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Simulating the Impact of the Economic Sustainability Plan on the Performance of the Nigerian Economy in the Post COVID-19 Era

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Abstract

This study examines the impact of Economic Sustainability Plan (ESP) on the performance of the Nigerian economy as a national economic resilient policy in the post COVID-19 era within the framework of a macro-econometric model. The study is hinged on the Keynesian general theory of employment, income and interest. Annual time series data spanning from 1970 to 2019 for within sample forecast, and a six-year out-of-sample forecast spanning from 2020 to 2025 were used. The policy scenario of 21.3 percent increase in government expenditure under the ESP as a stimulus package was simulated and the findings showed that increase in government expenditure under the ESP in critical areas would bring about significant impact on the macroeconomic performance of the Nigerian economy, especially on employment, inflation, economic growth and balance of payment in the post COVID-19 era. Emergent from these findings, the study recommended among others that the government should mobilize resources to finance the ESP in order to stimulate the economy in the post COVID-19 era by ensuring prudential fiscal management of resources; and the Central Bank of Nigeria (CBN) should ensure that financial institutions saddled with the responsibility of disbursement of intervention funds reduce interest rate from 9 percent to 5 percent as reflected in the ESP.

Keywords

Economic Sustainability Plan, Economic Performance, Government Expenditure and Simulation

1. Introduction

The outbreak of COVID-19 has created distortions in the global health and economic systems due to the high rates of infections and deaths resulting in serious disruptions in the macroeconomic trajectories of economies the world over. In Nigeria, the pandemic has taken a toll on the economy as a result of the lockdowns and the slump in international oil prices precipitated by low global demand for oil. The dependence of the Nigerian economy on oil for revenue and foreign exchange made the economy particularly vulnerable in the face of the pandemic. The dip in oil prices has reduced the revenue available for the government at all levels with its negative attendant consequences on wages, overheads and capital expenditures; this has implications for the 2020 budget. Given the shortfall in revenue to finance the budget and contain with the raising health expenditure, public debt in the economy has increased from US $79,303.31 million in March 2020 to US $85,896.52 million in June 2020 [1]. The lockdowns frozen economic activities resulting in production constraints, massive job losses and supply chain disruptions. As a consequence, the Gross Domestic Product (GDP) reduced by 6.10 percent in the second quarter of 2020 representing a dip of 8.22 percent points when compared to the second quarter of 2019 (2.12 percent) and 7.97 percent points decline compared to the first quarter of 2020 (1.87 percent) [2]. Again, unemployment rate that was 23.1 percent at the end of 2018 is expected to rise to 33.6 percent at the end of 2020 [2]. Furthermore, the outbreak of COVID-19 pandemic posed serious constraints on production and supply chains due to inter and intra country lockdowns, thereby causing inflation to rise from 12.26 percent in March 2020 to 13.22 percent in September 2020 in Nigeria [2].

Given this bleak economic outlook, the Nigerian government launched the Economic Sustainability Plan (ESP) on March 30, 2020 as the National Economic Resilience (NER) response to the outbreak of COVID-19 pandemic. The general objective of the plan is to provide stimulus packages to the Nigerian economy and prevent it from total collapse and illiquidity. The plan intends to invest in agriculture, manufacturing, Micro, Small and medium Scale Enterprises (MSMEs) with a view to creating jobs and reducing poverty in the post COVID-19 era [3]. The plan is to be funded by injecting stimulus package of N2.3 trillion into the economy which translates to 21.3 percent of the total expenditure of N10.8 trillion of the revised 2020 budget of the Federal Government of Nigeria [3]. This stimulus package is in line with the Keynesian postulations of stimulating the economy in times of economic crisis [4].

Following the proposed stimulus package in the Nigerian economy to salvage the ravaging effects of COVID-19, the fundamental question that arises is: to what extent will this injection stimulate the macroeconomic performance of the Nigerian economy in the post COVID-19 era? Answering this question requires simulating the impact of the increase in government expenditure under the ESP on macroeconomic indicators of the Nigerian economy. Therefore, the objective

of this paper is to simulate the extent of the impact of government expenditure under the ESP on the Nigerian economy in the post COVID-19 era. Towards this end, the rest of the paper is organized into four sections following the introduction. Section 2 is the literature review; Section 3 is hinged on the methodology; Section 4 dwells on results and discussion; Section 5 deals with the conclusion and policy recommendations.

2. Literature Review

The review of literature is divided into three parts, namely; the conceptual clarification, the theoretical and empirical literature review.

2.1. Conceptual Clarification

1) Economic Sustainability Plan: Economic Sustainability Plan is the Nigeria's National Economic Resilience (NER) plan in response to the outbreak of COVID-19 that was launched on March 30, 2020. The objectives of the Plan are to provide stimulus packages to the economy with the view to preventing businesses from total collapse and retain employment in the country; create jobs using agriculture, manufacturing and services; invest in infrastructural facilities such as roads, bridges, solar power and information technologies as well invest in the poor through social investment schemes [3].

The plan intends to increase agricultural production in the country so as to ensure food security and employment creation. The plan believes that increase in agricultural production will lead to employment creation, income generation and poverty reduction in the country in the post COVID-19 era. It is the intention of the ESP to increase agriculture production in order to reduce food importation in the country. The reduction in food importation will conserve the scarce foreign exchange thereby reducing pressure on foreign exchange and the country's reserves. The plan is anchored on three pillars, namely; real sector measures, fiscal and monetary measures and the implementation phase [3].

2) Economic Performance: According to [5], economic performance of an economy means the healthy state of such an economy in terms of the growth path of its macroeconomic aggregates. The performance of an economy is customarily measured in terms of the achievement of macroeconomic objectives. These objectives are both long and short term, such as sustainable growth and development; and the stabilization of the economy in response to sudden and unpredictable economic shocks [6]. The key indicators of economic performance are; economic growth (proxy by the rate of growth of real GDP), Inflation, Unemployment and current account balance [7]. **Figure 1** below shows the expected relationship between government expenditure under the economic sustainability plan and the economic performance of the Nigerian economy.

