditure on selected macroeconomic variables in Nigeria from 1986 – 2012.The study started by showing that public expenditure made or directed to particular investments may be able to bring about an appreciable level of economic development in general. But as important as public expenditure could be, when it is not efficiently utilize could put an economy in jeopardy or in a bad shape and cause more harm instead of good to the welfare of the people. Public expenditure was disaggregated into recurrent expenditure and capital expenditure, while the selected macroeconomic variables are inflation rate, unemployment rate, exchange rate and GDP growth rate.

Various concepts used in this study were reviewed as defined and explained by different scholars. Theories of public expenditure and empirical literatures that relate to this study were also reviewed in order to see or identify what has been done and the gap that needs to be filled.

In estimating the empirical result, this study used the Augmented Dickey Fuller statistics for unit root test. The test conducted established stationarity of all the variables at first difference. The Johansen Cointegration was conducted for each model and it showed that they have at least one (1) cointegrating equation at 5% critical level, with the aid of the trace statistics and the maximum eigenvalue. All the series were stationary at first difference and there was long run

equilibrium convergence between the components of public expenditure and each of the selected macroeconomic variables.

The study employed the ordinary least square method of estimation and four different regression models were built with a macroeconomic variable as the dependent variable. Due to existence of cointegration among the variables, error correction term was computed from the residual of each model and it was added to the regression model in order to correct or adjust the short run disequilibrium among the variables. The ECM was statistically significant – negative and ranges between zero and one in all the equations.

The findings showed that capital expenditure had positive impact on GDP growth rate and exchange rate, and negative impact on inflation and unemployment rate. On the other hand, recurrent expenditure had a positive impact on unemployment and exchange rate, and negative impact on inflation and GDP growth rate. The lagged dependent variables were later included in the models to know if their previous values have effects or policy implication on the current value. Only previous E_R had a positive effect on current E_R.

The Impulse Response Function (IFR) was conducted from the VEC result to show the structural one standard deviation innovation of explanatory variables ($K_{E,}$ R_E) on the explained variables (macroeconomic variables). The result of G_R (for both $K_{E,}$ and R_E) obtained from the IFR was in agreement with the one obtained from the regression result. It is the same of I_R and E_R for K_E, and U_R also the same for R_E (recurrent expenditure).

Finally, the granger causality test was used to determine the causality relationship among the variables. The test suggested a unidirectional causality from inflation rate to capital expenditure, K_E and R_E to G_R, and a bi-directional causality between unemployment rate and capital expenditure.

5.2 Conclusion

The findings of this study showed that there exist a long-run equilibrium relationship between the two components of public expenditure (capital and recurrent expenditure) and macroeconomic variables (inflation rate, unemployment rate, exchange rate and GDP growth rate) in Nigeria. The study was able to evaluate the relationships that exist between the components of public expenditure and the selected macroeconomic variables. The study showed that capital expenditure had positive impact on GDP growth rate and exchange rate, and negative impact on inflation and unemployment rate. On the other hand, recurrent expenditure had a positive impact on unemployment and exchange rate, and negative impact on inflation and GDP growth rate. The findings show that capital expenditure contributes minimally to growth as compared to the higher contributions from recurrent expenditure. This is probably because capital expenditure which is not meant for immediate consumption is more prone to misuse and embezzlement.

Granger causality technique was used to assess the direction of causation between macroeconomic variables and the components of public expenditure. The causal test shows the presence of causal flows. The results show that there is a unilateral causal relationship from capital and recurrent expenditure to GDP growth rate and a bilateral relationship between capital

expenditure and unemployment rate. The presence of a causal link between capital expenditure and unemployment rate, and the two components of public expenditure (capital and recurrent) and GDP has great implications for economic growth and development strategies for Nigeria. Since public expenditure causes GDP growth rate, public expenditure is therefore, an important factor necessary for improvement in the welfare of the public and the growth and development of the economy.

The findings of this study suggests that the problem of misallocation and mismanagement of public expenditure calls for a holistic approach in the allocation and management of public expenditure as it triggers different unfavourable effects on some macroeconomic variables in the Nigerian economy. It is expected that these effects would bring tangible or concrete improvement in the welfare of the people and the economy in general; unfortunately what is available in reality is less than expectation. Therefore, from the study, we can conclude that though public expenditure is generally effective theoretically, but it has intrinsic limitations in reality that often gradually undermine its effectiveness in Nigeria.

