The Impact of Government Expenditure on Economic Growth and Inflation Rate in Nigeria

Musa Adeyemi Ayinde

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Economics

Eastern Mediterranean University
February 2024
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Ali Hakan Ulusoy
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science in Economics.

Prof. Dr. Vedat Yorucu
Chair, Department of Economics

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Economics

Prof. Dr. Hasan Güngör
Supervisor

Examining Committee

1. Prof. Dr. Hasan Güngör

2. Asst. Prof. Dr. Hasan Rüstemoğlu

3. Asst. Prof. Dr. Yenal Süreç

ABSTRACT

The research's objective is to investigate the influence of government recurrent expenditure and government capital expenditure on economic growth; the impact of government recurrent expenditure and government capital expenditure on the inflation rate; how well the government expenditures work hand-in-hand with the money supply in influencing economic growth and inflations rate; and the long-run relationship between inflation rate and economic growth. All in the case study of Nigeria, from 1981 to 2022.

With the use of the ARDL Bound Test approach, there exists a long-run relationship between the variables. The estimated ARDL long-run coefficients showed that government recurrent expenditure and money supply have a positive relationship with economic growth and inflation rate; government capital expenditure has a negative relationship with economic growth and inflation rate; and a negative relationship between inflation rate and economic growth.

According to the Granger Causality Test results, there is a unidirectional causality from government expenditures to economic growth and money supply. However, no directional causality between government expenditures and inflation rate; inflation rate and economic growth; and money supply and inflation rate.

Keywords: government recurrent expenditure, government capital expenditure.

ÖZ

Araştırmanın amacı, hükümetin cari ve sermaye harcamalarının, ekonomik büyüme ve enflasyon üzerindeki etkisini araştırmaktadır. Ekonomik büyümeyi ve enflasyon oranını etkilemede, hükümetin cari harcamaları ve sermaye harcamalarının, para arzı ile el ele ne kadar iyi çalıştığını, ekonomik büyüme ve enflasyonun uzun dönem ilişkisini ele alarak göstermeyi amaçlamıştır. Söz konusu inceleme Nijerya için yapılmış olup, 1981 yılından 2022'e kadar olan süreyi kapsamaktadır.

ARDL Sınır Testi Yaklaşımı sonuçlarına göre değişkenler arasında uzun dönem ilişki bulunmaktadır. Tahmin edilen ARDL uzun dönem katsayıları, hükümetin cari harcamaları ve para arzının, ekonomik büyüme ve enflasyon oranı ile pozitif bir ilişkiye sahip olduğunu gösterirken; hükümetin sermaye harcamalarının ekonomik büyüme ve enflasyon oranı üzerinde negatif etkisi olduğu dolayısıyla ekonomik büyüme ve enflasyon oranı arasında da negatif ilişki olduğu sonucunu göstermiştir.

Granger Nedensellik Test sonuçlarına göre, kamu harcamalarından ekonomik büyümeye ve para arzına doğru tek yönlü nedensellik vardır. Ancak, kamu harcamaları ve enflasyon, ekonomik büyüme ve enflasyon, para arzı ve enflasyon arasında yönlü bir nedensellik bulunmamaktadır.

Anahtar Kelimeler: hükümet cari harcamaları, hükümet sermaye harcamaları.

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Chapter 1

INTRODUCTION

The research's objective is to investigate the influence of government recurrent expenditure and government capital expenditure on economic growth; the impact of government recurrent expenditure and government capital expenditure on the inflation rate; and the long-run association between inflation and economic growth – all in the case study of Nigeria. Government expenditure is at the heart of every country's macroeconomic policy. It has been an issue that divides economists into groups and schools of thought since the beginning of the 20th century. Hence, to determine the well-being of an economy, the government fiscal policy and public expenditure pattern may be a guiding part towards a meaningful answer.

In the modern day, given the extensive role of governments of different countries, public expenditure can be classified under several headings. In the case of Nigeria, the major headings are recurrent expenditure and capital expenditure. The recurrent expenditures are the expenditures on wages, salaries, overheads, depreciation, and others. They simply involve payments that do not result in the acquisition of new capital. Whereas capital expenditure involves the acquiring of capital, tangle, and intangible.

Using the endogenous growth theory model, the basic model framework of the research is formed to inquire about the influence of government public expenditure on economic growth. The two government public expenditure influences on economic growth are approached by using the endogenous growth model as the basic model framework. Then based on the theoretical literature, a variable in the form of the money supply was added to form another model, considering the effective policy view of Kahn (1931) that the fiscal policy needs to go hand-in-hand with the monetary policy to offset any negative effect that may arise from government spending and debt financing. An additional variable in the form of the inflation rate was also added to form another model, considering the empirical studies of Atesoglu (1998), Mallik & Chowdhury (2002), Attari & Javed (2013), and Aluthge et al. (2021).

To explore the public expenditure influence on the inflation rate, the explained variable is inflation, and the real gross domestic product is an explanatory variable alongside the existing government expenditure variables, which conforms with the empirical modeling of Akinbobola (2012) and Amassoma et al. (2018). For effective policy and offsetting, the money supply variable was included to form another model, which aligns with the model of Cynthia (2018) and Nnachi et al. (2023).

Given the combination of different variables to give different models, this research set out to get a holistic view of the influence of the federal government's expenditure on the Nigeria economy's well-being and how effective the monetary policy is in offsetting and contributing to the economy in the presence of fiscal public expenditure policy. The conclusion of the study shows that there is indeed a meaningful statistical impact of both the government recurrent expenditure and government capital expenditure on economic growth and inflation rate; economic growth is strongly

impacted by the money supply; and the money supply's weak relationship with the inflation rate. However, there was an inconclusive decision on what to make of the connection of economic growth with the level of inflation.

1.1 This Study's Aim and Objectives

The primary objectives and aims of this analysis are:

i. To determine if there is the presence of a statistically significant relationship between government recurrent and capital expenditure and the growth of the economy in the long run.

ii. To determine if there is the presence of a statistically significant relationship between government recurrent and capital expenditure and the economy's level of inflation in the long run.

iii. To ascertain a statistically significant estimated sign of the long-run coefficient, to ascertain if impact a positive or negative one on economic growth and inflation rate.

iv. The vis-à-vis causal relationship between the real gross domestic product, money supply, government recurring expenditure, government capital expenditure, and the inflation rate.

The secondary objectives are:

i. The relationship between inflation rate and the growth of the economy.

ii. The effect of the money supply on the economic growth and inflation rate.

iii. How well does the fiscal policy work hand in hand with the monetary policy in explaining the economic growth and inflation rate?

1.2 Research Methodology

The research methodology explains how the data from 1981 to 2022 were analyzed to arrive at the different statistics results and their interpretation. First, the Augmented Dickey-Fuller (ADF) Test for the state of stationarity to avoid having data that gives a spurious statistical interpretation. Next, the Autoregressive Lag Distribution cointegration Bounds Test was conducted to make sure there is an existing and statistically significant long-run connection between the explained and explanatory variables in each respective model. Then, the Error Correction Model (ECM) for Short-run dynamics and Long-run coefficients were calculated to see the speed of adjustment and magnitude impact of each variable. Finally, the Granger causality Test was carried out to see the unidirectional, or bidirectional, or no-directional of causality between the different variables in this study.

1.3 Segmentation of the Study

This research entails seven chapters. Beginning with Chapter one, the introduction, which explains the objective and methodology of this research. Chapter two is the detailed theoretical framework that serves as a foundation block for the variables. Chapter three details empirical literature studies related to the variables and goals of this research. It also provides some empirical framework that is used for the model specifications. Chapter four gives an overview of Nigeria in light of its economic growth, inflation rate, and government expenditures. Chapter five gives the data source, explains the variables, and model specification arrival. Chapter six shows the empirical outputs and interpretation of the empirical research conducted for this study. Lastly, chapter seven is the conclusion and recommendation.

Chapter 2

THEORETICAL LITERATURE REVIEW

When we have a look at the history of macroeconomics in line with the perspective of the different economics schools of thought, one of the most important differentiations is the duty and responsibility of government in the nation's economy and this is highlighted within the Classical vs. Keynesian view.

2.1 The Classical View

"Traditional macroeconomics" in its most standardized form can said to have begun in era prior to the 1936 publication of Keynes's famous book, The General Theory on Employment, Interest and Money. Hence the nomenclature "classical economics". According to Keynes, notable classical economists include Adams Smith, David Ricardo, and John Stuart Mill.

The core collective principle of classical economists is their unwavering faith in the natural adjustment ability of the market mechanisms to always bring the economy to an equilibrium level of full employment, i.e., the potential level of output or income. This means any disturbances that make the economy deviate from its equilibrium level of employment and output are momentary. Given this belief, they see no need to why the government needs to intervene during periods of temporary disequilibrium in the economy, and neither do they desire government intervention – thus *laissez-faire*. They complain that any government intervention policy will pose an additional disturbance which will further increase the market instability, Brewer (2010). Well, if we are to be

convinced about this view, we need to ask two questions. First, how did the classical economists arrive at this conclusion? Second, if the government is to refrain from market intervention, then what is the role of the government in the nation?

The answer to the first question begins with the following assumptions: all economic agents are rational and they aim to maximize utility or profit; no money illusion, i.e., agents view their income and wealth from a real and not nominal perspective; perfectly competitive market; no asymmetric information, i.e., all agents are well aware of the market situations including the prevailing prices; trade only takes place only when the Walrasian equilibrium has been established; and agents' expectations are stable. These assumptions make sure that the markets for output and labor are always in a state of equilibrium. Hence there is no need for the government to regulate the market in any form of intervention. These assumptions are based on the classical model designed with purpose is to explain the level of macroeconomic variables, such as, the price level (P), nominal wages (W), real wages (W/P), the real interest rate (r), and the real output (Y), Ackley (1966).

The classical view approach classifies the macro variables under two economic sectors: the monetary sector and the real sector. This classification helps to explain the determination of the most important macroeconomic variables while considering: first, the classical theoretical view of labor market employment level and production output determination in the goods and services market; second, the well-known Say's Law, which expresses that supply determines its level of demand; and third, the classical quantity theory of money that explains the neutrality of money. The first and second component explains the determination process of equilibrium of the macroeconomics real sector variables. The third component explains the determination of the monetary

variables. The prominent trademark of the classical views and their theory of macroeconomics is the distinguishment of the nominal macro-variables and the real macro-variables, Snowdon & Vane (2005).

First, the classical theoretical view of labor market employment level and production output determination in the goods and services market explains that $Y = Af(K, L)$, for any given level of capital (K) and level of technological efficiency (A), the level of aggregate output (Y) being produced in the economy is dependent on the level of equilibrium employment of labor (L) employed. The competitive market assumption makes sure that the supply and demand for labor in the labor market constantly create equilibrium, i.e., a full level of employment. Keynes (1936) regarded this equilibrium outcome to not be the norm but a special case where the output produced at full employment simply matches the economy's aggregated demand level. This means, that in a situation of deficiency of the aggregate demand, the labor market will not be at full employment. The classical economist denied this to be the case and they vindicated their standpoint with the use of 'Say's Law'. Say's Law, as Keynes (1936) noted, is a way the classical economists propose that the constant attainment of full employment in the economy is subject to no hindrance.

Second, Say's Law, which expresses that supply determines its level of demand thus no obstacle to the constant achievement of an equilibrium level of employment in the economy. Putting that statement of Say (1821) in simple words of economic understanding, when the labor works in the production of a good, this creates wage income (W) for the labor, which then creates a purchasing power for the goods produced in the economy. Thus, there cannot be an obstacle to full employment as a result of a deficiency of the aggregate demand. Given this understanding, on an

aggregate level, we expect that the aggregate demand (AD) will be equal to the aggregate supply (AS) when the labor market is at equilibrium. Furthermore, the classical theory of the market determination of the interest rate is crucially important in making sure that the economy does not experience a deficiency of aggregate demand, in the sense that the equilibrium real interest rate (r) occurs at the point where Savings (S) is equal to Investment (I) in the economy. The savings in the capital market represent the supply of loanable funds and investment represents the loanable funds demand in the capital market. Thus, at equilibrium, the capital market is sufficiently capable and efficiently optimal in allocating savings to whatever investment opportunities exist. However, once the government starts to intervene, it needs to debt finance the actions and spending, and the first well it will tap into is the Savings (S). This diverts savings from investments, thereby causing a disequilibrium of the steady state which in turn affects the economic growth of the nation, Brewer (2010). This equilibrium, without government intervention, in the loanable funds market ensures that the aggregate demand does not become deficient in the economy as both S and I are influenced by the level of real interest rate in decision-making. Since there cannot be demand deficiency to cause an imbalance in the equilibrium of the labor market – even if there is, the quick adjustment of the interest rate and flexible prices and flexible wages will only make the deficiency momentary – thus there is no need for government to intervene to adjust the real macro-variables level in the economy.

Third, the classical quantity theory of money that entails the neutrality of money explains the second part of the classical macroeconomics dichotomy. It is imperative to understand that under this stylized classical model, the quantity of money in the economy is insignificant in its impact on the real macro-variables in the economy.

Thus, there is money neutrality. At equilibrium in the money market, we expect money supply (M) to be equal to money demand (Md). Starting with the Cambridge cash balance approach associated with Marshall and Pigou, where the money supply (M) is exogenous, and the money demand (Md) is balances of the nominal money with fraction k of the nominal national income (PY). Thus, at equilibrium where $M = Md$, we have $M = kPY$. Using Fisher's exchange equation $MV = PY$, where M is the amount of money supply controlled by monetary authorities, V is $(1/k)$ the velocity of circulation at which a specified money unit changes hands in the path of final transactions process which entails the gross domestic product in its nominal form, i.e., (PY), where the economy's aggregate price level is represented with P, and Y represents the level output produced, Hansen (1949). Since V is determined by the frequent regularity of transactions done by economic agents which are, conclusively, habitual, we can assume it to be constant. Y is determined by the level of equilibrium in the labor market, thus, we can hold it constant at full employment. Hence, given that V and Y are constant, P is dependent on M, so $\Delta M = \Delta P$. As Hume (1752) expressed, the prices within the economy are a result of the direct proportional relationship that price has with money supply, hence, there are no consequential effects to plenty of money in an economy as prices adjust to keep real values unchanged. In this sense, the inflation level of the economy is not influenced by real variables but by the money supply which is exogenous in this classical model. As long as the labor market is at full employment, if the authorities, either the government or central bank, induce any change in the money supply, it will not cause a change in real output level, real wage level, and real interest rate level; but a change in the price level, which will translate to a change in the nominal output, the nominal wage, and the nominal interest rate. Thus, money is neutral, at least in the scenario of the long term – the question

remains if it is neutral in the short term. Because several classical economists were convinced that in the short-term, there may exist no neutrality of money, Corry (1962). This concludes the answer to the first question as to how the classical economists conclude that the markets in the economy will always be at equilibrium and there is no need nor desire for government regulation or intervention.