2.2. Theoretical Review

This study is anchored on the Keynes' General theory of Employment, Income and Interest which was propounded in 1936 in response to the Great Depression

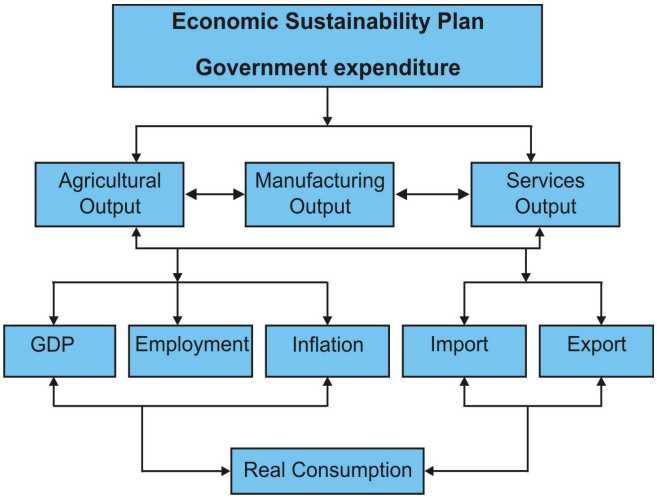

Figure 1. The conceptual framework. Source: Authors' construction.

of 1930s. The failure of the Classicalists theory of self-adjustment mechanism to address the global economic ills of 1930s necessitated the Keynesian general theory. The theory stresses the role of demand management by the government for the stable growth of the economy. The central theme of the Keynesian aggregate demand management theory is that, given the resources, the level of output and employment are determined by aggregate demand; unemployment and economic fluctuations are caused by aggregate demand deficiency and it can be removed through compensatory government spending [5]. The Keynesian theory emphasizes that in a situation of depressed economic activities, the government should inject money into the economy in form of stimulus packages to stimulate aggregate demand. Once the aggregate demand is stimulated, production will increase leading to employment of factors of production, income and consumption will increase via the multiplier effect, the national income will increase.

Also, in periods of economic depression, government reduces taxes and increase government expenditure to stimulate aggregate demands and conversely, in periods of booms government increases taxes and reduce government expenditure in order to control inflationary pressures in an economy. All these are done to maintain internal and external balance in an economy according to Keynesian aggregate demand management economic analyses [4].

This theory is found suitable for this study because the outbreak of COVID-19 has disrupted economic activities leading to GDP contraction, increase in the level of unemployment, inflation and balance of payments deficits. In order to avert recession, governments have responded by providing stimulus packages to their economies. In Nigeria, the economic sustainability plan is instituted as the national economic resilience response to the economic consequences of COVID-19. This fiscal action in the period of COVID-19 pandemic is in line with the postulations of the Keynesian theory of aggregate demand management by the government.

2.3. Empirical Literature

Empirical literature review in this study is grouped into two parts. The first part is on the impact of COVID-19 on macroeconomic variables and the second is on the impact of government expenditure on macroeconomic variables.

On COVID-19 and macroeconomic performance, [8] investigated the impact of COVID-19 on macroeconomic variables using US data and found that COVID-19 has caused a decline in GDP growth and manufacturing output. In Nigeria, studies such as [9] [10] have found that COVID-19 has precipitated serious economic distortions in the Nigerian economy leading to decline in oil prices, foreign reserves, GDP growth, increase in unemployment and inflation, depreciation of exchange rate as well as a fall in banks' lending to the private sector.

On the other hand, the empirical evidence on the impact of government expenditure on macroeconomic variables in Nigeria is mixed. For instance, [11] found that expenditure on general administration has positive impact on economic growth, while expenditure on defense has negative impact on GDP, and expenditure on education and health has positive effect on GDP in Nigeria. in another study, [12] found that government expenditure on transport and communication, education and health infrastructures have significant effects on economic growth; while expenditure on agriculture and natural resources have negative effects on economic growth in Nigeria. In other countries, [13] [14] found positive effect of government expenditure on economic growth of Eight European Union countries and Nepal respectively. Conversely, [15] [16] [17] found that government capital expenditure on agriculture, education, health and infrastructure have positive effects on economic growth; recurrent expenditure has negative effect on economic growth in Nigeria.

Furthermore, [18] [19] found that government expenditure has positive effect on private consumption and other macroeconomic aggregates like output growth and employment in Nigeria.

3. Methodology

3.1. Theoretical Framework of the Model

The study has employed a small macro econometric model to simulate the impact of increase government expenditure under the Economic Sustainability Plan on the performance of the Nigerian economy. The macro-econometric model for this study is derived from the theoretical foundations of the Keynesian aggregate demand management theory. The Keynesian model is stated as:

$$Y = C + I + G + (X - M) \tag{1}$$

where Y = supply of national income, C = private consumption, I = private investment, G = government expenditure, and X − M = income from abroad.

The modeling procedure divides the Nigerian economy into four interrelated blocks namely: production block, aggregate demand block, government block, and the external block. The specifications in these blocks are based on theories

and eclectic incorporation of specific features of the Nigerian economy within the broad Keynesian framework. The following schema shows the division of the blocks based on the Keynesian framework (Figure 2).

3.2. Model Specification

Based on the schema model, the equations in the macro-econometric model are specified block by block based on theories, empirical literature and the institutional knowledge of the Nigerian economy.