5.3 Recommendations

The findings of the study have important policy implications which led to making of the following recommendations below;

(i) Capital expenditure being the engine for industrial development should be increased in order to build up or increase productive capacity. In 2012 capital expenditure takes 21% of the total public expenditure, while recurrent expenditure takes 79% (table 2.1). Capital expenditure should be increased and made to take 55% of the total public expenditure. Furthermore, in our

model capital expenditure has a positive (0.15) relationship with GDP growth rate, this suggest that a unit increase in capital expenditure will generate a 15% increase in GDP growth rate.

(ii) The government should allocate or channel more funds toward reviving the non-oil sector, with attention given to agriculture, manufacturing and other export driven sectors of the economy. This has the potentials for self-sufficiency, creating more employment, more output, reduction in inflation rate (general price level), increasing export and economic growth.

(iii) Policy makers should exhibit a high public expenditure management capacity to ensure that both the recurrent and capital expenditure are properly and effectively managed in a manner that they will achieve the outcome for which they are intended for. In this manner the government should plan well before implementing projects so as not to abandon these projects in the long run. This raises the need for transparency, probity and accountability on how public expenditure is spent.

(iv) Government should always conduct cost-benefit analysis to assess projects to embark upon in order to avoid waste of resources and white elephant projects.

Finally, with proper handling of the capital expenditure and the recurrent expenditure, it will be easier for the government to manipulate Macroeconomic variables (unemployment rate, exchange rate, inflation and so on) to ensure steady and accelerated economic development in Nigeria.

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APPENDICES

Appendix A: Unit Root at First Difference

Appendix A(i)

Null Hypothesis: D(LOG(IR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.328451	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(IR),2)
Method: Least Squares
Date: 08/30/14 Time: 01:05
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(IR(-1)))	-1.399402	0.190955	-7.328451	0.0000
C	0.004030	0.274612	0.014676	0.9884

R-squared	0.700155	Mean dependent var	0.019875
Adjusted R-squared	0.687118	S.D. dependent var	2.454625
S.E. of regression	1.373016	Akaike info criterion	3.548515
Sum squared resid	43.35897	Schwarz criterion	3.646025
Log likelihood	-42.35644	Hannan-Quinn criter.	3.575560
F-statistic	53.70619	Durbin-Watson stat	2.174633
Prob(F-statistic)	0.000000		

Appendix A(ii)

Null Hypothesis: D(LOG(UR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.632658	0.0001
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	

10% level	-2.632604	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UR),2)
Method: Least Squares
Date: 08/30/14 Time: 08:56
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(UR(-1)))	-1.152744	0.204654	-5.632658	0.0000
C	0.058321	0.077737	0.750238	0.4607

R-squared	0.579731	Mean dependent var	-0.011128
Adjusted R-squared	0.561458	S.D. dependent var	0.579506
S.E. of regression	0.383763	Akaike info criterion	0.999038
Sum squared resid	3.387311	Schwarz criterion	1.096548
Log likelihood	-10.48797	Hannan-Quinn criter.	1.026083
F-statistic	31.72683	Durbin-Watson stat	1.904990
Prob(F-statistic)	0.000010		

Appendix A(iii)

Null Hypothesis: D(LOG(ER)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.136207	0.0003
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(ER),2)
Method: Least Squares
Date: 08/30/14 Time: 08:45
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(ER(-1)))	-1.014822	0.197582	-5.136207	0.0000
C	0.148844	0.071834	2.072046	0.0497

R-squared	0.534230	Mean dependent var	-0.026637

Adjusted R-squared	0.513979	S.D. dependent var	0.453197
S.E. of regression	0.315947	Akaike info criterion	0.610136
Sum squared resid	2.295924	Schwarz criterion	0.707647
Log likelihood	-5.626706	Hannan-Quinn criter.	0.637182
F-statistic	26.38063	Durbin-Watson stat	1.983935
Prob(F-statistic)	0.000033		

Appendix A(iv)