If government is to refrain from intervention, what is its role? Well, the classical view is that the government should confine its activities to ensuring the internal and external security of the country, creating a market competitive environment. The government should only intervene when the firm has too much market share which alludes to the monopoly that prevents competitive market mechanisms from holding, Mankiw & Taylor (2020).

2.2 The Keynesian View

The originator of this view is John Maynard Keynes. As Samuelson (1988) mentioned Keynes's impact was significant to the economic science growth in the twentieth century. Keynes's contribution mainly came up as an attack against the conclusion made by the classical economists. One could say it was quite unexpected for Keynes to have come up with his famous book, *The General Theory*. Because he grew up in the cultural environment of the *laissez-faire* doctrine of nineteenth-century classical economics. From around the early 1920s, Keynes' writings started proclaiming the idea that the concept of 'invisible hands' does not always create socially optimal equilibrium in the market. He started to promote the idea of government intervention to create a socially optimal equilibrium in the markets. Fortunately for Keynes, he was able to establish his view at the height of the 1930s Great Depression. Keynes blamed deficient aggregate demand for the issue of increased unemployment and depression

of the economy and criticized the naivety of the classical economists who believed in a 'natural' market adjusting mechanism.

The basic framework of the Keynesian view is that the national income (or total output value) is determined by the employment level of the labor market. However, this employment is not always at full employment due to involuntary employment that results from the deficiency in aggregate demand (AD). So, to fix this deficiency in the AD, government intervention is required as the market mechanism may take too long or fail to adjust the market to the optimal equilibrium levels. To explain this, we will assume the simplified Keynesian view of a closed economy.

In a closed economy, the principle of effect demand explains that the aggregate demand (AD) that determines the economy's level of output is the aggregate planned expenditure (E). The planned expenditure (E) is the households' consumption (C) and the firms' investment (I). Thus, $E = C + I$. Unlike the classical model that limits consumption (which is what is left after savings) and investment as functions of the interest rate; in Keynes's model, consumption consists of the autonomous portion and the induced part which depends more on income than interest rate, and investment depends on amount of profit that firms are expecting and borrowing cost of funds, i.e., interest rates. The amount of profit that firms expect, Keynes referred to this as "marginal efficiency of capital". In clear and simple words, this means if a firm expects high profitability in the future, its amount of investment will go up, creating a rising level of employment and output. However, these future expectations are influenced by lots of factors – some within and others beyond the influence of the firms; some rational and others irrational; some optimism and others pessimism. So, violent fluctuations of the firms' expectations create shocks that shift the 'real' aggregate

demand through the change in the level of investment (ΔI). Thus, economic fluctuations in the economy emerge from the real side of the economy. Couple this ΔI with the multiplier influenced by the marginal propensity to consume of households' consumption. So, the change in investment is amplified by its effect on AD which determines the output (Y) and employment level (L). Increasing investment expenditure ($+\Delta I$) will increase employment ($+\Delta L$) of firms producing capital goods. Additional labor employed by the capital-good firms will earn income and eventually spend the income on goods produced in the economy, creating an increase in the consumer goods demand ($+\Delta C$); and save what is left of the income, creating an increase in the level of savings ($+\Delta S$), Hicks (1937). Now, with the increase in demand for consumer goods, firms in these industries will increase their output production by employing more labor. These results in increase in the 'real' aggregate demand, the savings, the output, and the employment – a multiplier process as a result of $+\Delta I$. A similar process will occur if there is a positive change in autonomous household consumption that is not dependent on the income level. A vice versa multiplier effect will occur if the change in investment or change in autonomous consumption is negative. Given that investments and consumptions are subject to fluctuations, it is understandable why Keynes said full employment equilibrium is not a norm but a special case.

In the case of deficient aggregate demand, the Keynesian view proposes public expenditure programs. Since these public expenditures are autonomous, they will create a multiplier amplified results similar to that of a positive change in investment and autonomous consumption. These public expenditure programs are 'unnatural' as they are interventions to correct the failing 'natural' market mechanism, thus, a '*price*'

must be paid as a consequence of going against the market's nature and speeding up the market equilibrium mechanism. The AD-AS model explains that a public expenditure increase ($+\Delta G$) will result in an increase in aggregate demand (AD) because now $AD = C + I + G$, thus the AD shifts to right, *ceteris paribus*, there will be a rise in the aggregate level of price ($+\Delta P$) in the economy. Keynesian IS-LM model explains that the consequential price of government intervention is the real interest rate (r) increment. Since investment (I) is quite sensitive to the interest rate value, the rise in the level of interest rate will result to a fall in the level of investment ($-\Delta I$), resulting in negative multiplier amplified results on the economy. Government expenditure ended up reducing the investment in the economy through increased interest rate, this is known as the 'crowding-out effect'.

A major concern of government policymakers is the crowding out effect because it is like taking three steps forward two steps back; and if the crowding out effect is great, then it is like four steps back and the government expenditure will be rendered ineffective as the economy will be worse off than initial position. However, this crowding-out effect can be mitigated by counter policies by the monetary authority of the money market. As Kahn (1931) wrote in response to the government concern on crowding-out that, government expenditure on employment will be effective under a number of assumptions, we have chosen to focus on three assumptions. First, the economy has spare capacity. In the sense that economy is not at full employment. Second, there is monetary policy accommodation. The government should work hand-in-hand with the monetary authority of the economy to mitigate any negative consequences that may result from the public expenditures and its means of financing. Third is that nominal wages remain constant. However, any increase in the nominal

wages is as a result from increase in employment, i.e., the real component. In Kahn's (1931) words, “is to the reduction in unemployment rather than to the rise in prices that wages respond”. In an open economy, an increase in the level of consumption and import by decreasing the tax can also help in mitigating the crowding-out effect through the consumption and net export component of the aggregate demand, Keynes (1936).

The Keynesian view also rejects the classical view that money neutrality holds. According to Keynes (1936), the interest is purely a monetary occurrence that is determined by the liquidity preference, i.e., money demand by the economic agents in relation with the level of money created and supplied by the authority. The transitionary, precautionary, and speculative motives are the explanations that the liquidity preference proved as to why economic agents demand for money. The first and second are not sensitive to the interest rate, however the third is sensitive. Thus, in a way, Keynes is saying that the level of interest rate is dependent the rational confidence level through the speculative motive and the money supply. Since liquidity preference is subject to variation, then the unit circulation of money required to meet the recurrence of transactions of economic agents, i.e., velocity (V), is also subject to variation – not constant like the classical view assumed. Recall that the investment component of the aggregate demand may change due to the firms’ expectations. Hence, a period of negative or uncertain future expectations may increase the need for liquidity which may affect the aggregate demand. With these understanding, Keynes concludes that changes in the money demand (ΔMd) and supply of money(ΔM) not only influences the price level (P) but can also influence the produced output level (Y) and level of employment (L) in the labor market in the economy. For example, if the

supply of money is increased ($+\Delta M$) , this lead the level of interest rate of decrease ($-\Delta r$) in the money market, this will yield a positive influence on the amount of investment ($+\Delta I$), resulting in a multiplier amplified result on the economy's aggregate demand ($+\Delta AD$) that increases in the employment level ($+\Delta L$) and the level outputs ($+\Delta Y$) in the economy. Thus, the classical concept that adjustments in money supply (ΔM) only affects level of price (ΔP) is rejected – money is not neutral.

As seen, Keynesian view agreed to the effectiveness of the monetary policy in influencing the aggregate demand. However, Keynesian view also recognized that the monetary policy may be rendered weak and ineffective especially when liquidity trap exists and in period of deep recession. In this case of weakness, the government should take on the mantle to stimulate the aggregate demand through expansionary fiscal policies, i.e., increasing the public expenditure, Keynes (1936).

Chapter 3

EMPIRICAL LITERATURE REVIEW

3.1 Economic Growth and Government Expenditure

Landau (1983) surveyed on different countries to inquire about the real GDP per capita growth is influenced by the share of consumption expenditure in GDP. A panel data sample of 96 countries from 1961 to 1976. Landau pointed out that using the total government expenditure would have been a better approach to this analysis. However, due to a lack of data availability, government expenditure was limited to their consumption expenditure only. Overall, the regression showed that there is a negative relationship between the variables of the study.

Landau (1985) studied the connection between annual growth rates and government expenditure of 16 developed countries from the years 1952 to 1976. The government expenditure was defined in terms of the deflated share of total expenditure of the public sector in national income and the annual rate of growth was represented by the real per capita gross domestic income. Overall, the results showed the government expenditures with a negative coefficient, meaning a negative correlation with per capita output growth.

Wu et al. (2010) delved into the directional causality association between economic growth and spending of the government. For 182 countries, from 1950 to 2004, a panel data set approach was used. Their findings concluded that government expenditure is

indeed impactful on the growth of the economy regardless of how large the size and expenditure of the government and the growth of the economy are measured.

Attari & Javed (2013) explored the association of government spending, inflation, and economic growth in Pakistan from 1980 to 2010. A disaggregated approach was used as the government spending was divided into government development expenditure and government current expenditure. Real GDP is the dependent variable; independent variables were inflation, real development expenditure, real current expenditure, real total government expenditure. With the use of Autoregressive Distributed Lag (ARDL), the long-run estimates showed a positive association of the expenditures and growth of the economy. However, only the coefficient of real government development expenditure and real total government expenditure statistically significant at least a 10% level of significance. This estimated positive relationship result aligns with the result found in the case of the US, the UK, Sweden, Spain, New Zealand, Finland, and Australia, Mallik & Chowdhury (2002), Atesoglu (1998),). In addition, the estimated results of this study showed a significant negative association between inflation and growth of the economy. Furthermore, lack of directional causality between the inflation rate and total government expenditure was depicted by the Granger Causality test output. However, it depicted a unidirectional causality between government capital expenditure and GDP; inflation rate and GDP; and total government expenditure and GDP

Hasnul (2015) inquired about the short-run link between public expenditures in Malaysia and the growth of the nation's economy from 1970 to 2014. The government expenditures were broken down into the following categories: operating expenditure, development expenditure, health expenditure, education expenditure, housing

expenditure, and defense expenditure. Using the Ordinary Least Squares (OLS) approach, the different government expenditures turned out to have harmed the growth od the economy. Most importantly, all spending category negative coefficients were not significant except for development and housing expenditures. Since these two expenditures are capital-investment-type expenditures, the negative result is interesting. Hansul referred to Wahab's (2011) report for a plausible reason for these negative impacts, that, government investment expenditure will turn out to harm the economic growth when government investment expenditure growth exceeds its trend growth.

Akpan (2005) studied the relationship between the federal government of Nigeria's expenditure and its impact on the growth of the nation’s economy, from 1970 to 2001. The study followed a disaggregated approach to government expenditure by dividing it into two parts, recurrent expenditures and capital expenditures. Both expenditures were then broken down into four sectors, administrative, economic service, transfer, and social & community service. The results established the long-term relationship between the growth of the economy and the independent variables. The study gave room to lag variables, thus, the research highlights the how growth of the economy is influenced by the habitual nature of government spending. Overall, because the study is disaggregated, the results showed a mixed conclusion. From the total of 22 independent variables, (including the lag variables and excluding the constant term), 12 variables produced a negative link with the growth of the economy while others reflected a positive link. The prominence of the negative impact of more than half of the variables, in Akpan's (2005) words, “is not surprising as the funds allocated to these components are not properly channeled to this expenditure, and transfers are leakage

to the system. Also, this is not unconnected with the fact that the government has proven not to be good investors and managers."

Babatunde (2011) researched to see if Wagner's Law holds in Nigeria. That is the tendency of government expenditure to increase as a result of economic growth. The research took real government expenditure as the dependent variable and real GDP as the independent variable and constructed five different models. With the use of Granger Causality tests on the different models and the ARDL bounds tests, the outputs concluded a lack of long-run relationship between the variables. from 1970 to 2006. Thus, Wagner's Law establishment could not be ascertained in the case of Nigeria. Rather, the estimated outputs supported the Keynesian view that economic growth is dependent on government expenditures, not the other way around – at least in the case of Nigeria, between 1970 and 2006.

Gukat & Ogboru (2017) examined the ever-rising public expenditure in Nigeria and its impact on the growth of the Nigerian economy from 1981 to 2016. The paper chose to focus on the public recurrent expenditure and public capital expenditure in two separate models. The first model focused on the three classifications of recurrent expenditure – economic services expenditure, social & community services expenditure, and administration expenditure – and their respective impact on the real gross domestic product. The second model focused on the three classifications of capital expenditure – economic services expenditure, social & community services expenditure, and administration expenditure – and their respective impact on the real gross domestic product. The studies found a long-run relationship in both models. This long-run relationship was solidified with a negative and significant ECM result. Within the short-run dynamics of the first model showed that administration recurrent

expenditure had a significant positive link with the real gross domestic product, while social & community services recurrent expenditure and economic services recurrent expenditure had an insignificant negative impact on the growth of the economy. The short-run dynamics of the second model showed that administration capital expenditure and social & community services capital expenditure had an insignificant positive relationship with the real gross domestic product, while and economic services capital expenditure had an insignificant negative influence on economic growth.

3.2 Inflation and Government Expenditure

Onuoha & Okorie (2020) researched the long-term dynamics of the public expenditure and level of inflation in 11 African countries, with data ranging from the period 1990 to 2019. The countries were Tunisia, Tanzania, Sudan, South Africa, Nigeria, Mauritius, Kenya, Ghana, Ethiopia, Egypt, and Botswana. The panel data study used the price index of consumers (CPI) to represent the inflation rate which is the dependent variable. The independent variables were defense expenditure, capital expenditure, education expenditure, health expenditure, and the exchange rate. Variables cointegration long-term test – using the Pedroni Cointegration Test, and Panel Dynamic Ordinary Least Squares (PDOLS), and Fully Modified Ordinary Least Squares (FMOLS) – revealed the existence of a long-term association between the study variables. With the PDOLS results, all independent variables had an association that was positive with the rate of inflation except for the health expenditure which had a statistically insignificant negative impact.