Demand Block

The demand block is subdivided into private consumption and private investment. Based on the Keynesian psychological law of consumption, private consumption is specified as:

$$C = f(YD) \tag{2}$$

where C is consumption and Y^d is disposable income. In line with [20] this equation can be expanded to include other variables that affect consumption such inflation (INF), government expenditure (GEX), interest rate (INTR), and remittances (RMT). The private consumption is expressed as real consumption in order to measure the welfare gains of government expenditure. Hence, the private consumption model is specified as:

$$PC = f(YD, INF, GEX, INTR, RMT) \tag{3}$$

Private investment is modeled in line with the accelerator and Keynesian theories which emphasized the role of output growth in investment process and cost of capital (interest rate) as major determinants of private investments respectively. Therefore, private investment is a function of gross domestic product

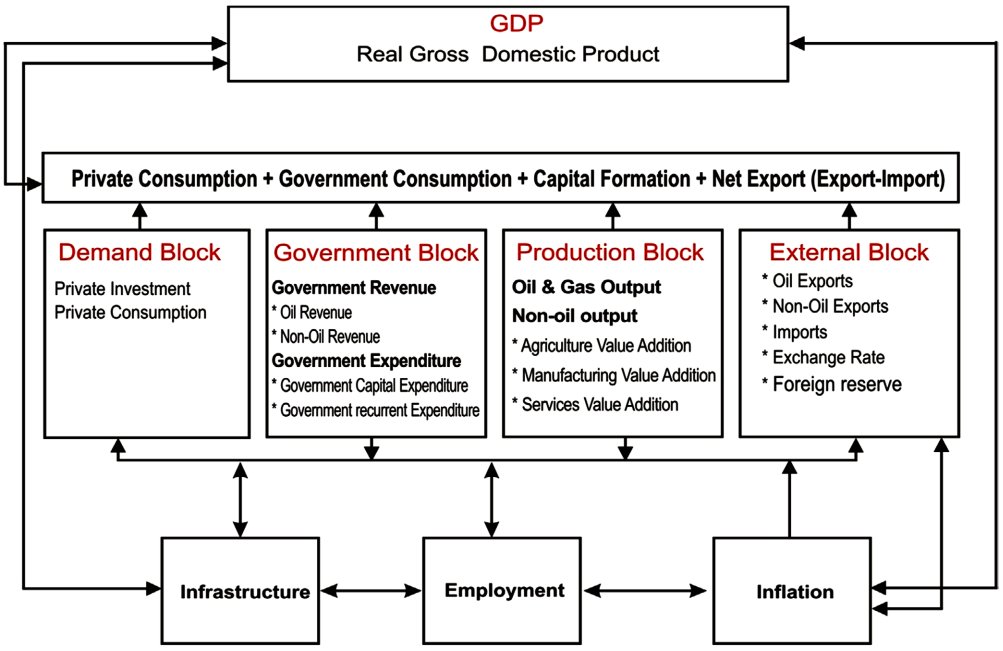

Figure 2. Schematic framework for the macro-econometric model. Source: Authors' compilation.

(Y), interest rate (INTR), credit to the private sector (CPS), government expenditure (GEX) and inflation rate (INF). Thus the private investment equation is specified as follows:

$$PI = f(Y, INTR, CPS, GEX, INF) \quad (4)$$

Government Block

The modeling of the government block is predicated on the Keynesian public sector-led development strategy typical of developing countries. The specification is subdivided into government expenditure and government revenue [21]. In this study, government revenue is decomposed into oil and non-oil revenue.

Government oil revenue

Government oil revenue according to [22] [23] is a influenced by oil gross domestic product (YO), exports of oil (XO), prices of oil (PO), nominal exchange rate (NER), and petroleum profit tax (PPT). The specification is given as:

$$GRVO = f(YO, XO, PO, NER, PPT) \quad (5)$$

Government non-oil revenue

Government non-oil revenue (GRVn) in line with [20] is a function of companies' income tax (CIT), gross domestic product from non-oil (Yn), imports (M), external borrowings (EXB), tariffs (TAR) and government expenditure. Thus the specification is stated as follows:

$$GRVN = f(CIT, Yn, M, EXB, TAR, GEX) \quad (6)$$

Government expenditure

Government expenditure is subdivided into capital and recurrent expenditure. In Nigeria, government expenditure is largely influenced by total government revenue (TGR), credit to government by deposit money banks (CGDMB), gross domestic product (Y), external borrowings (EXB), inflation rate (INF), and debt services (DS) [24] [25]. Therefore, the equations for government expenditure are given as:

$$GKE = f(TGR, CGDMB, Y, EXB, INF, DS) \quad (7)$$

$$GRE = f(TGR, CGDMB, Y, EXB, INF, DS) \quad (8)$$

Production Block

Production activities in Nigeria are segregated into oil and gas, non-oil and services sub-sectors. Thus following [21] the Cobb-Douglas production function that incorporates the regular inputs of labour and capital was employed. In this model, all important factors that determine production activities in the Nigerian economy were taken into account in explaining the real output.

Oil and gas sub-sector

Oil and gas sub-sector production activities according to [22] receives the chunk of foreign direct investment (FDI) and are dominated by foreign firms, production activity here are hugely capital-intensive and import depend. Oil and gas production is a function of import of capital goods (MK), index of openness (OPN), foreign direct investment in the industrial sector (FDII), oil price (PO),

OPEC quota (OPEC), government expenditure (GEX) and lag of oil gross domestic product (YO_{t-1}). Therefore, the relevant specification for oil sector becomes:

$$YO = f\left(MK, OPN, FDII, PO, OPEC, GEX, YO_{(-1)}\right) \quad (9)$$

Non-oil Sector

Non-oil production encompasses all other sectors besides oil and gas. It is sub-divided into three components, namely; agricultural, manufacturing, and services value additions. These sub-sectors employ a huge proportion of labour force and are critical sectors that have been in the development by government over the years.