Null Hypothesis: D(GR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.899693	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GR,2)
Method: Least Squares
Date: 08/20/14 Time: 13:51
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GR(-1))	-1.449501	0.183488	-7.899693	0.0000
C	0.390409	0.625371	0.624284	0.5386

R-squared	0.730695	Mean dependent var	0.069200
Adjusted R-squared	0.718986	S.D. dependent var	5.886058
S.E. of regression	3.120241	Akaike info criterion	5.190316
Sum squared resid	223.9258	Schwarz criterion	5.287826
Log likelihood	-62.87895	Hannan-Quinn criter.	5.217361
F-statistic	62.40515	Durbin-Watson stat	1.619227
Prob(F-statistic)	0.000000		

Appendix A(v)

Null Hypothesis: D(LOG(KE)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-5.588690	0.0001
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(KE),2)
Method: Least Squares
Date: 08/30/14 Time: 00:52
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(KE(-1)))	-1.118415	0.200121	-5.588690	0.0000
C	0.219044	0.075749	2.891711	0.0082

R-squared	0.575908	Mean dependent var	0.009695
Adjusted R-squared	0.557469	S.D. dependent var	0.494853
S.E. of regression	0.329191	Akaike info criterion	0.692264
Sum squared resid	2.492442	Schwarz criterion	0.789774
Log likelihood	-6.653302	Hannan-Quinn criter.	0.719309
F-statistic	31.23345	Durbin-Watson stat	1.943514
Prob(F-statistic)	0.000011		

Appendix A(vi)

Null Hypothesis: D(LOGRE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.686224	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGRE,2)
Method: Least Squares
Date: 08/30/14 Time: 00:58
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGRE(-1))	-1.393424	0.181288	-7.686224	0.0000

C	0.309810	0.067763	4.571939	0.0001

R-squared	0.719779	Mean dependent var	-0.028248
Adjusted R-squared	0.707595	S.D. dependent var	0.476660
S.E. of regression	0.257751	Akaike info criterion	0.202976
Sum squared resid	1.528023	Schwarz criterion	0.300486
Log likelihood	-0.537202	Hannan-Quinn criter.	0.230021
F-statistic	59.07804	Durbin-Watson stat	2.108496
Prob(F-statistic)	0.000000		

Appendix B: Cointegration Test

Appendix B(i)

Date: 08/30/14 Time: 14:20
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGIR LOGKE LOGRE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.522409	32.69748	29.79707	0.0225
At most 1	0.330933	14.22247	15.49471	0.0770
At most 2 *	0.153824	4.175695	3.841466	0.0410

Trace test indicates 1 cointegratingeqn(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	0.522409	18.47501	21.13162	0.1131
At most 1	0.330933	10.04677	14.26460	0.2089
At most 2 *	0.153824	4.175695	3.841466	0.0410

Max-eigenvalue test indicates no cointegration 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):

LOGIR	LOGKE	LOGRE
-0.624141	-0.647432	-0.118769
-1.330105	-0.758733	0.733606
0.001029	-2.272091	2.061354

Unrestricted Adjustment Coefficients (alpha):

D(LOGIR)	0.344802	0.590968	0.141100
D(LOGKE)	0.093551	-0.114138	0.033689
D(LOGRE)	0.076595	-0.022247	-0.086131

1 Cointegrating Equation(s): Log likelihood -29.48868

Normalized cointegrating coefficients (standard error in parentheses)

LOGIR	LOGKE	LOGRE
1.000000	1.037318	0.190292
	(0.78376)	(0.72071)

Adjustment coefficients (standard error in parentheses)

D(LOGIR)	-0.215205
	(0.15872)
D(LOGKE)	-0.058389
	(0.03265)
D(LOGRE)	-0.047806
	(0.03276)

2 Cointegrating Equation(s): Log likelihood -24.46530

Normalized cointegrating coefficients (standard error in parentheses)

LOGIR	LOGKE	LOGRE
1.000000	0.000000	-1.457892
		(0.44227)
0.000000	1.000000	1.588890
		(0.58518)

Adjustment coefficients (standard error in parentheses)

D(LOGIR)	-1.001255	-0.671623
	(0.31924)	(0.21672)
D(LOGKE)	0.093426	0.026032
	(0.06710)	(0.04555)
D(LOGRE)	-0.018215	-0.032710
	(0.07676)	(0.05211)