Ojarikre et al. (2015) investigated Nigeria's inflation rate and government expenditures to check if there exists a long-run relationship and the direction of the

causality between them. The study focused on the period from 1981 to 2012. The dependent variable was the inflation rate and the independent variables were government capital expenditure and government recurring expenditure. The long-term association between the interested variables – inflation rate and government expenditures – was established with the use of the Johansen Co-integration Test. The result of the Granger Causality Test at Lag 2 showed a bidirectional causality between capital expenditure and recurrent expenditure. However, there was no directional causality between any of the government expenditures and the inflation rate.

Amassoma et al. (2018) explored the influence of the money supply on inflation in Nigeria from 1970 to 2016. The research took the consumer price index as the variable to be explained. The explanatory variables were the monetary policy rate, real gross domestic product domestic oil price, real exchange rate, and the money supply. With the use of the Johansen Co-integration Test, the results showed a long-run relationship between the dependent and independent variables. The study was more interested in the short-term dynamic influence of the money supply; thus, the ECM was used to check the short-term dynamic influence. The result showed that money supply had a statistically insignificant negative relationship with the inflation rate. In addition, there was a positive relationship between the real gross domestic product and the inflation rate. The Granger Causality Test result showed that there was a bidirectionality causality between the real exchange rate and the inflation rate. However, there was no directional causality between the money supply and the inflation rate. This result supports the argument made by Akinbobola (2012) that the money supply does not explain the inflation rate in Nigeria.

Cynthia (2018) focused on public spending and the inflation rate in Nigeria from 1981 to 2017. The study depicted inflation as regressed, and the regressors were government capital expenditure, government recurring expenditure, money supply, and exchange rate. With the use of the ARDL Bounds Test to check for co-integration, the result was no long-term association between the regressed variable and the regressors, thus further analysis was done to show the short-term impact. The ARDL Short-Term Estimation result showed that both government capital expenditure and government recurrent expenditure have a negative influence on the inflation rate, however, the estimated coefficient of government recurrent expenditure was statistically insignificant. Furthermore, the supply of money has a relationship that is positive with the inflation rate, while its first lag has a negative relationship with the inflation rate. The exchange rate had a statistically insignificant positive link with the level of inflation.

Lubo & Bigbo (2021) delved into the contribution of government expenditure on the inflation rate in Nigeria during the period 1981 to 2018. A disaggregated approach was employed by classifying the government expenditure into transport and communication, defense, agriculture, education, and health. The Johansen Co-integration approach was used and determined that there exists between the variables in the study a long-term association. The Parsimonious Error Correction Model result showed a mixture of positive and negative impacts of the different expenditures on the inflation rate because the regression gave room to lags for up to the third period.

Nnachi et al. (2023) researched the influence of government expenditure on the inflation rate in Nigeria during the period 1986-2021. A disaggregated approach was employed, dividing the government expenditure into education, health, agriculture,

roads and construction, transport and communication, and pension and gratuities. The methodology used in the research was the ARDL approach. The Bounds Test depicted that a long-term relation exists between the variables. The ARDL Long-run Test result showed that all estimated coefficients are positive. That is, all categories of government expenditure in this model had a positive impact on the inflation rate. However, in contrast to the ARDL short-run result where all estimates were significant; the estimated long-run coefficients of government expenditure on agriculture, roads and construction, and pension and gratuities failed to statistically significant at least 10% level of significance.

Chapter 4

GOVERNMENT EXPENDITURE IN NIGERIA

4.1 An Overview of Nigeria's Economy

Nigeria is one of the most endowed nations in Africa. The country is situated in the geographical region of West Africa and it is bordered by land and sea, thus, making it a hub to facilitate international trade and movement of labor and capital. About 80% of the country's land is arable for agricultural purposes. However, the country's discovery and richness in oil and gas have made the agricultural sector take a back seat as the main driving force of economic growth. Nigeria is the largest economy in Africa, yet the country sits low on the per capita measure.

From the period of 2000 to 2014, Nigeria experienced a sustained average economic growth of 7% annually. However, due to several factors – like ever-increasing exchange rates, monetary and exchange rate distortions, increasing fiscal debts, low national savings, unsustainable fuel subsidy plans, and many more – the economic growth rate decreased on average between the period 2015 to 2022. The official inflation rate in the economy was 26% as of the middle of 2023, a 17-year high record. Given that the population of the country is around 213 million – a very high number, with the decreasing economic growth rate, GDP per capita is also decreasing. This means with the soaring inflation rates, the cost and standard of living have become more expensive for the country's residents in recent years.

On the bright side, the new federal government administration in 2023 and their reforms, like the removal of the costly subsidy and a floating singular exchange rate system, along with other reforms are expected to help drive the economic growth of the nation back to an upward annual average. It is expected that the Nigerian economy will be at an average of 3.5% annual growth between 2023 and 2025. Further reforms like the increased scope of government expenditure, fiscal and monetary consolidation, diversification towards the agricultural sector, internal security, reduced corruption, open trade policies, and others will end up setting up Nigeria back to the course of steady economic growth. Source: World Bank, Nigeria.

4.2 Government Expenditure

The country has 36 autonomous states and a Federal Capital Territory. The expenditures made by these 36 autonomous states are known as the State Government Expenditures. The expenditures made by the federal government of the country are known as the Federal Government Expenditures. In this research, the federal government expenditures are our main government expenditure focus.

The total Federal Government expenditures in Nigeria can be disaggregated into three main categories: recurrent expenditure, capital expenditure, and transfers. Previously the transfer expenditures were categorized either under the recurrent expenditure or the capital expenditure, depending on the nature of the transfer spending. From 2004 onwards, a separate category was created to record the transfer expenditures as it was separated from the recurrent and capital expenditures. However, certain types of transfers that fit the definition of recurrent or capital expenditures are still recorded under these two categories. Source: Central Bank of Nigeria (2023).

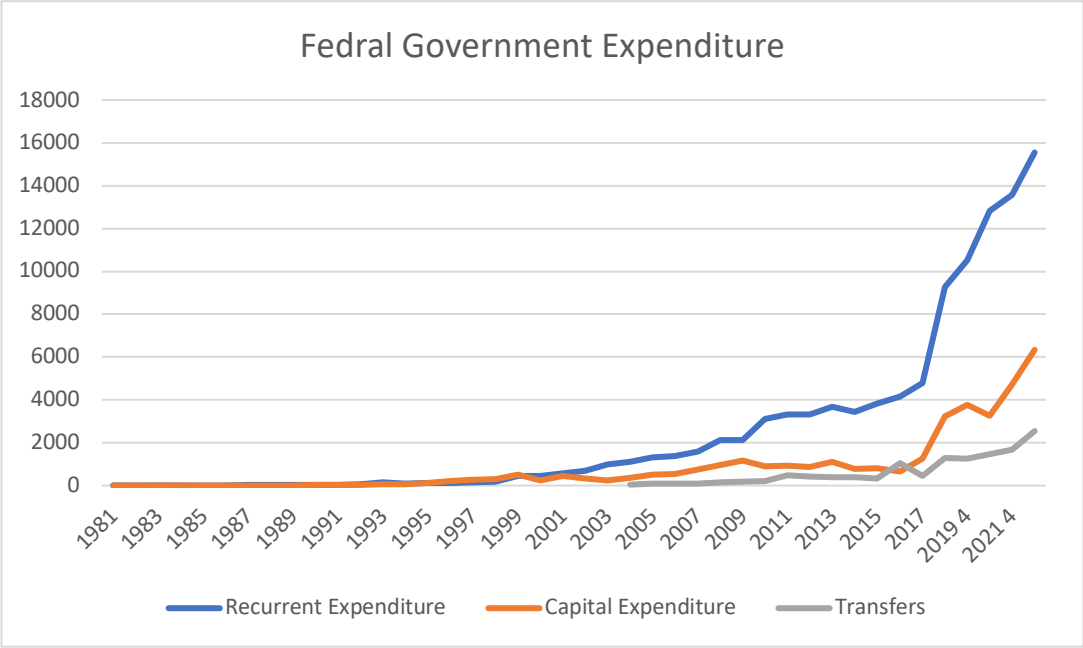

Figure 1: Line graph of the disaggregated federal government expenditure
Source: Central Bank of Nigeria (2023)

From Figure 4.1, it can be seen that the recurrent expenditure is the largest type of government expenditure, followed by capital expenditure, then transfer which started in 2004. In addition, towards the beginning of the 21st century, the recurrent expenditure saw a significant rise compared to the capital expenditure. This means, the government directed a lot of its expenditures toward noncapital expenditures. This burst in the amount of spending on recurrent expenditure happened to be just around the year 2000 and the significant difference between what used to be a hand-in-hand walk between recurrent and capital became obvious from 2003 onwards – and the gap has been ever-growing.

The Nigerian government was consistently stagnant in its capital spending from 2010 to 2017. That is 7 years of no increment in the allocation of expenditure towards capital like, infrastructures, tangible, and intangible assets. It is important to note that these expenditure data are in nominal value. Inflation in Nigeria from 2010 to 2017 averaged around 13%. This means, if we adjust the nominal capital spending for inflation, the

real capital spending decreases on average for 7 consecutive years. For better development and economic growth, this seems detrimental to the well-being of the country.

The recurrent and capital government expenditure in Nigeria can be disaggregated further.

4.2.1 Recurrent Expenditures

The recurrent expenditure is public expenditures that include wages, salaries, operating costs, fixed capital consumption (i.e., depreciation); other transfers, interest payments on debt service, and extra-budgetary items. Central Bank of Nigeria (2023). These recurrent expenditures are annual, and they do not create ownership of new assets.

According to the Central Bank of Nigeria, the recurrent expenditures are disaggregated into four categories: transfers, economic services, social and community services, and administration.

The administration expenditure includes expenditures on national assembly, internal security, defense, and general administration. The economic services expenditure includes expenditures on transport and communication, road and construction, agriculture, and other economic services. Health, education, and other social and community services are the expenditures included in the social and community services category. While the transfers are expenditures on domestic and foreign public debts servicing, pension and gratuities, and others.

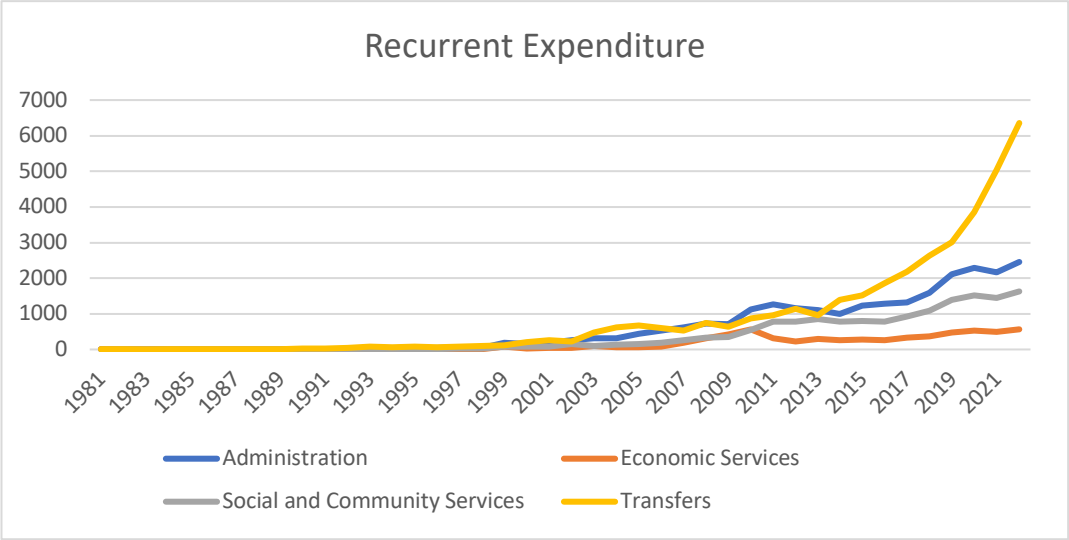

Figure 2: Line graph of the disaggregated government recurrent expenditure
Source: Central Bank of Nigeria (2023)

From Figure 4.2, it can be seen that the bulk of the government's recurrent expenditure is incurred in the form of transfers. In 2022, the total government recurrent expenditure was 11,002.31 (₦' billion), around 22% was for administration, 5% for economic services, 15% for social and community services, and 58% for transfers. The transfer was more than half of the half of the Nigerian government's recurrent expenditure. In addition, 89% of the transfer expenditure is expenditure on public debt servicing. This means about 51% of the federal government's recurrent expenditure went to domestic and foreign debt servicing.

In addition, the economic service component of the recurrent expenditure is the lowest of all at 5% and has been stagnant since 2010. This means that, when adjusted for inflation, there has been close to zero growth in the amount of recurrent expenditure that the government has allocated to agriculture, transport and communication, road and construction, and other economic services.

4.2.2 Capital Expenditure

Government capital expenditure, according to the Central Bank of Nigeria (2023), is the second of three classifications of the Federal Government of Nigeria's expenditure. Capital expenditure is public expenditures that include payments for the acquisition of fixed capital assets, land, stocks, and intangible assets; net lending, other transfers, and capital repayments on debt service. Source: Central Bank of Nigeria (2023). These expenditures are annual, and they do result in the creation or acquisition of fixed assets. However, their return lasts for several years into the future.

On the authority of the Central Bank of Nigeria, the capital expenditures of the federal government are disaggregated into four categories: economic services, social and community services, administration, and transfers.