1) Agricultural Value Added

According to [26] in Nigeria, agricultural production (YA) is basically rain-feed and thus depends largely on the amount of rainfall and government support. Therefore, government expenditure is a critical factor in agricultural production. Hence, agricultural value added in Nigeria is determined by the amount of rainfall (RNF), agricultural sector credit (CREA), prime lending rate (PLR), government expenditure (GEX), agriculture capacity utilization (CUA), and import of capital goods (MK) [27]. The equation for agricultural value added is specified as follows:

$$YA = f\left(RNF, CREA, PLR, GEX, CUA, MK\right) \quad (10)$$

2) Manufacturing Value Added

Manufacturing sub-sector (YM) in Nigeria in line with [17] [28], is determined by the index of electricity production (IEP), import of capital goods (MK), manufacturing capacity utilization (CUM), credit to manufacturing (CREM), nominal exchange rate (NER), and government expenditure (GEX). Therefore, the equation for manufacturing value added is specified as:

$$YM = f\left(IEP, MK, CUM, CREM, NER, GEX\right) \quad (11)$$

3) Services and Value Added

Like other aspects of productive activities, services value addition (YS) largely depends on credit to the private sector (CPS), exchange rate (EXR), capacity utilization in the services sector (CUS), import of capital goods (MK), infrastructure proxy by the index of electricity production (IEP), and government expenditure (GEX). Thus the services value added equation is specified in line with [26] as:

$$YS = f\left(CPS, EXR, CUS, MK, IEP, GEX\right) \quad (12)$$

External Block

The external sector of the model takes into account exports and imports activities. Exports are sub-divided into oil and non-oil exports, while imports are sub-divided into import of capital goods and imports of consumables.

Oil Exports

In modeling the external sector in line with [22], exports of oil (XO) is deter-

mined by domestic oil production (YO), OPEC quota (OPEC), index of openness (OPN), oil price (PO), and government expenditure (GEX). Therefore, the specification for oil exports is given as:

$$XO = f(YO, OPEC, OPN, PO, GEX) \tag{13}$$

Non-oil exports

Non-oil exports (XN) are further sub-divided into the exports of agriculture (XA), manufacturing exports (XM) and services exports (XS). In Nigeria, non-oil exports are influenced by exchange rate (EXR), government expenditure (GEX), credit to the private sector (CPS), prime lending rate (PLR), and terms of trade (TOT) [28] [29]. Thus, the specifications for the various components of non-oil exports as identified above are stated as follows:

$$XA = f(EXR, GEX, CREA, PLR, TOT) \tag{14}$$

$$XM = f(EXR, GEX, CREM, PLR, TOT) \tag{15}$$

$$XS = f(CRES, EXR, GEX, PLR, TOT) \tag{16}$$

Imports

In line with [21], total imports are influenced by gross domestic product (Y), exchange rate (EXR), tariff (TAR), foreign reserves (RES), access and cost of finance proxy by prime lending rate (PLR), government expenditure (GEX) and terms of trade (TOT). Therefore, the model for imports is specified as:

$$M = f(Y, EXR, TAR, RES, PLR, GEX, TOT) \tag{17}$$

Exchange Rate

In this study, exchange rate is modeled using modified uncovered interest parity (UIP). According to [20] in Nigeria, the nominal exchange rate is influenced by real money supply (M2), interest rate differential (IRD), inflation (INF), government expenditure (GEX), oil price (PO), and tariff (TAR). The equation for exchange rate is specified as:

$$EXR = f(M2, IRD, INF, GEX, PO, TAR) \tag{18}$$

Foreign Reserve

Following the work of [30], in Nigeria, foreign reserves depend crucially on the oil sector which is the main foreign exchange earner. Thus, external reserves (RES) are functionally determined by exchange rate (EXR), oil price (PO), the volume of oil exports (XO), net exports (NX), external debt services (EDS), and tariff (TAR). The specification is given as follows:

$$RES = f(EXR, PO, XO, NX, EDS, TAR) \tag{19}$$

Gross Domestic Product

Furthermore, gross domestic product, infrastructure, inflation and employment specifications are considered so as to track the effects of increase in government expenditure on the performance of the Nigerian economy. Accordingly, GDP in Nigeria is influenced by critical variables such as interest rate (INTR), government expenditure (GEX), tariff (TAR), exchange rate (EXR), infrastruc-

ture proxy by the index of electricity production (IEP), and private investment (PI). The specification for gross domestic product is given as follows:

$$Y = f(INT, GEX, TAR, EXR, IEP, PI) \tag{20}$$

Infrastructure

The model for infrastructure is built in line with [22] where infrastructure is very key and critical in the production activities of a typical developing economy like Nigeria. Hence, infrastructure proxy by the index of electricity production (IEP) is influenced by government expenditure (GEX), foreign direct investment (FDI), exchange rate (EXR), inflation (INF) and import of capital goods (MK). The specification is as follows:

$$IEP = f(GEX, FDI, EXR, INF, MK). \tag{21}$$

Inflation

The inflation rate in Nigeria is determined by both monetary and fiscal activities in the economy. Thus, inflation is a function of money supply (M2), exchange rate (EXR), government expenditure (GEX), level of trade openness (OPN), gross domestic product (Y) and the lag of inflation (INF_{t-1}). Therefore, inflation is specified as follows:

$$INF = f(M2, EXR, GEX, OPN, Y, INF_{t-1}) \tag{22}$$

Employment

Employment in the primary, secondary and tertiary sectors of the Nigerian economy is influenced by the demand for and supply of goods and services which equally affect wage and price levels. The specification of the employment equation is in line with the Okun's Law (OL) which postulates a negative relationship between an increase in unemployment rate and growth rate of real gross domestic product [31].