Appendix B(ii)

Date: 08/30/14 Time: 14:21
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGUR LOGKE LOGRE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.671905	44.81717	29.79707	0.0005
At most 1 *	0.332374	16.95589	15.49471	0.0299
At most 2 *	0.239827	6.855219	3.841466	0.0088

Trace test indicates 3 cointegratingeqn(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 *	0.671905	27.86128	21.13162	0.0049
At most 1	0.332374	10.10067	14.26460	0.2054
At most 2 *	0.239827	6.855219	3.841466	0.0088

Max-eigenvalue test indicates 1 cointegratingeqn(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):

LOGUR	LOGKE	LOGRE
-0.294622	-1.862738	1.182307
-2.182810	0.104345	0.319791
-2.814473	-2.963258	3.752259

Unrestricted Adjustment Coefficients (alpha):

D(LOGUR)	-0.210861	0.127022	-0.069587
D(LOGKE)	0.095128	0.109267	0.024672
D(LOGRE)	0.041823	0.052421	-0.108078

1 Cointegrating Equation(s): Log likelihood 7.914149

Normalized cointegrating coefficients (standard error in parentheses)

LOGUR	LOGKE	LOGRE
1.000000	6.322468	-4.012964
	(1.34051)	(1.18968)

Adjustment coefficients (standard error in parentheses)

D(LOGUR)	0.062124
	(0.01981)
D(LOGKE)	-0.028027
	(0.01364)
D(LOGRE)	-0.012322
	(0.01584)

2 Cointegrating Equation(s): Log likelihood 12.96448

Normalized cointegrating coefficients (standard error in parentheses)

LOGUR	LOGKE	LOGRE
1.000000	0.000000	-0.175518
		(0.09543)
0.000000	1.000000	-0.606954
		(0.05714)

Adjustment coefficients (standard error in parentheses)

D(LOGUR)	-0.215140	0.406032
	(0.13426)	(0.11372)
D(LOGKE)	-0.266536	-0.165798
	(0.08663)	(0.07338)
D(LOGRE)	-0.126746	-0.072435

	(0.11559)	(0.09791)

Appendix B(iii)

Date: 08/30/14 Time: 15:06
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LOGER LOGKE LOGRE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.746697	49.50499	35.19275	0.0008
At most 1	0.276871	15.17573	20.26184	0.2165
At most 2	0.246376	7.071531	9.164546	0.1227

Trace test indicates 1 cointegratingeqn(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 *	0.746697	34.32927	22.29962	0.0007
At most 1	0.276871	8.104195	15.89210	0.5353
At most 2	0.246376	7.071531	9.164546	0.1227

Max-eigenvalue test indicates 1 cointegratingeqn(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):

LOGER	LOGKE	LOGRE	C
-0.070311	-0.064379	-0.238410	5.365378
0.188863	1.227215	-0.794618	-4.971147
2.277414	-1.641170	0.038266	10.88401

Unrestricted Adjustment Coefficients (alpha):

D(LOGER)	0.155293	0.035757	-0.130033
D(LOGKE)	0.285266	-0.064947	0.005415
D(LOGRE)	0.221780	0.092650	-0.026134

1 Cointegrating Equation(s): Log likelihood 6.931904

Normalized cointegrating coefficients (standard error in parentheses)

LOGER	LOGKE	LOGRE	C
1.000000	0.915632	3.390782	-76.30885
	(4.11378)	(3.89952)	(15.6505)

Adjustment coefficients (standard error in parentheses)

D(LOGER)	-0.010919
	(0.00438)
D(LOGKE)	-0.020057
	(0.00318)
D(LOGRE)	-0.015594
	(0.00345)

2 Cointegrating Equation(s): Log likelihood 10.98400

Normalized cointegrating coefficients (standard error in parentheses)

LOGER	LOGKE	LOGRE	C
1.000000	0.000000	4.637069	-84.50804
		(1.38022)	(18.1482)
0.000000	1.000000	-1.361122	8.954667
		(0.30220)	(3.97361)

Adjustment coefficients (standard error in parentheses)

D(LOGER)	-0.004166	0.033884
	(0.01245)	(0.07592)
D(LOGKE)	-0.032324	-0.098069
	(0.00866)	(0.05278)
D(LOGRE)	0.001904	0.099423
	(0.00900)	(0.05488)