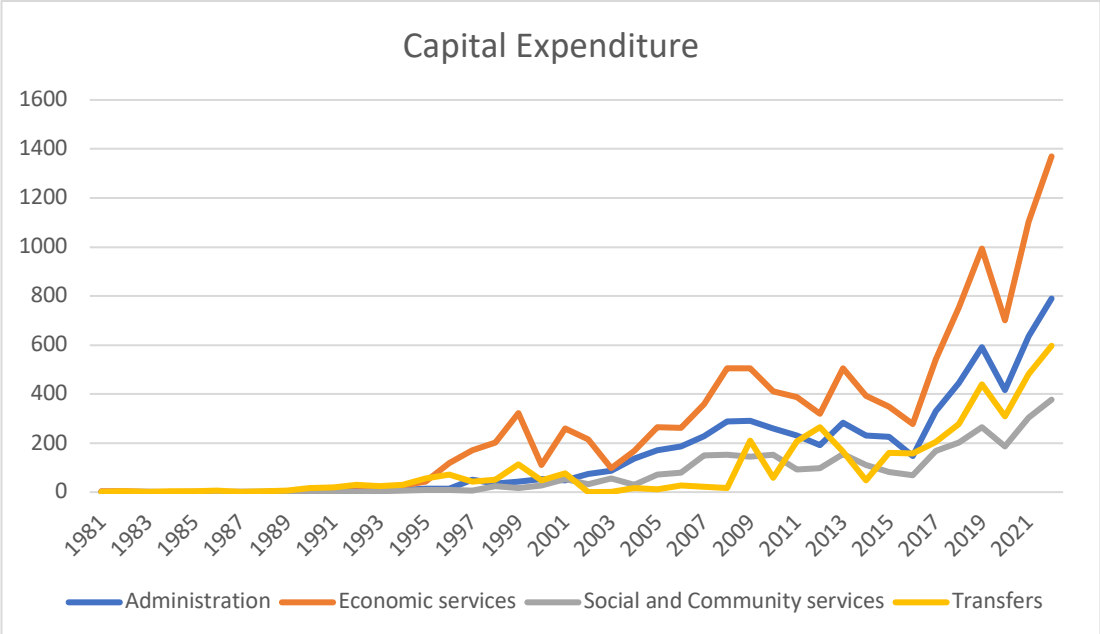

Figure 3: Line graph of the disaggregated federal government capital expenditure
Source: Central Bank of Nigeria (2023)

Economic services is the highest expenditure incurred by the federal government in terms of capital expenditure of the government. The lack of growth in capital expenditure from 2010 to 2017 is also noticeable in this disaggregated breakdown.

4.3 Financing the Government Expenditure

One of the most important concerns about government expenditure is the way the expenditure will be financed. On the authority of the Central Bank of Nigeria (2023), the nation’s federal government finances its expenditure fundamentally through oil revenues and non-oil revenue. However, since 1981, the government has been consistently spending more than they are earning, i.e., always in a position of overall deficit. This deficit had a sudden boom around 1998, in line with the period of increase in recurrent expenditures. This persistent deficit needs financing.

There are two main ways the federal government finances its debt: foreign financing and domestic financing – with domestic being the dominant source. Domestic financing involves the banking system which includes the deposit money banks and central bank; also, privatization proceeds and the non-bank public; other funds include special, trust, and public funds; excess reserve, federal government's contribution to the external creditors' fund, treasury clearance funds, etc.

Chapter 5

DATA AND METHODOLOGY

This research focuses on two fundamental questions. First, the influence of public expenditure on the growth of the economy and inflation rate in Nigeria. Second, the association between the growth of the economy and the inflation rate in Nigeria. This chapter provided the data explanation, model specification, and the methodology used in running the regression that may provide the answer to these questions. The source of the data along with the definition of each variable is important to understanding the models to be regressed. How it will be ensured that the data are free from non-stationarity issues is explained. The approach and arrival of the model specifications; and the methodology, like the ARDL and Granger Causality, applied to help arrive at a meaningful statistical regression are explained.

5.1 Data

The data used in this research were acquired from the Central Bank of Nigeria (2020)(2023) and World Bank Development Indicators (2023). For this study, the data set extends from 1981 to 2022, thus making 42 years of observation. Given the study and data's features, a time series approach will be used in this research analysis.

5.2 The Variables

This research has a total of five variables – the real gross domestic product (RGDP), the government recurrent expenditure (GRE), the government capital expenditure (GCE), the inflation rate (INFL), and the money supply (MS). The focus variables are the first four, which align with the two purposes of this research; first, the influence of

government expenditure on the growth of the economy and inflation rate in Nigeria; second, the relationship between economic growth and rate of inflation in Nigeria. The supply of money variable is introduced as a fiscal policy offsetting or balancing variable.

Thus,

$$RGDP = f(GRE, GCE, INFL, MS) \quad (1)$$

$$INFL = f(GRE, GCE, RGDP, MS) \quad (2)$$

Table 1: Variables and their unit of measure

N	Variable	Name	Unit of Measure
1	Real Gross Domestic Product	RGDP	Annual Naira (₦) Billion
2	Inflation Rate	INFL	Annual Percentage (%)
3	Government Recurrent Expenditure	GRE	Annual Naira (₦) Billion
4	Government Capital Expenditure	GCE	Annual Naira (₦) Billion
5	Money Supply	MS	Annual Naira (₦) Billion

5.2.1 Real Gross Domestic Product (RGDP)

Real Gross Domestic Product is one of the popular and accurate indicators used to measure economic growth, Dornbusch et al. (2018). The real gross domestic product measures – at unchanging base year prices – the total market value of all final goods at services produced within the country in some period. In the case of this study, the real gross domestic product is annual and calculated at a base year price of 2010 less indirect taxes net of subsidies, CBN (2023).

5.2.2 Inflation Rate (INFL)

The rate at which price levels increase is referred to as the inflation rate. However, inflation has become a 'formal' economic terminology for a percentage change of the economy's overall level of price over some time. The price level in an economy usually reflects the position of the aggregate demand that is met by the aggregate supply in the economy. Thus, if supply cannot meet the demand in the economy due to an increase in any of the aggregate demand components, the price level tends to increase, and this is known as demand-pull inflation. If the demand cannot be met by the supply in the economy due to an increase in the cost of production, the price level tends to rise, and this is known as cost-push inflation. The inflation rate is usually a reflector of the standard of living and cost of living, Mankiw & Taylor (2020). Thus, a high inflation rate means maintaining the same standard of living becomes expensive and the unit value of money decreases in purchasing power. The inflation rate can be measured with different approaches like the gross domestic product (GDP) deflator, producer price index (PPI), and consumer price index (CPI). In this research's case, the inflation rate data sourced from the World Bank Development Indicators (2023), was measured by CPI. The CPI's percentage change reflects the cost of acquiring a selected basket of commonly consumed goods over some period. For this case study, the period is annual.

5.2.3 Government Recurrent Expenditure (GRE)

Government recurrent expenditure, according to the Central Bank of Nigeria (2023), is the first of three classifications of the Federal Government of Nigeria's expenditure. The recurrent expenditure is public expenditures that include wages, salaries, operating costs, fixed capital consumption (i.e., depreciation); extra-budgetary items, interest payments on debt service, and other transfers. These expenditures are annual,

and they do not create ownership of new assets The sources of the data collected to arrive at the total annual recurrent expenditure amount are the Central Bank of Nigeria, the Office of the Accountant General of the Federation, and the Federal Ministry of Finance, Central Bank of Nigeria (2023).

5.2.4 Government Capital Expenditure (GCE)

Government capital expenditure, according to the Central Bank of Nigeria (2023), is the second of three classifications of the Federal Government of Nigeria's expenditure. Capital expenditure is public expenditures that include payments for the acquisition of fixed capital assets, land, stocks, and intangible assets; capital repayments on debt service, net lending, and other transfers. These expenditures are annual, and they do result in the creation or acquisition of fixed assets. However, their return lasts for several years into the future. The sources of the data collected to arrive at the total annual capital expenditure amount are the Central Bank of Nigeria, the Office of the Accountant General of the Federation, and the Federal Ministry of Finance, Central Bank of Nigeria (2023).

5.2.5 Money Supply (MS)

Money Supply is the total amount of money that the monetary authority allows to be in circulation over some period. One of the most important indicators that reflects the monetary policy of the authority is the money supply. The monetary authority in Nigeria is the Central Bank of Nigeria (CBN). There are three main different money supply definitions in Nigeria – the M1, M2, and M3. For this research, the M2 definition and data of money supply are used. The M2 is the money supply account for the amount of currency in circulation, savings deposits, demand deposits, other liquid deposits, money market funds, certificates of deposits, and other long-term deposits. The sources of the data collected to arrive at the total annual money supply

are the National Bureau of Statistics and the Central Bank of Nigeria, Central Bank of Nigeria (2023).

5.3 Unit Root Test

The data of the variables and the nature of this empirical paper is a time series. Time series data are prone to a non-stationarity problem, which is a stochastic process with structural breaks or unit roots. Unit root often leads to spuriousness in time series data, especially when the number of observations is very large. There are different methods of checking no unit root problem. In this research, the Augmented Dickey-Fuller Unit Root Test is applied to test that our time series data will not yield spurious interpretation.

5.3.1 Augmented Dickey-Fuller (ADF) Test

The initial unit root test model of Dickey-Fuller for variable Z data, by Dickey & Fuller (1976), presented in random walk with drift about a deterministic trend is shown below.

$$\Delta Z_t = \beta_1 + \beta_2 t + \delta Z_{t-1} + u_t$$

Dickey & Fuller extended their initial Dickey-Fuller Test to create the ADF Test due to consideration that the u_t in the initial approach may suffer from correlation. Thus, the test was augmented with the consideration of the multiple lagged values of the variable. This approach is represented in this form:

$$\Delta Z_t = \beta_1 + \beta_2 t + \delta Z_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta Z_{t-i} + \nu_t$$

$H_0 : \delta = 0$ (i.e., non stationary)

$H_1 : \delta < 0$ (i.e., stationary)

Dickey and Fuller (1976) expressed that following this hypothesis, $H_0 : \delta = 0$, the coefficient Z_{t-1} that is estimated is in line with the τ-*statistic (tau statistic)*, while keeping in mind that the t-test is one-sided due to the alternate hypothesis. Thus, given the chosen lag length and selection criterion, using the estimated t-statistic, the rejection of null hypothesis at a specific level of significance to establish the (level of) stationarity of data.

5.4 Model Specifications

The models of this study can be classified under two main headings. These headings are defined by the dependent variables – first, the real gross domestic product (RGDP); second, the inflation rate (INFL). That is, when RGDP is defined as the regressed variable, all other variables take a position of regressors. Similarly, when INFL is defined as the regressed variable, all other variables take the position of regressors.

First, when the real gross domestic product (RGDP) is the explained or regressed variable, the first set of models in a stochastic form can be expressed in four different models.

$$LRGDP_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \epsilon_t \quad \text{Equation M-1}$$

$$LRGDP_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \beta_3 LMS_t + \epsilon_t \quad \text{Equation M-2}$$

$$LRGDP_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \beta_3 LINFL_t + \epsilon_t \quad \text{Equation M-3}$$

$$LRGDP_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \beta_3 LINFL_t + \beta_4 LMS_t + \epsilon_t \quad \text{Equation M-4}$$

where:

LRGDP is the real gross domestic product expressed in natural log form.

LGRE is the government recurrent expenditure expressed in natural log form.

LGCE is the government capital expenditure expressed in natural log form.

LMS is the money supply expressed in natural log form.

LINFL is the inflation rate expressed in natural log form.

The fundamental framework of these models is the Endogenous Growth theory model which explains that the fundamental growth and performance of an economy is influence by endogenous factors. At the forefront of these endogenous factors that is in line with this research is the government expenditures. That is:

$$Y = f(GRE, GCE)$$

$$Y = A.GRE^{\beta_1}.GCE^{\beta_2}.\varepsilon$$

$$LNY = LN(A) + LN(GRE^{\beta_1}) + LN\left(GCE^{\beta_2}\right) + LN\varepsilon$$

$$LNY = LN(A) + \beta_1 LN(GRE) + LN\beta_1 LN(GCE) + LN\varepsilon$$

Thus, presenting the base model (M-1):

$$LRGDP_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \epsilon_t$$

Equation M-1 can also be viewed from the perspective of the Keynesian view that explains that government expenditures contribute to the aggregate demand, thus affecting output and economic growth. In addition, this equation M-1 is in line with the model used by Akpan (2005), and similar to the model of Attari & Javed (2013).

Equation M-2 is simply the introduction of the money supply (LMS) into equation M-1. This was done following the effective policy view that the fiscal policy needs to be hand-in-hand with the monetary policy to offset any negative effect that may arise from government spending and debt financing.

Equation M-3 is the introduction of the inflation rate (LINFL) into M-1. This was done to capture the economic growth and the inflation rate relationship. This equation M-3 is similar to the model of Atesoglu (1998), Mallik & Chowdhury (2002), Attari & Javed (2013), and Aluthge et al. (2021).

Equation M-4 is the addition of both the inflation rate (LINFL) and the money supply (LMS) to equation M-1.

Second, when the inflation rate (INFL) is the dependent variable, the second set of models in a stochastic form can be expressed in four different models.

$$LINFL_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \epsilon_t \quad \text{Equation M-5}$$

$$LINFL_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \beta_3 LMS_t + \epsilon_t \quad \text{Equation M-6}$$

$$LINFL_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \beta_3 LRGDP_t + \epsilon_t \quad \text{Equation M-7}$$

$$LINFL_t = \beta_0 + \beta_1 LGRE_t + \beta_2 LGCE_t + \beta_3 LRGDP_t + \beta_4 LMS_t + \epsilon_t \quad \text{Equation M-8}$$

where:

LINFL is the inflation rate expressed in natural log form.

LGRE is the government recurrent expenditure expressed in natural log form.

LGCE is the government capital expenditure expressed in natural log form.

LMS is the money supply expressed in natural log form.

LRGDP is the real gross domestic product expressed in natural log form.

Equation M-5 stems from the Keynesian view that government spending has a multiplier effect on the economy, thus, *ceteris paribus*, may always affect the level of aggregate price in the economy. This equation M-5 is in line with the model of Ojarikre et al. (2015) and Lubo & Bigbo (2021).

Equation M-6 is the introduction of the money supply (LMS) into equation M-5. It was done with the perspective that fiscal policy works hand-in-hand with monetary policy to prevent inflation from getting too high or too low. This equation M-6 is in line with the model of Cynthia (2018) and Nnachi et al. (2023).

Equation M-7 is the introduction of real gross domestic product (LRGDP) into equation M-5. This was done with the theoretical knowledge of the AS-AD model, that, *ceteris paribus*, an increase or decrease in the economy's output produced may influence the price level in the economy.

Equation M-8 is the inclusion of both money supply (LMS and real gross domestic product (LRGDP) into equation M-5 since theoretical knowledge states that both influence the overall price level in the economy. This equation M-8 is similar to the model of Akinbobola (2012) and Amassoma et al. (2018).

5.5 Autoregressive Lag Distribution (ARDL), Bounds Test, Error Correction Model (ECM)

The ARDL/Bounds test methodology was the contribution of Pesaran & Shin (1999) and Pesaran et al. (2001). The ARDL model is an example of a dynamic model that includes the depiction of the time path of the dependent variable concerning its previous values. The autoregressive means that new independent variables are created in the form of the lagged values of the regressed variable. Distributed lag means that new explanatory variables are created from the lagged values of the explanatory variables. Given the accommodation of this model for the lags, which can be assigned at different levels for different variables, the ARDL approach is suitable for cointegration testing, estimating the long-term relationships of the variables in the study, and the correction speed of the short-term dynamics towards the level equilibrium in the long-term.