$$EMP = f(GDP) \tag{23}$$

In this study, employment and unemployment are used interchangeably as the same variable in line with [32]. Thus the model for employment is further expanded to include other important variables such as government expenditure (GEX), private investment (PI), credit to the private sector (CPS), and infrastructure proxy by index of electricity production (IEP). Therefore, employment equation is specified as:

$$EMP = f(Y, GEX, PI, CPS, IEP) \tag{24}$$

The stochastic forms of the equations are expressed as:

$$PC = \alpha_0 + \alpha_1 YD + \alpha_2 INF + \alpha_3 GEX + \alpha_4 INTR + \alpha_5 REM + \mu_t \tag{25}$$

$$PI = \alpha_0 + \alpha_1 Y + \alpha_2 INTR + \alpha_3 CPS + \alpha_4 GEX + \alpha_5 INF + \mu_t \tag{26}$$

$$GRVo = \alpha_0 + \alpha_1 Yo + \alpha_2 Xo + \alpha_3 Po + \alpha_4 NER + \alpha_5 PPT + \mu_t \tag{27}$$

$$GRVn = \alpha_0 + \alpha_1 CIT + \alpha_2 Yn + \alpha_3 M + \alpha_4 EXB + \alpha_5 TAR + \alpha_6 GEX + \mu_t \tag{28}$$

$$GKE = \alpha_0 + \alpha_1 TGR + \alpha_2 CGDMB + \alpha_3 Y + \alpha_4 INF + \alpha_5 DS + \mu_t \tag{29}$$

$$\mathrm{GRE} = \alpha_0 + \alpha_1 \mathrm{TGR} + \alpha_2 \mathrm{CGDMB} + \alpha_3 \mathrm{Y} + \alpha_4 \mathrm{INF} + \alpha_5 \mathrm{DS} + \mu_t \quad (30)$$

$$\log \mathrm{Yo} = \alpha_0 + \alpha_1 \log \mathrm{MK} + \alpha_2 \log \mathrm{OPN} + \alpha_3 \log \mathrm{FDII} + \alpha_4 \log \mathrm{Po} + \alpha_5 \log \mathrm{OPEC} + \alpha_6 \log \mathrm{Yo}_{(-1)} + \mu_t \quad (31)$$

$$\log \mathrm{YA} = \alpha_0 + \alpha_1 \log \mathrm{RNF} + \alpha_2 \log \mathrm{CREA} + \alpha_3 \log \mathrm{PLR} + \alpha_4 \log \mathrm{GEX} + \alpha_5 \log \mathrm{CUA} + \alpha_6 \log \mathrm{MK} + \mu_t \quad (32)$$

$$\log \mathrm{YM} = \alpha_0 + \alpha_1 \log \mathrm{IEP} + \alpha_2 \log \mathrm{MK} + \alpha_3 \log \mathrm{CUM} + \alpha_4 \log \mathrm{CREM} + \alpha_5 \log \mathrm{NER} + \alpha_6 \log \mathrm{GEX} + \mu_t \quad (33)$$

$$\log \mathrm{YS} = \alpha_0 + \alpha_1 \log \mathrm{CPS} + \alpha_2 \log \mathrm{EXR} + \alpha_3 \log \mathrm{CUS} + \alpha_4 \log \mathrm{MK} + \alpha_5 \log \mathrm{IEP} + \alpha_6 \log \mathrm{GEX} + \mu_t \quad (34)$$

$$\mathrm{XO} = \alpha_0 + \alpha_1 \mathrm{YO} + \alpha_2 \mathrm{OPEC} + \alpha_3 \mathrm{OPN} + \alpha_4 \mathrm{PO} + \alpha_5 \mathrm{GEX} + \mu_t \quad (35)$$

$$\mathrm{XA} = \alpha_0 + \alpha_1 \mathrm{EXR} + \alpha_2 \mathrm{GEX} + \alpha_3 \mathrm{CREA} + \alpha_4 \mathrm{PLR} + \alpha_5 \mathrm{TOT} + \mu_t \quad (36)$$

$$\mathrm{XM} = \alpha_0 + \alpha_1 \mathrm{EXR} + \alpha_2 \mathrm{GEX} + \alpha_3 \mathrm{PLR} + \alpha_4 \mathrm{TOT} + \alpha_4 \mathrm{CREM} + \mu_t \quad (37)$$

$$\mathrm{XS} = \alpha_0 + \alpha_1 \mathrm{CRES} + \alpha_2 \mathrm{EXR} + \alpha_3 \mathrm{GEX} + \alpha_4 \mathrm{PLR} + \alpha_5 \mathrm{TOT} + \mu_t \quad (38)$$

$$\mathrm{M} = \alpha_0 + \alpha_1 \mathrm{Y} + \alpha_2 \mathrm{EXR} + \alpha_3 \mathrm{TAR} + \alpha_4 \mathrm{RES} + \alpha_5 \mathrm{PLR} + \alpha_6 \mathrm{GEX} + \alpha_7 \mathrm{TOT} + \mu_t \quad (39)$$

$$\mathrm{EXR} = \alpha_0 + \alpha_1 \mathrm{M2} + \alpha_2 \mathrm{IRD} + \alpha_3 \mathrm{INF} + \alpha_4 \mathrm{GEX} + \alpha_5 \mathrm{PO} + \alpha_6 \mathrm{TAR} + \mu_t \quad (40)$$

$$\mathrm{RES} = \alpha_0 + \alpha_1 \mathrm{EXR} + \alpha_2 \mathrm{PO} + \alpha_3 \mathrm{XO} + \alpha_4 \mathrm{NX} + \alpha_5 \mathrm{EDS} + \alpha_6 \mathrm{TAR} + \mu_t \quad (41)$$

$$\mathrm{Y} = \alpha_0 + \alpha_1 \mathrm{INTR} + \alpha_2 \mathrm{GEX} + \alpha_3 \mathrm{TAR} + \alpha_4 \mathrm{EXR} + \alpha_5 \mathrm{IEP} + \alpha_6 \mathrm{PI} + \mu_t \quad (42)$$

$$\mathrm{IEP} = \alpha_0 + \alpha_1 \mathrm{GEX} + \alpha_2 \mathrm{FDI} + \alpha_3 \mathrm{EXR} + \alpha_4 \mathrm{INF} + \alpha_5 \mathrm{MK} + \mu_t \quad (43)$$

$$\mathrm{INF} = \alpha_0 + \alpha_1 \mathrm{M2} + \alpha_2 \mathrm{EXR} + \alpha_3 \mathrm{GEX} + \alpha_4 \mathrm{OPN} + \alpha_5 \mathrm{Y} + \mu_6 \mathrm{INF}_{t-1} + \mu_t \quad (44)$$

$$\mathrm{EMP} = \alpha_0 + \alpha_1 \mathrm{Y} + \alpha_2 \mathrm{GEX} + \alpha_3 \mathrm{PI} + \alpha_4 \mathrm{CPS} + \alpha_5 \mathrm{IEP} + \mu_t . \quad (45)$$