Appendix B(iv)

Date: 08/30/14 Time: 14:18
Sample (adjusted): 1990 2012
Included observations: 23 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGGR LOGKE LOGRE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.546521	34.92741	29.79707	0.0117
At most 1 *	0.441337	16.73888	15.49471	0.0323
At most 2	0.135470	3.348087	3.841466	0.0673

Trace test indicates 2 cointegratingeqn(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	0.546521	18.18852	21.13162	0.1230
At most 1	0.441337	13.39080	14.26460	0.0684
At most 2	0.135470	3.348087	3.841466	0.0673

Max-eigenvalue test indicates no cointegration 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):

LOGGR	LOGKE	LOGRE
-1.169503	0.320688	0.334941
0.178277	0.174470	0.502368
-0.395606	-2.341294	2.168150

Unrestricted Adjustment Coefficients (alpha):

D(LOGGR)	1.147929	-0.062479	0.149788
D(LOGKE)	-0.049687	-0.154111	0.061086
D(LOGRE)	0.077309	-0.092715	-0.059693

1 Cointegrating Equation(s): Log likelihood -37.50985

Normalized cointegrating coefficients (standard error in parentheses)

LOGGR	LOGKE	LOGRE
1.000000	-0.274209	-0.286396
	(0.42650)	(0.37628)

Adjustment coefficients (standard error in parentheses)

D(LOGGR)	-1.342506
	(0.31039)
D(LOGKE)	0.058109
	(0.07961)
D(LOGRE)	-0.090413
	(0.06209)

2 Cointegrating Equation(s): Log likelihood -30.81445

Normalized cointegrating coefficients (standard error in parentheses)

LOGGR	LOGKE	LOGRE
1.000000	0.000000	0.393034
		(0.26054)
0.000000	1.000000	2.477779
		(0.87613)

Adjustment coefficients (standard error in parentheses)

D(LOGGR)	-1.353645	0.357227
	(0.31349)	(0.09674)
D(LOGKE)	0.030634	-0.042822
	(0.06811)	(0.02102)
D(LOGRE)	-0.106942	0.008616

	(0.05724)	(0.01767)

Appendix C: Regression Model

Appendix C(i)

Dependent Variable: D(IR)
Method: Least Squares
Date: 08/30/14 Time: 03:39
Sample (adjusted): 1987 2012
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.896706	4.575553	0.633083	0.5332
D(LOG(KE))	-8.279113	10.78168	-0.767887	0.4507
D(LOG(RE))	-6.236224	11.74862	-0.530805	0.6009
ECM(-1)	-0.500867	0.198141	-2.527835	0.0192

R-squared	0.302734	Mean dependent var	-0.064231
Adjusted R-squared	0.207653	S.D. dependent var	18.86667
S.E. of regression	16.79395	Akaike info criterion	8.620553
Sum squared resid	6204.812	Schwarz criterion	8.814107
Log likelihood	-108.0672	Hannan-Quinn criter.	8.676290
F-statistic	3.183942	Durbin-Watson stat	2.007426
Prob(F-statistic)	0.043900		

Appendix C(ii)

Dependent Variable: D(UR)
Method: Least Squares
Date: 08/30/14 Time: 04:06
Sample (adjusted): 1987 2012
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.257816	0.746090	-0.345555	0.7330
D(LOG(KE))	-0.575232	1.797381	-0.320039	0.7520
D(LOG(RE))	4.576592	1.866160	2.452412	0.0226
ECM(-1)	-0.473006	0.188649	-2.507337	0.0200

R-squared	0.397053	Mean dependent var	0.715385
Adjusted R-squared	0.314833	S.D. dependent var	3.229823
S.E. of regression	2.673480	Akaike info criterion	4.945277
Sum squared resid	157.2449	Schwarz criterion	5.138830
Log likelihood	-60.28860	Hannan-Quinn criter.	5.001013
F-statistic	4.829151	Durbin-Watson stat	2.079022
Prob(F-statistic)	0.009893		

Appendix C(iii)