One of the most appreciated features of the ARDL/Bound Test approach is its usefulness for a set of variables that are only level stationary, I(0); a set of variables

that are only first difference stationarity, I(1); or a set of variables that have mixed stationarity features, I(0)s and I(1)s.

The lag and stationarity accommodation of the ARDL method is why this study has chosen the ARDL approach to test for the possibility of a long-term association between the variables, to estimate the variables' long-term coefficients, and the speed of adjustment from the short-run toward the long-term. The Ordinary Least Squares (OLS) method is used to estimate these ARDL models and their related ECM.

5.5.1 ARDL Bounds Test

Once this study tests for the stationarity in the data, the ARDL Bound Test for cointegration that will be carried out can be represented with the following equations.

The ARDL (p, r_1, r_2) model for Bounds Test for Equation M-1 in the stochastic form:

$$\Delta LRGDP_t = \delta_{0i} + \delta_1 LRGDP_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LRGDP_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + v_{1t}$$

The ARDL (p, r_1, r_2, r_3) model for Bounds Test for Equation M-2 in the stochastic form:

$$\Delta LRGDP_t = \delta_{0i} + \delta_1 LRGDP_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \delta_4 LMS_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LRGDP_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + \sum_{t=m}^{k} \alpha_{4i} \Delta LMS_{t-m} + v_{2t}$$

The ARDL (p, r_1, r_2, r_3) model for Bounds Test for Equation M-3 in the stochastic form:

$$\Delta LRGDP_t = \delta_{0i} + \delta_1 LRGDP_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \delta_4 LINFL_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LRGDP_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + \sum_{t=m}^{k} \alpha_{4m} \Delta LINFL_{t-m} + v_{3t}$$

The ARDL (p, r_1, r_2, r_3, r_4) model for Bounds Test for Equation M-4 in the stochastic form:

$$\Delta LRGDP_t = \delta_{0i} + \delta_1 LRGDP_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \delta_4 LINFL_{t-1} + \delta_5 LMS_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LRGDP_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + \sum_{t=m}^{k} \alpha_{4m} \Delta LINFL_{t-m} + \sum_{t=m}^{k} \alpha_{5m} \Delta MS_{t-m} + v_{4t}$$

The ARDL (p, r_1, r_2) model for Bounds Test for Equation M-5 in the stochastic form:

$$\Delta LINFL_t = \delta_{0i} + \delta_1 LINFL_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LINFL_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + v_{5t}$$

The ARDL (p, r_1, r_2, r_3) model for Bounds Test for Equation M-6 in the stochastic form:

$$\Delta LINFL_t = \delta_{0i} + \delta_1 LINFL_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \delta_4 LMS_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LINFL_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + \sum_{t=m}^{k} \alpha_{4m} \Delta LMS_{t-m} + v_{6t}$$

The ARDL (p, r_1, r_2, r_3) model for Bounds Test for Equation M-7 in the stochastic form:

$$\Delta LINFL_t = \delta_{0i} + \delta_1 LINFL_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \delta_4 LRGDP_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LINFL_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + \sum_{t=m}^{k} \alpha_{4m} \Delta LRGDP_{t-m} + v_{7t}$$

The ARDL (p, r_1, r_2, r_3, r_4) model for Bounds Test for Equation M-8 in the stochastic form:

$$\Delta LINFL_t = \delta_{0i} + \delta_1 LINFL_{t-1} + \delta_2 LGRE_{t-1} + \delta_3 LGCE_{t-1} + \delta_4 LRGDP_{t-1} + \delta_5 LMS_{t-1} + \sum_{t=m}^{k} \alpha_{1m} \Delta LINFL_{t-m} + \sum_{t=m}^{k} \alpha_{2m} \Delta LGRE_{t-m} + \sum_{t=m}^{k} \alpha_{3m} \Delta LGCE_{t-m} + \sum_{t=m}^{k} \alpha_{4m} \Delta LRGDP_{t-m} + \sum_{t=m}^{k} \alpha_{5m} \Delta MS_{t-m} + v_{8t}$$

In all the stated equations for the Bounds Test for cointegration, the k's in each respective equation represent the maximum lag order selected for the variables corresponding to the model's p and r order, respectively. The coefficients represented with " α " represent model's short-term dynamics. The coefficients represented with " δ " correspond with the specification of the long-term association in the model. Thus, for there to be an overall long-run relationship in each respective specified model, the Wald restriction test (F-statistics test) is examined with the joint null hypothesis that the coefficients " δ " of the lagged variables are different from zero. That is:

$H_0 : \delta_1 = \delta_2 = \cdots = \delta_n = 0$ (Null, i.e., a long-term association does not exist.)

$H_1 : \delta_1 \neq \delta_2 \neq \cdots \neq \delta_n \neq 0$ (Alternate, i.e., a long-term association does exist.)

Given the model's specified lags and the chosen criterion, at a specific level of significance, Pearson et al. (2001) provided two different asymptotic critical values referred to as the upper critical bound and the lower critical bound. The upper critical bound assumes that the variables are I(1); while in stationarity lower critical bound assumes that the variables are I(0) in stationarity. Hence the name 'Bounds Test' for multiple levels of significance.

At a specified level of significance, the null hypothesis is rejected if the F-statistic of the model is greater than the upper critical bounds value; the null hypothesis is not rejected if the F-statistic of the model is less than the lower critical bounds value. However, if the F-statistics value resides between the two critical bounds, the decision of if the null will be rejected or not will be determined by the stationarity of the variables – the reject the null if variables are all I(0); do not reject the null if the variables are all I(1); however, if the model consists of I(0) and I(1), then a decision is indeterminate with regards to long-run relationship.

5.5.2 ARDL Long-Run Coefficient Estimation

Once the Wald restriction test (F-statistics test) ascertains a long-term association in each respective model, we will move forward to determining the estimated long-term coefficients of the dependent variables of each respective model. The ARDL Long-Term Estimation of the Coefficients of each model can be represented with the following equations. The ARDL (p, r_1, r_2, … , r_n) model for Long-term Estimation of the respective model in the stochastic form.

Model 1 (M-1):

$$\Delta LRGDP_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LRGDP_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + v_{1t}$$

Model 2 (M-2):

$$\Delta LRGDP_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LRGDP_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + \sum_{t=i}^{k} \delta_{4i} LMS_{t-i} + v_{2t}$$

Model 3 (M-3):

$$\Delta LRGDP_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LRGDP_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + \sum_{t=i}^{k} \delta_{4i} LINFL_{t-i} + v_{3t}$$

Model 4 (M-4):

$$\Delta LRGDP_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LRGDP_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + \sum_{t=i}^{k} \delta_{4i} LINFL_{t-i} + \sum_{t=i}^{k} \delta_{5i} MS_{t-i} + v_{4t}$$

Model 5 (M-5):

$$\Delta LINFL_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LINFL_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + v_{5t}$$

Model 6 (M-6):

$$\Delta LINFL_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LINFL_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + \sum_{t=i}^{k} \delta_{4i} LMS_{t-i} + v_{6t}$$

Model 7 (M-7):

$$\Delta LINFL_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LINFL_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + \sum_{t=i}^{k} \delta_{4i} LRGDP_{t-i} + v_{7t}$$

Model 8 (M-8):

$$\Delta LINFL_t = \delta_0 + \sum_{t=i}^{k} \delta_{1i} LINFL_{t-i} + \sum_{t=i}^{k} \delta_{2i} LGRE_{t-i} + \sum_{t=i}^{k} \delta_{3i} LGCE_{t-i} + \sum_{t=i}^{k} \delta_{4i} LRGDP_{t-i} + \sum_{t=i}^{k} \delta_{5i} MS_{t-i} + v_{8t}$$

In all the stated equations for the Long-Run Coefficient Estimation models, the *k*'s in each respective equation represent the maximum lag order selected for the variables corresponding to the model's *p* and *r* order, respectively. The coefficients represented with " δ " represent the long-term coefficients of the model. Thus, to determine if there is a long-term association between each respective independent variable with the respective dependent variable in each respective model, the t-statistic test is carried

out with the individual null hypothesis that the independent variable estimated coefficient " δ_{ni} " is different from zero. That is:

$$H_0 : \delta_{ni} = 0$$

$$H_1 : \delta_{ni} \neq 0$$

At a specific level of significance, the rejection of the null hypothesis means the presence of a long-term association between the independent variable and the dependent variable within the respective model.

5.5.3 ARDL Error Correction Model

Once the Wald restriction test (F-statistics test) establishes that there is a long-run relationship in each respective model, we can also move forward with the representation of the ARDL error adjustment representation. The representation is known as the ECM. The Error Correction Model shows the adjustment and correction speed of the model's short-run dynamics towards the model's long-run equilibrium. A positive error correction coefficient indicates a divergence away from equilibrium, while a negative error correction indicates a convergence towards equilibrium. When the coefficient is represented in percentage, it represents the speed; the coefficient to -1, i.e., 100%, the instantaneous and full the model's adjustment is towards the equilibrium state. The ECM can be said to be a reflection that confirms the presence of a long-term association in the variables, Nkoro & Uko (2016).

The ECM is captured in the estimation of the short-term dynamics of each model when equilibrium long-term exists. The following equations represent the ARDL approach to estimating the short-run dynamics that capture the ECM for each model. The ARDL ($p, r_1, r_2, \dots, r_n$) model for Short-term Dynamics of the respective model in the stochastic form.

Model 1 (M-1):

$$\Delta LRGDP_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LRGDP_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \theta_1 ECM + \upsilon_{1t}$$

Model 2 (M-2):

$$\Delta LRGDP_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LRGDP_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \sum_{t=i}^{k} \alpha_{5i} \Delta MS_{t-i} + \theta_2 ECM + \upsilon_{2t}$$

Model 3 (M-3):

$$\Delta LRGDP_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LRGDP_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \sum_{t=i}^{k} \alpha_{4i} \Delta LINFL_{t-i} + \theta_3 ECM + \upsilon_{3t}$$

Model 4 (M-4):

$$\Delta LRGDP_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LRGDP_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \sum_{t=i}^{k} \alpha_{4i} \Delta LINFL_{t-i} + \sum_{t=i}^{k} \alpha_{5i} \Delta MS_{t-i} + \theta_4 ECM + \upsilon_{4t}$$

Model 5 (M-5):

$$\Delta LINFL_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LINFL_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \theta_5 ECM + \upsilon_{5t}$$

Model 6 (M-6):

$$\Delta LINFL_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LINFL_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \sum_{t=i}^{k} \alpha_{5i} \Delta MS_{t-i} + \theta_6 ECM + \upsilon_{6t}$$

Model 7 (M-7):

$$\Delta LINFL_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LINFL_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \sum_{t=i}^{k} \alpha_{4i} \Delta LRGDP_{t-i} + \theta_7 ECM + \upsilon_{7t}$$

Model 8 (M-8):

$$\Delta LINFL_t = \alpha_0 + \sum_{t=i}^{k} \alpha_{1i} \Delta LINFL_{t-i} + \sum_{t=i}^{k} \alpha_{2i} \Delta LGRE_{t-i} + \sum_{t=i}^{k} \alpha_{3i} \Delta LGCE_{t-i} + \sum_{t=i}^{k} \alpha_{4i} \Delta LRGDP_{t-i} + \sum_{t=i}^{k} \alpha_{5i} \Delta MS_{t-i} + \theta_8 ECM + \upsilon_{8t}$$

In all the stated equations for the Short-Run Dynamic models, the *k*'s in each respective equation represent the maximum lag order selected for the variables that correspond with the model's *p* and *4* order, respectively. The coefficients represented with " α " represent respective model's short-term coefficients. The " θ " is the coefficient of the ECM, i.e., the " θ " represents the adjustment speed in each respective model.

5.6 Granger Causality Test

The famous well-known dictum, "correlation does not mean causality", is always at the heart of every statistician and economist when they are trying to establish if one variable does or does not affect another variable. If we have regressed a explained

variable on a set of explanatory variables, and the estimated results were statistically significant, it does not necessarily mean that the independent variables cause the dependent variable. The Granger Causality Test, developed by Granger (1969), is a test designed to estimate if one variable helps forecast another variable. However, the test does not prove causality with firm conviction. Rather it is a prediction or forecast with the hope that it partly entails the 'real' directional causality, Sorensen (2005). As a result of the Granger Causality Test at a specified number of lags, two variables may have bidirectional causality, or unidirectional causality, or no directional causality.

It is important to the question of 'Granger cause' that the two variables we are testing are stationary at first difference I(1) or level I(0), i.e., no problem of unit root, and that there is cointegration in the model or equation they are part of. If these two conditions are not met, then the question of 'Granger cause' is pointless and its result will be ambiguous in interpretation, Gujarati & Porter (2009).

In this research, we would like to know the causality direction between the variables. That is, which variables are responsible for 'causing' another variable? After establishing the stationarity of the data and cointegration in the variables, the Granger Causality Test carried out in this study can be wholly represented with these equations in stochastic form.

$$LRGDP_t = \sum_{i=1}^{n} \alpha_i \, LGRE_{t-i} + \sum_{j=1}^{n} \beta_j \, LGCE_{t-j} + \sum_{k=1}^{n} \gamma_k \, LINFL_{t-k} + \sum_{l=1}^{n} \delta_l \, LMS_{t-l} + \sum_{m=1}^{n} \varepsilon_i \, LRGDP_{t-m} + \nu_t$$

$$LGRE_t = \sum_{i=1}^{n} \epsilon_i \, LRGDP_{t-i} + \sum_{j=1}^{n} \zeta_j \, LGCE_{t-j} + \sum_{k=1}^{n} \eta_k \, LINFL_{t-k} + \sum_{l=1}^{n} \theta_l \, LMS_{t-l} + \sum_{m=1}^{n} \iota_i \, LGRE_{t-m} + \nu_t$$

$$LGCE_t = \sum_{i=1}^{n} \kappa_i \, LGRE_{t-i} + \sum_{j=1}^{n} \lambda_j \, LRGDP_{t-j} + \sum_{k=1}^{n} \mu_k \, LINFL_{t-k} + \sum_{l=1}^{n} \xi_l \, LMS_{t-l} + \sum_{m=1}^{n} o_i \, LGCE_{t-m} + \chi_t$$

$$LINFL_t = \sum_{i=1}^{n} \pi_i \, LGRE_{t-i} + \sum_{j=1}^{n} \varpi_j \, LGCE_{t-j} + \sum_{k=1}^{n} \rho_k \, LRGDP_{t-k} + \sum_{l=1}^{n} \varrho \, LMS_{t-l} + \sum_{m=1}^{n} \sigma_i \, LINFL_{t-m} + \psi_t$$

$$LMS_t = \sum_{i=1}^{n} \varsigma_i \, LGRE_{t-i} + \sum_{j=1}^{n} \tau_j \, LGCE_{t-j} + \sum_{k=1}^{n} \upsilon_k \, LINFL_{t-k} + \sum_{l=1}^{n} \varphi_l \, LRGDP_{t-l} + \sum_{m=1}^{n} \phi_i \, LMS_{t-m} + \omega_t$$

The statistical significance of any of the coefficients of the independent variables, at a specified number of lags, ‘does not Granger cause’ represents the rejection of the null hypothesis. This means, we can attest to the causality and the direction of the Granger cause from that independent variable to the respective dependent variable.