3.3. Measurement of Variables

The measurement of variables used in the macro-econometric model is presented in Appendix I.

3.4. Estimation Technique

The stochastic equations of the model were estimated using the Two-Stage Least Squares technique given that all the equations in the system were over identified and the quest to circumvent the simultaneity problems inherent with macro econometric models. The study used annual data spanning from 1970 to 2018 for the within sample forecast and from 2019 to 2025 for the out-of-sample forecast. Data for this study were sourced from CBN statistical bulletins, National Bureau of Statistics bulletins, direction of trade, and world trade indicators.

3.5. Policy Scenario

The study simulated 21.3 percent increase in government expenditure in Nigeria under the Economic Sustainability Plan. This is because the plan is to be funded by injecting stimulus package of N2.3 trillion into the economy which translates

to 21.3 percent of the total expenditure of N10.8 trillion of the revised 2020 budget of the Federal Government of Nigeria.

4. Results Presentation and Discussion

The estimated results using the two stage least squares is presented in Table 1 as follows.

The results reveal that government expenditure has positive and statistically significant relationship with private investment, agricultural output, manufacturing output, services output, critical infrastructure and employment. The implication of the result is that increase in government expenditure on agriculture, manufacturing, services and critical infrastructure will boost output growth in the economy and increase a sustained level of employment in Nigeria. The results of this study have buttressed the findings of [17] that public expenditure impacts domestic private investment and consequently, causes real growth in the economy. Also, the results revealed inverse relationships between government

Table 1. The results of the two stage least square estimate.

PC = 23.6 + 4.50 * YD − 0.25 * INF − 0.92 * GEX − 1.35 * INTR + 0.40 * RMT
PI = 3.78 − 0.06 * Y − 0.12 * INTR + 1.02 * CPS + 0.09 * GEX − 0.02 * INF
GRVO = −11.1 + 2.62 * YO + 0.15 * XO + 0.51 * PO − 0.01 * NER + 0.39 * PPT
GRVN = −2.98 − 0.44 * CIT − 0.13 * YN − 0.37 * M + 0.65 * EXB − 1.71 * TAR + 1.78 * GEX
GKE = 0.93 + 1.41 * TGR − 0.28 * CGDMB − 0.08 * Y + 0.22 * EXB − 0.28 * INF − 0.71 * DS
GRE = −4.39 + 0.67 * TGR + 0.03 * CGDMB + 1.09 * Y + 0.07 * EXB − 0.03 * INF − 0.07 * DS
YO = 1.06 + 0.017 * MK + 0.02 * OPN + 0.03 * FDII − 0.019 * PO − 0.04 * OPEC + 0.02 * GEX + 0.71 * YO (−1)
YA = 46.3 − 9.76 * RNF + 0.05 * CREA + 0.44 * PLR + 0.59 * GEX + 0.03 * CUA − 0.03 * MK
YM = 4.73 − 0.78 * IEP − 0.10 * MK + 0.26 * CUM + 0.28 * CREM − 7.49 * NER − 0.07 * GEX
YS = 4.86 + 0.58 * CPS − 0.08 * EXR − 0.05 * CUS − 0.07 * MK − 0.46 * IEP + 0.18 * GEX
XO = 36.5 − 5.89 * YO + 4.06 * OPN − 6.17 * OPEC − 3.16 * PO + 1.67 * GEX
XA = 0.67 + 0.61 * EXR + 0.19 * GEX + 0.18 * CREA + 0.08 * PLR + 0.08 * TOT
XM = −1.89 − 0.61 * EXR − 0.31 * GEX + 0.27 * CREM + 2.94 * PLR + 1.18 * TOT
XS = 8.67 − 1.36 * CRES + 2.68 * EXR − 0.54 * GEX − 0.31 * PLR − 0.34 * TOT
M = −7.12 − 0.22 * Y − 0.62 * EXR + 0.24 * TAR + 0.36 * RES + 0.98 * PLR + 1.52 * GEX − 0.07 * TOT
EXR = −4.37 − 0.10 * M2 + 0.59 * IRD + 0.16 * INF + 0.95 * GEX + 0.04 * PO
RES = 1.40 − 0.87 * EXR + 0.73 * PO − 0.09 * XO + 0.56 * NX + 0.72 * EDS + 0.31 * TAR
Y = 3.76 − 1.09 * INTR + 0.52 * GEX − 0.04 * TAR − 0.23 * EXR + 0.02 * IEP − 0.08 * PI
IEP = 2.69 + 0.35 * GEX + 0.31 * FDI + 0.01 * EXR − 0.14 * INF − 0.04 * MK
INF = 5.47 + 0.37 * M2 + 0.46 * EXR − 0.68 * GEX + 0.11 * OPN − 0.69 * Y + 0.57 * INF(−1)
EMP = 1.73 + 0.01 * Y + 0.02 * GEX + 0.02 * PI − 0.01 * CPS − 0.01 * IEP

Source: Extract from E-views 10.

expenditure and private consumption, manufacturing exports, services exports and inflation rate. This suggests that government expenditure have crowding-in and crowding-out effect on macroeconomic variables. Government expenditure here has crowded-out private consumption, exports of manufacturing and services sector as well as inflation rate in Nigeria. This finding is in tendon with the findings of [18] that government expenditure on non-critical areas such as excessive administrative expenditures crowd-out private consumption, triggers inflation and other sensitive macroeconomic variables in the economy.