Dependent Variable: D(ER)
Method: Least Squares
Date: 08/30/14 Time: 04:50
Sample (adjusted): 1987 2012
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.962391	3.904012	0.246513	0.8076
D(LOG(KE))	1.821000	8.616170	0.211347	0.8346
D(LOG(RE))	19.97236	10.03146	1.990972	0.0590
ECM(-1)	-0.065013	0.093597	-0.694604	0.4946

R-squared	0.193078	Mean dependent var	5.913077
Adjusted R-squared	0.083043	S.D. dependent var	14.83157
S.E. of regression	14.20239	Akaike info criterion	8.285336
Sum squared resid	4437.576	Schwarz criterion	8.478890
Log likelihood	-103.7094	Hannan-Quinn criter.	8.341073
F-statistic	1.754701	Durbin-Watson stat	1.914468
Prob(F-statistic)	0.185227		

Appendix C(iv)

Dependent Variable: D(GR)
Method: Least Squares
Date: 08/30/14 Time: 04:35
Sample (adjusted): 1987 2012
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.362487	0.769247	0.471223	0.6421
D(LOG(KE))	0.146931	1.729872	0.084937	0.9331
D(LOG(RE))	-0.626233	1.981603	-0.316023	0.7550
ECM(-1)	-0.812763	0.217526	-3.736387	0.0011

R-squared	0.392364	Mean dependent var	0.180385
Adjusted R-squared	0.309505	S.D. dependent var	3.407511
S.E. of regression	2.831507	Akaike info criterion	5.060134
Sum squared resid	176.3835	Schwarz criterion	5.253687
Log likelihood	-61.78174	Hannan-Quinn criter.	5.115870
F-statistic	4.735295	Durbin-Watson stat	1.992157
Prob(F-statistic)	0.010721		

Appendix D: Dynamic Regression Model

Appendix D(i)

Dependent Variable: DLOG(IR)
Method: Least Squares
Date: 08/30/14 Time: 03:45
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.705881	0.355206	1.987246	0.0608
D(LOG(KE))	-1.884304	0.950972	-1.981451	0.0615
D(LOG(RE))	-1.464086	0.925771	-1.581477	0.1295
D(LOG(IR(-1)))	-0.054553	0.210276	-0.259438	0.7979
ECM(-1)	-0.015822	0.014705	-1.075970	0.2947

R-squared	0.420402	Mean dependent var	0.008552
Adjusted R-squared	0.304482	S.D. dependent var	1.466377
S.E. of regression	1.222925	Akaike info criterion	3.417224
Sum squared resid	29.91091	Schwarz criterion	3.661000
Log likelihood	-37.71530	Hannan-Quinn criter.	3.484837
F-statistic	3.626665	Durbin-Watson stat	1.993157
Prob(F-statistic)	0.022264		

Appendix D(ii)

Dependent Variable: DLOG(UR)
Method: Least Squares
Date: 08/30/14 Time: 04:15
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.029144	0.108823	-0.267811	0.7916
D(LOG(KE))	-0.171624	0.319786	-0.536684	0.5974
D(LOG(RE))	0.534310	0.264231	2.022130	0.0567
D(LOG(UR(-1)))	-0.071556	0.265272	-0.269744	0.7901
ECM(-1)	-0.044891	0.025134	-1.786061	0.0893

R-squared	0.300087	Mean dependent var	0.049119
Adjusted R-squared	0.160104	S.D. dependent var	0.380205
S.E. of regression	0.348442	Akaike info criterion	0.906169
Sum squared resid	2.428243	Schwarz criterion	1.149944
Log likelihood	-6.327113	Hannan-Quinn criter.	0.973782
F-statistic	2.143744	Durbin-Watson stat	2.150592
Prob(F-statistic)	0.112874		

Appendix D(iii)

Dependent Variable: DLOG(ER)
Method: Least Squares
Date: 08/30/14 Time: 03:57
Sample (adjusted): 1988 2012
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.57E-05	0.083236	0.001149	0.9991
D(LOG(KE))	0.103121	0.189057	0.545448	0.5915
D(LOG(RE))	0.602189	0.195770	3.076000	0.0060
D(LOG(ER(-1)))	0.001754	0.182986	0.009585	0.9924
ECM(-1)	-0.002385	0.001717	-1.389088	0.1801