Chapter 6

EMPIRICAL RESULTS

6.1 Descriptive Statistics

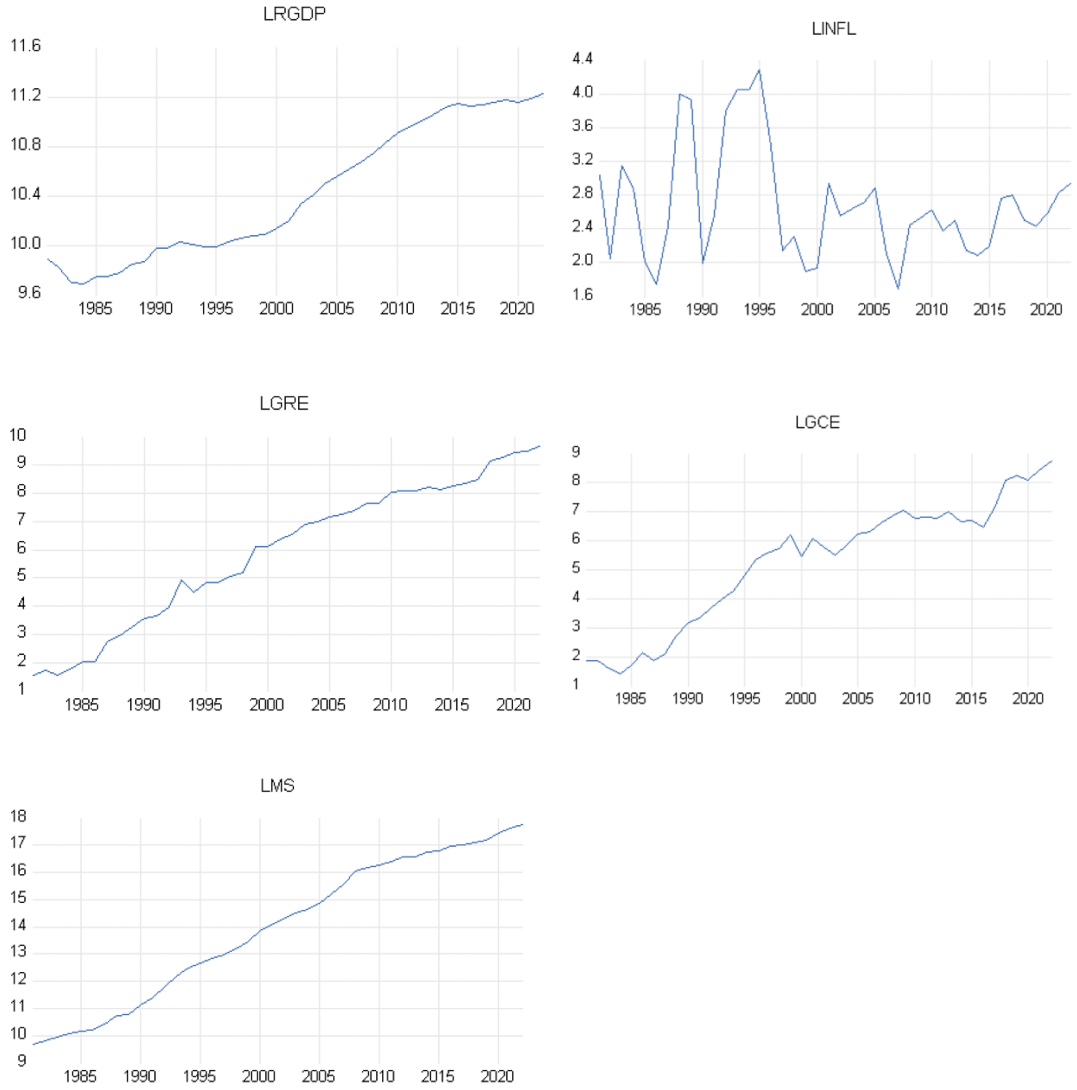

Figure 4: Line graphs of all study variables

Table 2: Descriptive statistics results

	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**JB**	**JB *p-value***
LRGDP	10.41710	11.22042	9.683359	0.542014	4.497432	0.105535
LINFL	2.686616	4.288204	1.684176	0.668722	5.211775	0.073838
LGRE	5.929525	9.652044	1.568616	2.553384	3.166997	0.205256
LGCE	5.267138	8.753937	1.410987	2.173740	3.121352	0.209994
LMS	13.94130	17.76216	9.690400	2.669968	3.597064	0.165542

Expressed in logarithmic form, the money supply (LMS) variable has the highest mean value, then followed by real gross domestic product (LRGDP). The mean values of the government expenditures (LGRE and LGCE) are close.

At a 5% critical value, using the probability values of the Jarque-Bera Test, the variables follow a normal distribution.

Table 3: Correlation coefficients results

	LRGDP	LINFL	LGRE	LGCE	LMS
LRGDP	1.0000				
LINFL	–0.2528	1.0000			
LGRE	0.94753	–0.2105	1.0000		
LGCE	0.8987	–0.2210	0.9783	1.0000	
LMS	0.9700	–0.2364	0.9921	0.9670	1.0000

The result shows that there is a high level of correlation between government expenditures (GRE and GCE) and the real gross domestic product (RGDP). However, government expenditures have a low level of correlation with the inflation rate (INFL).

Furthermore, there is a high level of correlation between government expenditures and the money supply (MS). And the money supply highly correlates with the gross domestic product. However, there is a low level of correlation between the rate of inflation and money supply.

Finally, there is a low level of correlation between the inflation rate and the real gross domestic product. All variables are negatively correlated with the inflation rate.

6.2 Unit Root Test

This Unit Root Test was conducted with the Augmented Dickey-Fuller (ADF) method. The test results are presented in MacKinnon's (1996) one-sided *p-values of the t-statistics*. The p-values represent the minimum level of significance required to reject the null hypothesis that states the presence of unit root.

Table 4: ADF unit root test, results in p-values

VARIABLES	**Level – I(0)**		Rem arks	**First Difference – I(1)**		Rem arks
	Intercept	Trend and Intercept		Intercept	Trend and Intercept	
RGDP	0.9881	0.4471	NS	0.0199**	0.0441**	S
INFL	0.0385**	0.0121**	S	0.0000*	0.0000*	S
GCE	1.0000	1.0000	NS	0.9921	0.9689	NS
GRE	0.9998	1.0000	NS	1.0000	1.0000	NS
MS	1.0000	1.0000	NS	0.9982	0.4128	NS

Significant, thus, rejecting the null hypothesis of unit root presence at *1%, **5%, ***10%.

Only the variables RGDP and INFL are stationary at least at the first difference I(1) and at least a 5% level of significance. All other variables have a presence of unit root at the level and first difference.

Table 5: ADF unit root test, results in p-values

VARIABLES (Natural Log)	**Level – I(0)**		Remarks	**First Difference – I(1)**		Remarks
	Intercept	Trend and Intercept		Intercept	Trend and Intercept	
LRGDP	0.7775	0.5996	NS	0.0032*	0.0201**	S
LINFL	0.0120**	0.0049*	S	0.0000*	0.0000*	S
LGCE	0.8964	0.7036	NS	0.0000*	0.0001*	S
LGRE	0.6612	0.6749	NS	0.0000*	0.0000*	S
LMS	0.7131	0.9304	NS	0.0023*	0.0091*	S

Significant, thus, rejecting the null hypothesis of unit root presence at *1%, **5%, ***10%.

Once all variables are expressed in natural logarithm form, the issue of unit root ceases to exist. All variables are I(1), except for the Natural Log of Inflation which is I(0), thus we can confidently proceed to conduct the ARDL methodology for our models. Further analyses will be done with all variables in natural logarithm form. That is, the analysis will be done as stated in equations M-1, M-2, M-3, M-4, M-5, M-6, M-7, and M-8 – as expressed under Chapter 5, section 5.5.

6.3 Cointegration

The purpose of cointegration is to establish whether there is a long-run relationship between the variables or no long-run relationship. To determine this, the ARDL Bounds Testing approach is applied with the null hypothesis stating: no levels relationship.

ARDL Bounds Testing of Equation M-1:

Table 6: Bound test result for equation M-1 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.63	3.35
5%	3.1	3.87
1%	4.13	5.00
	F-statistics = 14.39335	

Since the F-statistics is greater than the critical value for all upper critical bounds I(1) across all levels of significance, we can conclude that there is co-integration and we reject the null. That is there exists a long-term association between the variables in the equation M-1.

ARDL Bounds Testing of Equation M-2:

Table 6: Bound test result for equation M-2 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.37	3.20
5%	2.79	3.67
1%	3.65	4.66
	F-statistics = 12.99661	

Since the F-statistics is greater than the critical value for all upper critical bounds I(1) across all levels of significance, we can conclude that there is co-integration and we reject the null. That is there exists a long-term association between the variables in the equation M-2.

ARDL Bounds Testing of Equation M-3:

Table 7: Bound test result for equation M-3 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.37	3.20
5%	2.79	3.67
1%	3.65	4.66
	F-statistics = 13.73029	

Since the F-statistics is greater than the critical value for all upper critical bounds I(1) across all levels of significance, we can conclude that there is co-integration and we reject the null. That is, there exists a long-term association between the variables in the equation M-3.

ARDL Bounds Testing of Equation M-4:

Table 8: Bound test result for equation M-4 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.20	3.09
5%	2.56	3.49
1%	3.29	4.37
	F-statistics = 13.29256	

Since the F-statistics is greater than the critical value for all upper critical bounds I(1) across all levels of significance, we can conclude that there is co-integration and we reject the null. That is, there exists a long-term association between the variables in the equation M-4.

ARDL Bounds Testing of Equation M-5:

Table 9: Bound test result for equation M-5 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.63	3.35
5%	3.1	3.87
1%	4.13	5
	F-statistics = 3.62722	

The F-statistics is greater than the critical value for upper critical bounds I(1) at least at a 10% level of significance. We can conclude that there is co-integration and we reject the null. That is, there exists a long-term association between the variables in the equation M-5.

ARDL Bounds Testing of Equation M-6:

Table 10: Bound test result for equation M-6 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.37	3.20
5%	2.79	3.67
1%	3.65	4.66
	F-statistics = 3.026422	

The F-statistics is less than the critical value for all upper critical bounds I(1) across all level of significance. We can conclude that there is no co-integration and we fail to reject the null. That is, there exists a long-term association between the variables in the equation M-6.

ARDL Bounds Testing of Equation M-7:

Table 11: Bound test result for equation M-7 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.37	3.20
5%	2.79	3.67
1%	3.65	4.66
	F-statistics = 4.576317	

The F-statistics is greater than the critical value for upper critical bounds I(1) at least at a 5% level of significance. We can conclude that there is co-integration and we reject the null. That is, there exists a long-term association between the variables in the equation M-7.

ARDL Bounds Testing of Equation M-8:

Table 12: Bound test result for equation M-8 at lag 1 and schwarz criterion

Level of Significance	**Lower Bound - I(0)**	**Upper Bound - I(1)**
10%	2.20	3.09
5%	2.56	3.49
1%	3.29	4.37
	F-statistics = 4.584638	

Since the F-statistics is greater than the critical value for all upper critical bounds I(1) across all levels of significance, we can conclude that there is co-integration and we reject the null. That is, there exists a long-term association between the variables in the equation M-8.

Summary and Comparison:

Table 13: Summary of ARDL bounds test result for all models

	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8
F-statistics	14.4*	13.0*	13.7*	13.3*	3.6***	4.6	4.6**	4.6*

Significant, thus, rejecting the null hypothesis of no cointegration at *1%, **5%, ***10%.

We can conclude that, at least at a 10% level of significance, except for Model-6, there is cointegration in all models. Hence, we move to see the estimated short-term dynamics coefficients and the long-term association coefficients in all models, except Model-6.

6.4 The Short-Run Dynamics

The short-run dynamics with the use of the ARDL approach will capture the Error Correction Model (ECM) that will provide the speed of adjustment of each model towards long-run equilibrium after a shock in the short term.

ARDL Short-Run Dynamics of Equation M-1:

Table 14: The estimated short-run dynamics and ECM result of equation M-1

Variable	Coefficient	t-Statistics	p-Value
C	1.415260	4.340793	0.0001*
LGRE	0.064463	3.923166	0.0004*
LGCE	–0.032910	–2.309031	0.0266**
CointEq(-1)	–0.153462	–4.351057	0.0001*

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 15.35%.

ARDL Short-Run Dynamics of Equation M-2:

Table 15: The estimated short-run dynamics and ECM result of equation M-2

Variable	Coefficient	t-Statistics	p-Value
C	1.720416	4.844785	0.0000*
LGRE	0.034376	1.520812	0.1370
LGCE	–0.040115	–2.801445	0.0081*
LMS	0.049019	1.872873	0.0692***
CointEq(-1)	–0.227853	–4.351052	0.0001*

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 22.79%.

ARDL Short-Run Dynamics of Equation M-3:

Table 16: The estimated short-run dynamics and ECM result of equation M-3

Variable	Coefficient	t-Statistics	p-Value
C	1.601047	4.987548	0.0000*
LGRE	0.070021	4.426387	0.0001*
LGCE	–0.037432	–2.732088	0.0097*
LINFL	–0.019106	–2.223248	0.0326*
CointEq(-1)	–0.167309	–4.906082	0.0000*

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 16.73%.