Simulation Results

Before the simulation experiments were conducted, the model was evaluated using the validation statistics. The validation results of the estimated model are reported in Table 2.

Table 2. Summary statistics of model validation.

Variables	RMSPE	Theil's Inequality	Bias Proportion	Variance Proportion	Covariance Proportion
PC	0.643587	0.046798	0.000000	0.143045	0.856960
PI	0.135909	0.012780	0.000000	0.003194	0.996806
GRVO	0.221360	0.042645	0.000000	0.009746	0.990254
GRVN	0.377808	0.072665	0.000000	0.378321	0.962168
GKE	0.281497	0.048936	0.000000	0.014512	0.985488
GRE	0.187482	0.032793	0.000000	0.008550	0.991450
YO	0.029553	0.003901	0.000000	0.026671	0.973324
YA	0.196785	0.025335	0.000000	0.093464	0.906536
YM	0.121717	0.017898	0.000000	0.088325	0.911675
YS	0.043594	0.005614	0.000000	0.003928	0.996072
XO	0.558936	0.06.805	0.000000	0.092297	0.907703
XA	0.183187	0.024129	0.000000	0.008285	0.991715
XM	0.355870	0.011740	0.000000	0.046284	0.953716
XS	0.625410	0.068100	0.000000	0.121906	0.878094
M	0.187298	0.035593	0.000000	0.004972	0.995028
EXR	0.127413	0.042310	0.000000	0.003911	0.996089
RES	0.301401	0.031507	0.000000	0.019676	0.980324
Y	0.199530	0.021445	0.000000	0.068574	0.931426
IEP	0.115741	0.032651	0.000000	0.144420	0.855580
INF	0.237629	0.011735	0.000000	0.026293	0.951370
EMP	0.006587	0.001906	0.000000	0.092912	0.907088

Source: Authors' computation.

Table 1 has indicated that, the coefficients of RMSPE and the Theil's Bias proportion, and Variance proportion are low as expected. This implies that the causes of disparities between the actual and simulated values of most variables are not precipitated by the differentials in their mean and variances except for PC and XS which showed relatively high values of RMSPE. This does not however, affect the validity of the model. The Co-variances are high as expected, suggesting that the actual and simulated values co-move. The implication is that the model is suitable for forecasting and policy simulation in the Nigerian economy. Furthermore, the actual and the simulated paths of the 21 endogenous variables were plotted together and presented in the following Figure 3 to examine their critical turning points.

The baseline simulation of the endogenous variables shows that the simulated values were able to mimic the critical turning points of the historical data. This also validates the suitability of model for policy analysis and projections of the macroeconomic variables of the Nigerian economy in the post COVID-19 era.