R-squared	0.426541	Mean dependent var	0.146281
Adjusted R-squared	0.311849	S.D. dependent var	0.309333
S.E. of regression	0.256607	Akaike info criterion	0.294312
Sum squared resid	1.316940	Schwarz criterion	0.538087
Log likelihood	1.321099	Hannan-Quinn criter.	0.361925
F-statistic	3.719021	Durbin-Watson stat	2.305706
Prob(F-statistic)	0.020251		

Appendix D(iv)

Dependent Variable: DLOG(GR)
Method: Least Squares
Date: 08/30/14 Time: 04:46
Sample (adjusted): 1990 2012
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.151356	0.352196	-0.429751	0.6725
D(LOG(KE))	0.102299	0.831878	0.122973	0.9035
D(LOG(RE))	1.078199	0.987238	1.092137	0.2892
D(LOG(GR(-1)))	-0.408781	0.147545	-2.770549	0.0126
ECM(-1)	-0.479664	0.113997	-4.207700	0.0005

R-squared	0.673669	Mean dependent var	-0.003612
Adjusted R-squared	0.601151	S.D. dependent var	1.983822
S.E. of regression	1.252873	Akaike info criterion	3.478416
Sum squared resid	28.25443	Schwarz criterion	3.725262
Log likelihood	-35.00178	Hannan-Quinn criter.	3.540497
F-statistic	9.289676	Durbin-Watson stat	2.060991
Prob(F-statistic)	0.000296		

Appendix E: Lag Length

VAR Lag Order Selection Criteria
Endogenous variables: IR GR ER UR KE RE
Exogenous variables: C
Date: 08/30/14 Time: 12:05
Sample: 1986 2012
Included observations: 25

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1052.570	NA	2.42e+29	84.68563	84.97816	84.76676
1	-926.3132	181.8103*	1.94e+26*	77.46506*	79.51277*	78.03300*
2	-891.9685	32.97094	3.97e+26	77.59748	81.40037	78.65224

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

Appendix F: Vector Error Correction Mechanism

Vector Error Correction Estimates
Date: 08/30/14 Time: 02:34
Sample (adjusted): 1990 2012
Included observations: 23 after adjustments
Standard errors in ( ) & t-statistics in [ ]

CointegratingEq:	CointEq1
LOGIR(-1)	1.000000
LOGGR(-1)	2.291987 (0.24501) [9.35476]
LOGER(-1)	-0.023489 (0.48906) [-0.04803]
LOGUR(-1)	-1.985045 (0.72850) [-2.72483]
LOGKE(-1)	-0.064551 (0.39519) [-0.16334]
LOGRE(-1)	0.530430 (0.56396) [0.94055]
C	-7.234302

Error Correction:	D(LOGIR)	D(LOGGR)	D(LOGER)	D(LOGUR)	D(LOGKE)	D(LOGRE)
CointEq1	-0.466346 (0.18926) [-2.46402]	-0.109679 (0.24020) [-0.45662]	-0.040328 (0.05916) [-0.68172]	-0.042106 (0.07021) [-0.59973]	0.023563 (0.04335) [0.54351]	-0.048328 (0.03978) [-1.21485]
D(LOGIR(-1))	-0.564283 (0.28175) [-2.00279]	0.885908 (0.35758) [2.47754]	0.019201 (0.08806) [0.21803]	0.014545 (0.10452) [0.13917]	0.081567 (0.06454) [1.26385]	0.009495 (0.05922) [0.16034]
D(LOGGR(-1))	0.448062 (0.26237) [1.70777]	-0.371870 (0.33298) [-1.11680]	0.021856 (0.08201) [0.26651]	0.054105 (0.09733) [0.55590]	-0.014725 (0.06010) [-0.24501]	0.104499 (0.05515) [1.89491]
D(LOGER(-1))	-1.491925 (1.77600) [-0.84005]	1.111656 (2.25398) [0.49320]	-0.140493 (0.55511) [-0.25309]	-0.905023 (0.65882) [-1.37370]	0.204078 (0.40682) [0.50164]	0.229199 (0.37330) [0.61398]
D(LOGUR(-1))	-0.075153 (1.15400) [-0.06512]	1.703502 (1.46458) [1.16313]	-0.057384 (0.36070) [-0.15909]	0.174245 (0.42809) [0.40703]	-0.421524 (0.26434) [-1.59462]	-0.119736 (0.24256) [-0.49363]
D(LOGKE(-1))	-0.956170	1.204988	0.058118	0.056990	0.134468	0.085098