ARDL Short-Run Dynamics of Equation M-4:

Table 17: The estimated short-run dynamics and ECM result of equation M-4

Variable	Coefficient	t-Statistics	p-Value
C	2.062138	6.045922	0.0000*
LGRE	0.045305	2.151525	0.0386**
LGCE (-1)	–0.060369	–4.006717	0.0003*
D(LGCE)	–0.017182	–1.005075	0.3220
LINFL	–0.022834	–2.702389	0.0107**
LMS	0.061340	2.389212	0.0226**
CointEq(-1)	–0.268100	–5.294967	0.0000*

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 26.81%.

ARDL Short-Run Dynamics of Equation M-5:

Table 18: The estimated short-run dynamics and ECM result of equation M-5

Variable	Coefficient	t-Statistics	p-Value
C	1.439166	2.918628	0.0060*
LGRE	0.206965	1.150423	0.2574
LGCE	–0.270849	–1.303402	0.2005
CointEq(-1)	–0.463295	–3.231982	0.0026*

Significant, thus, rejecting the null hypothesis of no relationship between LINFL and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 46.33%. However, other independent variables are statistically insignificant.

ARDL Short-Run Dynamics of Equation M-7:

Table 19: The estimated short-run dynamics and ECM result of equation M-7

Variable	Coefficient	t-Statistics	p-Value
C	14.97338	2.509859	0.0169**
LGRE	0.775733	2.692303	0.0108**
LGCE	–0.556028	–2.460683	0.0189**
LRGDP(-1)	–1.460762	–2.281183	0.0287**
D(LRGDP)	–6.174233	–2.554529	0.0151**
CointEq(-1)	–0.482549	–3.586704	0.0010*

Significant, thus, rejecting the null hypothesis of no relationship between LINFL and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 48.25%.

ARDL Short-Run Dynamics of Equation M-8:

Table 20: The estimated short-run dynamics and ECM result of equation M-8

Variable	Coefficient	t-Statistics	p-Value
C	21.50852	2.990449	0.0052*
LGRE	0.688432	1.982604	0.0558***
LGCE(-1)	–0.849668	–3.125129	0.0037*
D(LGCE)	–0.262592	–0.869910	0.3906
LRGDP(-1)	–2.614975	–2.500056	0.0176**
D(LRGDP)	–7.684602	–3.024940	0.0048*
LMS	0.546654	1.206658	0.2361
CointEq(-1)	–0.543405	–3.811389	0.0006*

Significant, thus, rejecting the null hypothesis of no relationship between LINFL and the independent variable at *1%, **5%, ***10%.

The error correction estimate is negative and significant at a 1% level of significance. This means the model corrects and adjusts towards the long-run equilibrium at a speed of 54.34%.

Summary and Comparison:

Table 21: Summary of the coefficients of the ECM

	M-1	**M-2**	**M-3**	**M-4**
Speed of Adjustment	15.35%	22.79%	16.73%	26.81%

Based on these results, it can be said that the models with money supply (LMS) have a faster speed of adjustment when compared to the models without money supply variables.

Table 22: Summary of the coefficients of the ECM

	M-5	**M-6**	**M-7**	**M-8**
Speed of Adjustment	46.33%	--	48.25%	54.34%

6.5 The Level Long-Run Relationship

The long-run relationship between the different variables based on the model equation will be estimated with the ARDL method. The ARDL long-run form shows the estimated long-run relationship between the dependent variable and the independent variables.

ARDL Level Long Run Form of Equation M-1:

Table 23: The estimated long-run form result of equation M-1

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	9.222209	89.45245	0.0000*
LGRE	0.420059	5.660410	0.0000*
LGCE	–0.214447	–2.529823	0.0158**

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 0.42% increase in real gross domestic production (RGDP) on average. This estimated coefficient of LGRE is statistically significant at a 1% level of significance and the estimated result is in line with the *a priori* expectation of a positive relationship between LGRE and RGDP.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 0.21% decrease in real gross domestic production (RGDP) on average. This estimated coefficient of LGCE is statistically significant at a 5% level of significance. However, this estimated result goes against the *a priori* expectation of a positive relationship between GCE and RGDP.

ARDL Level Long Run Form of Equation M-2:

Table 24: The estimated long-run form result of equation M-2

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	7.550544	11.52210	0.0000*
LGRE	0.150869	1.353689	0.1843
LGCE	–0.176055	–3.111711	0.0036*
LMS	0.215135	2.566948	0.0146**

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 0.15% increase in real gross domestic production (RGDP) on average. However, this estimated coefficient of LGRE is not statistically significant.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 0.18% decrease in real gross domestic production (RGDP) on average. This estimated coefficient of LGCE is statistically significant at a 1% level of significance. However, this estimated result goes against the *a priori* expectation of a positive relationship between GCE and RGDP.

In the long run, *ceteris paribus*, a 1% increase in money supply (MS) is expected to lead to a 0.22% increase in real gross domestic production (RGDP) on average. This estimated coefficient of LMS is statistically significant at a 5% level of significance and the estimated result is in line with the *a priori* expectation of a positive relationship between LMS and RGDP.

ARDL Level Long Run Form of Equation M-3:

Table 25: The estimated long-run form result of equation M-3

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	9.569387	52.57184	0.0000*
LGRE	0.418512	6.474630	0.0000*
LGCE	–0.223727	–3.012938	0.0047*
LINFL	–0.114193	–2.180254	0.0359**

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 0.42% increase in real gross domestic production (RGDP) on average. This estimated coefficient of LGRE is statistically significant at a 1% level of significance and the estimated result is in line with the *a priori* expectation of a positive relationship between LGRE and RGDP.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 0.22% decrease in real gross domestic production (RGDP) on average. This estimated coefficient of LGCE is statistically significant at a 1% level of significance. However, this estimated result goes against the *a priori* expectation of a positive relationship between GCE and RGDP.

In the long run, *ceteris paribus*, a 1% increase in the inflation rate (INFL) is expected to lead to a 0.11% decrease in real gross domestic production (RGDP) on average. This estimated coefficient of LINFL is statistically significant at a 1% level of significance.

ARDL Level Long Run Form of Equation M-4:

Table 26: The estimated long-run form result of equation M-4

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	7.691677	13.44048	0.0000*
LGRE	0.168985	1.879973	0.0687***
LGCE	–0.225172	–4.666608	0.0000*
LINFL	–0.085171	–2.511491	0.0169**
LMS	0.228796	3.376924	0.0018*

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 0.17% increase in real gross domestic production (RGDP) on average. This estimated coefficient of LGRE is statistically significant at a 10% level of significance and the estimated result is in line with the *a priori* expectation of a positive relationship between LGRE and RGDP.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 0.23% decrease in real gross domestic production (RGDP) on average. This estimated coefficient of LGCE is statistically significant at a 1% level of significance. However, this estimated result goes against the *a priori* expectation of a positive relationship between GCE and RGDP.

In the long run, *ceteris paribus*, a 1% increase in the inflation rate (INFL) is expected to lead to a 0.09% decrease in real gross domestic production (RGDP) on average. This estimated coefficient of LINFL is statistically significant at a 5% level of significance.

In the long run, *ceteris paribus*, a 1% increase in money supply (MS) is expected to lead to a 0.23% increase in real gross domestic production (RGDP) on average. This estimated coefficient of LMS is statistically significant at a 1% level of significance and the estimated result is in line with the *a priori* expectation of a positive relationship between LMS and RGDP.

ARDL Level Long Run Form of Equation M-5:

Table 27: The estimated long-run form result of equation M-5

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	3.106370	5.758222	0.0000*
LGRE	0.446724	1.008326	0.3198
LGCE	–0.584615	–1.131739	0.2650

Significant, thus, rejecting the null hypothesis of no relationship between LINFL and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 0.45% increase in the inflation rate (INFL) on average. However, this estimated coefficient of LGRE is not statistically significant.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 0.58% decrease in the inflation rate (INFL) on average. However, this estimated coefficient of LGCE is not statistically significant.

ARDL Level Long Run Form of Equation M-7:

Table 28: The estimated long-run form result of equation M-7

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	31.02976	2.232085	0.0321**
LGRE	1.607573	2.084338	0.0445**
LGCE	–1.152273	–1.917654	0.0633***
LRGDP	–3.027179	–2.013312	0.0518***

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 1.61% increase in the inflation rate (INFL) on average. This estimated coefficient of LGRE is statistically significant at a 5% level of significance.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 1.15% decrease in the inflation rate (INFL) on average. This estimated coefficient of LGCE is statistically significant at a 10% level of significance.

In the long run, *ceteris paribus*, a 1% increase in the real gross domestic product (RGDP) is expected to lead to a 3.03% decrease in the inflation rate (INFL) on average. This estimated coefficient of LRGDP is statistically significant at a 10% level of significance.

ARDL Level Long Run Form of Equation M-8:

Table 29: The estimated long-run form result of equation M-8

Variable	**Coefficient**	**t-Statistics**	**p-Value**
C	39.58097	2.478124	0.0185**
LGRE	1.266884	1.842082	0.0745***
LGCE	–1.563599	–2.368468	0.0239**
LRGDP	–4.812199	–2.078317	0.0455**
LMS	1.005978	1.111390	0.2744

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, ***10%.

In the long run, *ceteris paribus*, a 1% increase in government recurrent expenditure (GRE) is expected to lead to a 1.27% increase in the inflation rate (INFL) on average. This estimated coefficient of LGRE is statistically significant at a 10% level of significance.

In the long run, *ceteris paribus*, a 1% increase in government capital expenditure (GCE) is expected to lead to a 1.56% decrease in the inflation rate (INFL) on average. This estimated coefficient of LGCE is statistically significant at a 5% level of significance.

In the long run, *ceteris paribus*, a 1% increase in the real gross domestic product (RGDP) is expected to lead to a 4.81% decrease in the inflation rate (INFL) on average.

This estimated coefficient of LRGDP is statistically significant at a 5% level of significance.

In the long run, *ceteris paribus*, a 1% increase in money supply (MS) is expected to lead to a 1.01% increase in the inflation rate (INFL) on average. However, this estimated coefficient of LMS is not statistically significant.

Summary and Comparison:

Table 30: Long-run relationship with LRGDP as the dependent variable

MODEL	**C**	**LGRE**	**LGCE**	**LINFL**	**LMS**
M-1	9.22*	0.42*	–0.21**		
M-2	7.55*	0.15	–0.18*		0.22**
M-3	9.57*	0.42*	–0.22*	–0.11**	
M-4	7.69*	0.17***	–0.23*	–0.09**	0.23*

Table 31: Long-run relationship with LINFL as the dependent variable

MODEL	**C**	**LGRE**	**LGCE**	**LRGDP**	**LMS**
M-5	3.11*	0.45	–0.58		
M-6	-	-	-		-
M-7	31.03**	1.16**	–1.15***	–3.03***	
M-8	39.58**	1.27***	–1.56**	–4.81**	1.01

Significant, thus, rejecting the null hypothesis of no relationship between LRGDP and the independent variable at *1%, **5%, and ***10%.

From 1981 to 2022 in Nigeria, the following conclusions can be deducted from the regression results:

First, we notice a positive long-run relationship between government recurring expenditure (GRE) and real domestic product (RGDP); and a negative long-run relationship between government capital expenditure (GCE) and real domestic product (RGDP). This result is in line with the study conducted by Akpan's (2005) study of Nigeria from 1970 to 2001 and Okonye et al. (2018) study of Nigeria from 1990 to 2015.

Second, we notice a positive long-run relationship between government recurring expenditure (GRE) and inflation rate (INFL); and a negative long-run relationship between government capital expenditure (GCE) and inflation rate (INFL). The negative relationship between government capital expenditure and the inflation rate is also present in the short-run of this study, which is in line with the short-run study done by Cynthia (2018).

Third, overall, we can say that there is a negative long-run relationship between the inflation rate (INFL) and real gross domestic product (RGDP). This result is in line with the study conducted by Adaramola & Dada (2020).

Fourth, there is a positive relationship between the money supply (MS) and real domestic product (RGDP). This result is in line with the study conducted by Marshal (2016) and Adaramola & Dada (2020). In addition, the addition of money supply into model 1 to get model 2 and into model 3 to get model 4 seems to have a substantial effect on reducing statistical significance of the government's recurrent expenditure and its the impact on the real gross domestic product.

Fifth, the positive relationship between the money supply and the inflation rate is insignificant. This result, along with the lack long-run relationship in M-6 after the introduction of money supply into M-5, can be used to support the argument of Akinbobola (2012) and Amassoma et al. (2018) that in the long run, money supply does not explain the inflation rate in Nigeria.

6.6 Diagnostics and Specification Tests

6.6.1 Serial Correlation Test

The serial correlation was checked using the Breusch-Godfery Langrage Multiplier (LM) Test.

Table 32: Breusch-Godfery langrage multiplier (LM) test results

MODEL	F-statistic	p-value	Lag Specification
M-1	0.844960	0.3890	At up to 2 lags
M-2	0.861027	0.3722	At up to 2 lags
M-3	0.387896	0.6330	At up to 2 lags
M-4	0.324146	0.6656	At up to 2 lags
M-5	2.524077	0.1012	At up to 1 lag
M-6	-	-	-
M-7	0.315544	0.5392	At up to 1 lag
M-8	1.245306	0.2152	At up to 1 lag

Significant, thus, rejecting the null hypothesis of no serial correlation at *1%, **5%, ***10%.

Based on the above results, we can say that there is no serial correlation in the models. That is, the disturbance term that relates to any variable has not been affected by the disturbance term that relates to another variable.

6.6.2 Heteroskedasticity Test

This heteroskedasticity test was conducted using the White Test.

Table 33: White test results

MODEL	F-statistic	p-value
M-1	0.606566	0.8130
M-2	0.897029	0.4740
M-3	0.867946	0.8502
M-4	2.248197	0.8984
M-5	1.936064	0.1647
M-6	-	-
M-7	1.254575	0.3764
M-8	0.844317	0.7653

Significant, thus, rejecting the null hypothesis of homoskedasticity at *1%, **5%, ***10%.

Based on the results, we can say there is no heteroskedasticity. That is, the error terms observations have been drawn from a distribution that has a constant variance.

6.6.3 Functional Form Test

To check if the different models have been presented in the 'appropriate' functional form, we will be applying the Ramsey Reset Test. The Ramsey Rest Test simply checks if the relationship between the dependent and independent variables should be expressed in a linear form or a non-linear form, Brooks (2019).

Table 34: Ramsey reset test results

MODEL	t-statistic	p-value
M-1	–0.735159	0.4670
M-2	–0.184136	0.8550
M-3	–0.548509	0.5868
M-4	– 0.329279	0.7440
M-5	–1.151167	0.2573
M-6	-	-
M-7	–1.583445	0.1226
M-8	–1.742627	0.0910

Significant, thus, rejecting the null hypothesis of linear relationship at *1%, **5%, ***10%.

Based on the results, we can say that it is appropriate to have expressed the models in linear form. However, at a 10% level of significance, we can say that a linear function is inappropriate for Model 8 (M-8).

6.6.4 Instability Test

Brown et al. (1975) proposed the CUSUM approach for instability testing. The CUSUM of Square Test can be considered a test of instability of variance of the error of the regression, Brooks (2019).

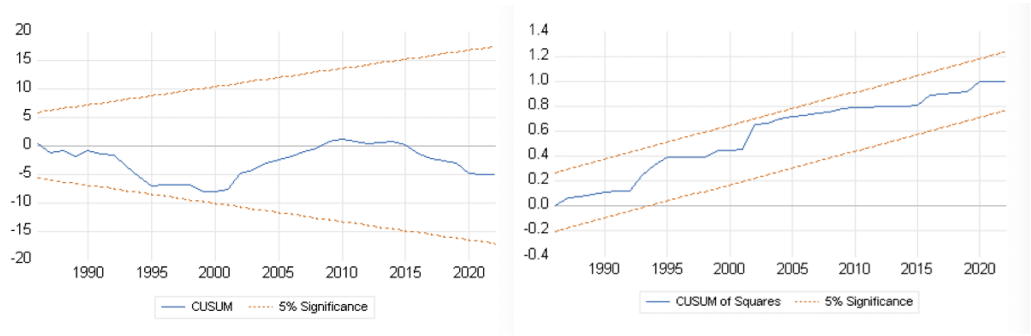

Figure 5: Equation M-1 CUSUM test and CUSUM of squares test

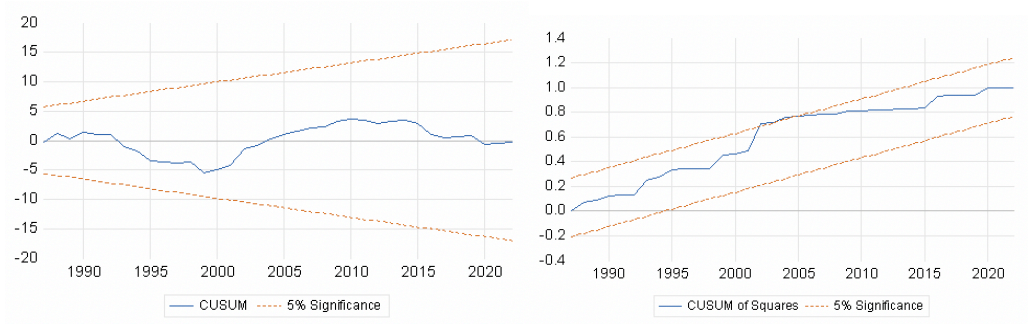

Figure 6: Equation M-2 CUSUM test and CUSUM of squares test

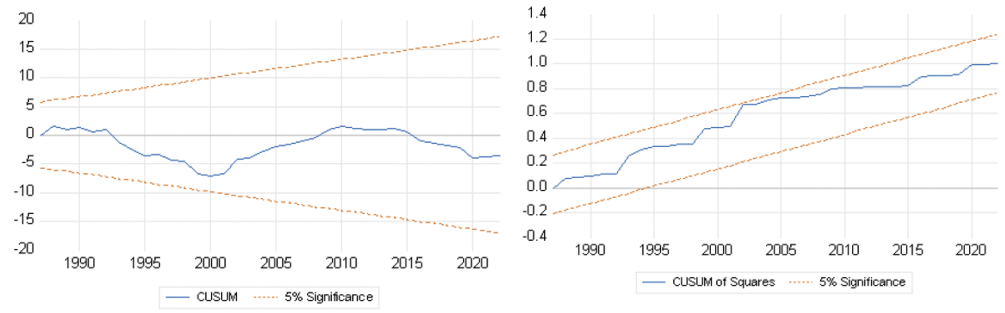

Figure 7: Equation M-3 CUSUM test and CUSUM of squares test

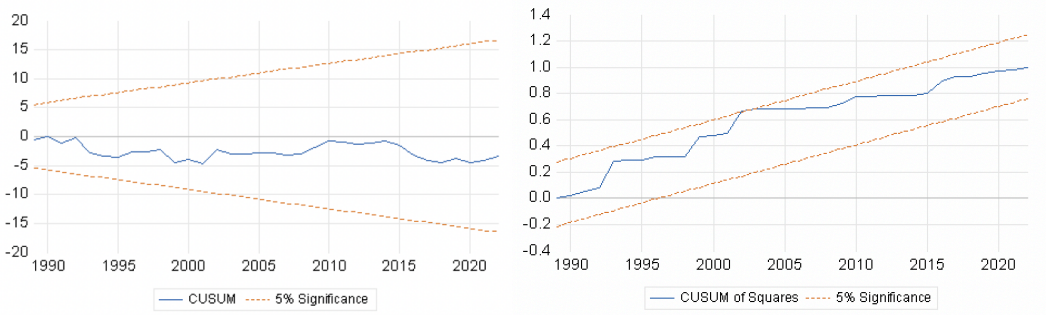

Figure 8: Equation M-4 CUSUM test and CUSUM of squares test

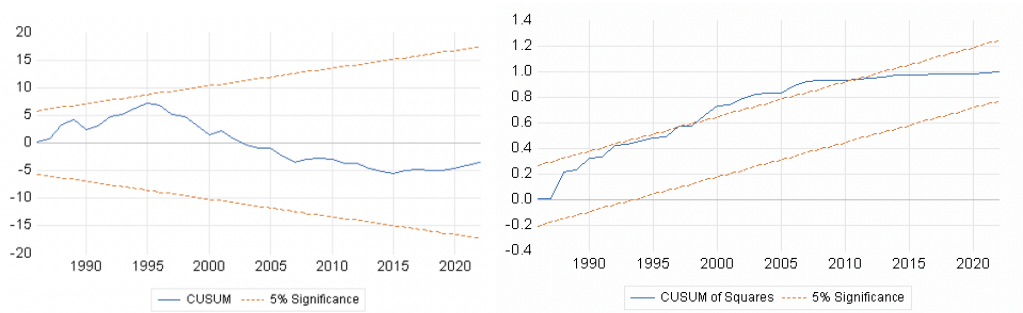

Figure 9: Equation M-5 CUSUM test and CUSUM of squares test

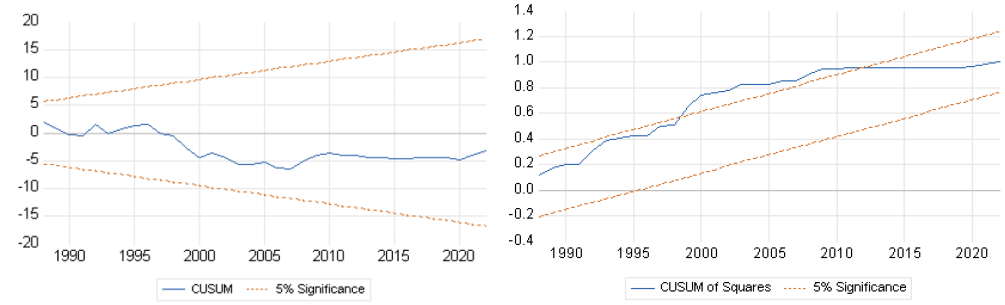

Figure 10: Equation M-7 CUSUM test and CUSUM of squares test

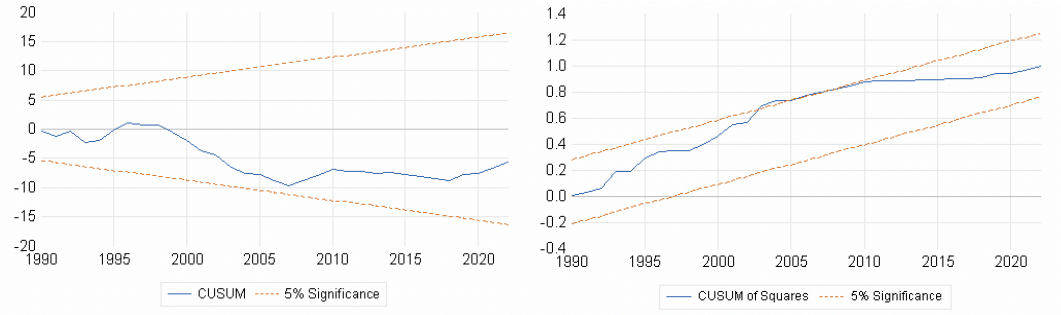

Figure 11: Equation M-8 CUSUM test and CUSUM of squares test

Summary and Comparison:

Table 35: Summary of instability test

MODEL	CUSUM	CUSUM of Squares
M-1	Stable	Stable
M-2	Stable	Stable
M-3	Stable	Stable
M-4	Stable	Stable
M-5	Stable	Unstable
M-6	--	--
M-7	Stable	Unstable
M-8	Stable	Stable

At 5% level of significance

The CUSUM of Squares for Model 5 and Model 7 shows that, at a 5% level of significance, there is an issue of instability of variance of the error of the regression.

6.6 Causality Test

The Granger Causality Test was used to see if there is directional causality between the variables used in this empirical study.

Table 36: Granger causality test results at lag 1

Variables	**F-statistic**	**p-value**
LGRE → LRGDP	16.7278*	0.0002*
LRGDP → LGRE	0.01452	0.9047
LGCE → LRGDP	6.71271**	0.0135**
LRGDP → LGCE	0.22644	0.6369

LINFL → LRGDP	0.00067	0.9795
LRGDP → LINFL	0.42385	0.5189
LMS → LRGDP	18.4244*	0.0001*
LRGDP → LMS	3.84055***	0.0574***
LGCE → LGRE	2.03177	0.1622
LGRE → LGCE	2.68527	0.1095
LINFL → LGRE	0.00263	0.9593
LGRE → LINFL	0.34112	0.5626
LMS → LGRE	0.89470	0.3502
LGRE → LMS	17.9920*	0.0001*
LINFL → LGCE	6.74554**	0.0133**
LGCE → LINFL	0.86256	0.3589
LMS → LGCE	1.50120	0.2280
LGCE → LMS	10.2922*	0.0027*
LMS → LINFL	0.49423	0.4863
LINFL → LMS	0.33421	0.5666

Significant, thus, rejecting the null hypothesis of does not Granger Cause at Lag 1 at *1%, **5%, ***10%.

The test results show there is unidirectional causality between government recurring expenditure and real gross domestic product; government capital expenditure and real gross domestic product; government recurring expenditure and money supply; government capital expenditure and money supply; inflation rate and government capital expenditure.

The unidirectional relationship between government expenditures (GRE and GCE) and economic growth (RGDP) shows that Wagner's Law does not hold, but the Keynesian view holds in Nigeria from 1981 to 2022. This result is in line with Babatunde's (2011) study of Nigeria from 1970 to 2006.

There is bidirectional causality between supply of money and real gross domestic product. This supports the statistically significant estimated positive long-run relationship previously obtained. Thus, the money supply is significantly effective as a control policy variable and contributes to Nigeria's economic growth.

There is no directional causality between the inflation rate and real gross domestic product; government recurring expenditure and inflation rate; government recurring expenditure and government capital expenditure; and money supply and inflation rate.

The lack of a directional relationship between the money supply and inflation rate is in line with the results of Ditimi et al. (2017). study of Nigeria from 1970 to 2016. This further supports the argument made by Akinbobola (2012) and Amassoma et al. (2018) that the money supply does not explain the inflation rate in Nigeria. The lack of directional causality between government expenditures and the inflation rate is in line with the results of Ojarikre et al. (2015) study of Nigeria from 1981 to 2012. However, the lack of directional causality between the two government expenditures is not in line with the Ojarikre et al. (2015) study, perhaps because their study used a Lag of 2.

Chapter 7

CONCLUSION AND RECOMMENDATION

The research objective is to see the government expenditures have a statistically significant long-term influence on the growth of the economy and inflation rate in Nigeria. Therefore, the research used time series annual data from 1981 to 2022. In accordance to macroeconomic theories and past empirical studies, this research used the following variables real gross domestic product (RGDP), inflation rate (INFL), money supply (MS); and government expenditure which was disaggregated to government recurring expenditure (GRE) and government capital expenditure (GCE). The data for these variables were sourced from the Central Bank of Nigeria (2023) and the web page of the World Bank's World Development Indicators (WDI).

The data were adjusted to natural logarithm form to make sure that no problem stationarity may yield spurious results. A cointegration test was done and long-run relationships were established in all the models, except for one model. From the estimated long-run results and the causality test, the results provide us with the following conclusions and recommendations:

(i) government capital expenditure harms growth of the economy.

(ii) government recurring expenditure has a positive impact on growth of the economy.

(iii) government recurring expenditure has a positive association with the inflation rate.

(iv) government capital expenditure has a negative link with the inflation rate.

(v) inflation and economic growth have a negative relationship.

(vi) money supply has a positive influence on growth of the economy.

(vii) money supply does not explain the inflation rate level.

First, one may say that the ever-increasing recurrent expenditure of the federal government is worth the spending in terms of its effect on economic growth. However, this spending is reflected in the inflation rate. Since we expect monetary policy to work hand-in-hand with fiscal policy, the lack of explanation by the money supply to statistically adjust the inflation may be pointing to a few policy reviews, or perhaps, it's the issue of not capturing vital and sufficient variables to make the money supply explanatory; although money supply is an explanatory variable for economic growth.

Second, the 7 years of stagnant allocation of capital expenditures may be responsible for this negative impact on economic growth. It is also possible that Nigeria's economy cannot absorb or utilize the development and infrastructure created from the capital expenses due to technological inefficiency, adaptive inefficiency, or inefficient use of the funds allocated for capital expenditures.

The negative association between the the real gross domestic product and the inflation rate leaves this research with an inconclusive decision. According to theoretical frameworks, an increase in the equilibrium output in the economy may lead to an increase or decrease depending on the source of the change, i.e., from aggregate demand or aggregate supply. In addition, causality direction does not exist between the inflation rate and growth of the economy. Hence, inconclusive decision.

Third, the directional causality between the government expenditures and money supply may lead to the confirmation that, indeed the government's main source of debt financing is through the domestic economy, and perhaps the banking sector. Couple this with the significant relationship in the model that entails economic growth, recurrent expenditure, and the money supply. Thus, the recommendation is given that these three variables are highly linked, the government and the central bank should work closer and take advantage of this significant relationship to further increase the economic growth in Nigeria.

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