	(0.98893)	(1.25509)	(0.30910)	(0.36685)	(0.22653)	(0.20786)
	[-0.96687]	[0.96008]	[0.18802]	[0.15535]	[0.59360]	[0.40939]
D(LOGRE(-1))	1.183708	-1.067550	0.010672	0.354885	-0.160977	-0.652068
	(1.15104)	(1.46082)	(0.35977)	(0.42699)	(0.26366)	(0.24194)
	[1.02838]	[-0.73079]	[0.02966]	[0.83113]	[-0.61054]	[-2.69518]
C	0.063362	-0.227232	0.145084	0.109345	0.188613	0.313125
	(0.38617)	(0.49010)	(0.12070)	(0.14325)	(0.08846)	(0.08117)
	[0.16408]	[-0.46365]	[1.20201]	[0.76331]	[2.13224]	[3.85771]
R-squared	0.576065	0.621162	0.085418	0.148871	0.547583	0.509592
Adj. R-squared	0.378228	0.444372	-0.341387	-0.248323	0.336455	0.280735
Sum sq. resids	20.36428	32.80055	1.989494	2.802336	1.068534	0.899696
S.E. equation	1.165169	1.478751	0.364188	0.432230	0.266900	0.244908
F-statistic	2.911823	3.513544	0.200133	0.374807	2.593609	2.226686
Log likelihood	-31.23590	-36.71752	-4.488025	-8.427615	2.660291	4.638122
Akaike AIC	3.411818	3.888480	1.085915	1.428488	0.464323	0.292337
Schwarz SC	3.806772	4.283435	1.480870	1.823443	0.859277	0.687292
Mean dependent	-0.057148	-0.003612	0.132530	0.072600	0.176680	0.210930
S.D. dependent	1.477656	1.983822	0.314448	0.386857	0.327652	0.288774

Determinant resid covariance (dof adj.)	8.45E-07
Determinant resid covariance	6.50E-08
Log likelihood	-5.505963
Akaike information criterion	5.174432
Schwarz criterion	7.840375

Appendix G: Granger Causality

Pairwise Granger Causality Tests
Date: 08/30/14 Time: 18:55
Sample: 1986 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GR does not Granger Cause IR	25	2.93829	0.0761
IR does not Granger Cause GR		0.29309	0.7491
ER does not Granger Cause IR	25	2.53101	0.1047
IR does not Granger Cause ER		1.53601	0.2396
UR does not Granger Cause IR	25	1.71011	0.2062
IR does not Granger Cause UR		1.04605	0.3698
KE does not Granger Cause IR	25	2.00469	0.1609
IR does not Granger Cause KE		0.04045	0.9604
RE does not Granger Cause IR	25	1.15023	0.3366
IR does not Granger Cause RE		0.42221	0.6613
ER does not Granger Cause GR	25	1.58159	0.2303
GR does not Granger Cause ER		0.13955	0.8706
UR does not Granger Cause GR	25	2.70864	0.0910
GR does not Granger Cause UR		0.01181	0.9883
KE does not Granger Cause GR	25	1.03059	0.3750
GR does not Granger Cause KE		0.21308	0.8099
RE does not Granger Cause GR	25	0.94512	0.4053
GR does not Granger Cause RE		0.04157	0.9594
UR does not Granger Cause ER	25	0.13083	0.8781
ER does not Granger Cause UR		1.13433	0.3415
KE does not Granger Cause ER	25	0.99783	0.3863
ER does not Granger Cause KE		10.7098	0.0007
RE does not Granger Cause ER	25	0.16038	0.8529
ER does not Granger Cause RE		1.23303	0.3126
KE does not Granger Cause UR	25	7.48833	0.0037
UR does not Granger Cause KE		5.49076	0.0126
RE does not Granger Cause UR	25	1.89408	0.1765
UR does not Granger Cause RE		0.24328	0.7863
RE does not Granger Cause KE	25	0.24353	0.7861
KE does not Granger Cause RE		9.54054	0.0012