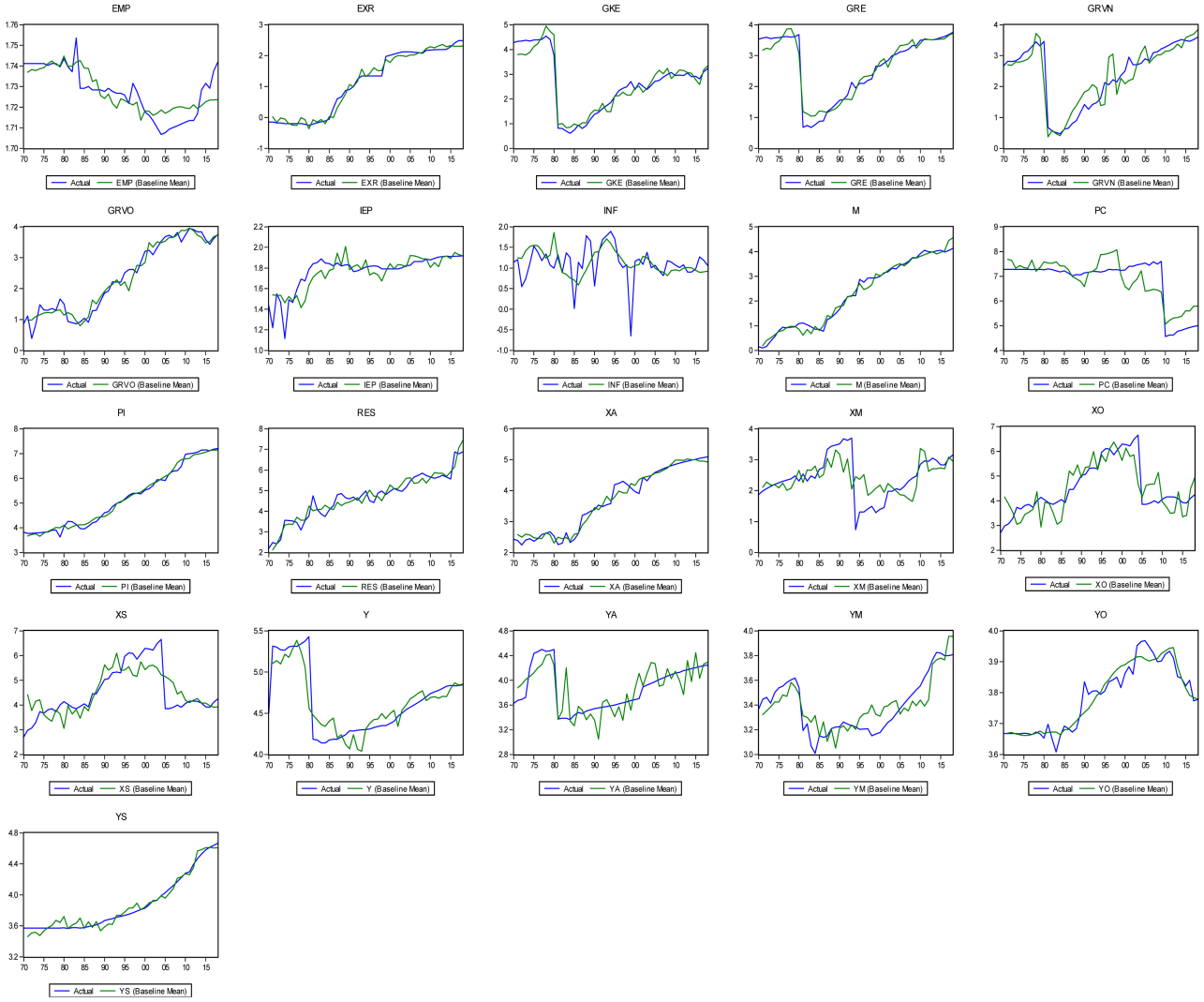

Figure 3. Baseline simulation of the endogenous variables. Source: Extract from E-views 10.

Policy Scenario: Increase in Government Expenditure by 21.3%

The scenario used for the simulation was 21.3 percent increase in government expenditure under the ESP. The results of the simulation are shown in Table 3.

The results of the simulation experiment reveal that 21.3 percent increase in government expenditure as a stimulus to the Nigerian economy would increase economic activities such as private investment and consumption, output of agriculture, manufacturing, and services by 6.54, 4.63, 3.03, 2.59 and 3.51 percent, respectively in the out-of-sample forecast. The simulation results further indicate that inflation and unemployment would reduce by 0.13 and 0.71 percent respectively as a result of increase in government expenditure in the post COVID-19 era. These findings lend credence to the Keynesian theoretical postulations that stimulus packages by the government in periods of economic crisis will stimulate aggregate demand and consequently, other macroeconomic aggregates. The findings are also in line with that of [17] [19] who found that increasing government expenditures stimulates macroeconomic activities such as private investment, private consumption, and employment expansion among others in an economy.

To clearly show the impact of increase in government expenditure under the ESP on key macroeconomic aggregates that underscore economic performance of the Nigerian economy in the post COVID-19 era, the following variables, namely; inflation as a measure of price stability, unemployment, Gross Domestic Product (GDP) as a measure of economic growth, and import and export as a measure of balance of payments are depicted in Figure 4.

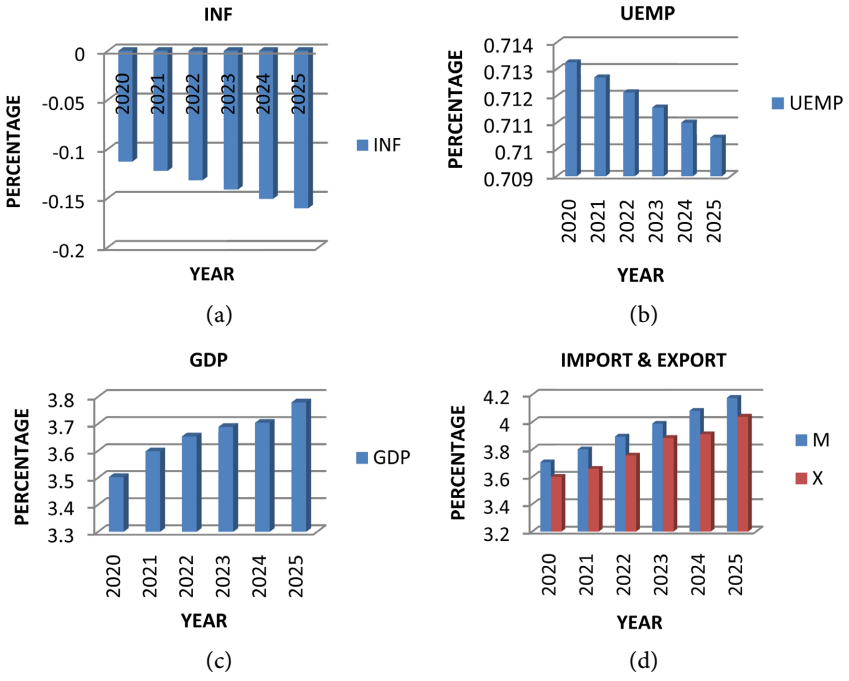

Figure 4. Trends of simulated impact of increase in government expenditure on inflation, unemployment, GDP and import and export from 2020 to 2025. Source: Authors' compilation.

Table 3. Simulated results for 21.3% increase in government expenditure.

Variables	21.3% Increase in Government Expenditure	Variables	21.3% Increase in Government Expenditure
	Out of Sample		Out of Sample
PI	6.54	**XS**	4.00
PC	4.63	**M**	3.89
YO	2.95	**GRVN**	2.26
YA	3.03	**GRVO**	3.45
YM	2.59	**EXR**	2.03
YS	3.51	**RES**	5.73
XO	4.08	**Y**	3.49
XA	4.59	**INF**	−0.13
XM	1.55	**YA**	3.03
IEP	1.00	**UEMP**	0.71

Source: Authors' computation.

In (a), increase in government expenditure under ESP would reduce inflation by 0.11 percent in 2020 and this will continuously reduce inflation to 0.16 percent in 2025. This represents 31.25 percent reduction in the rate of inflation over this forecast horizon in the post COVID-19 era in Nigeria. This reduction may be attributed to the Keynesian transmission mechanism that increase in government expenditure would boost aggregate demand via consumption. The simulation results depicted in Table 3 is reflective of the Keynesian postulation; this is because, increase in government expenditure by 21.3 percent would significantly increase consumption by 4.63 percent over the forecast horizon. This increase in consumption would further trigger output in oil, agriculture, manufacturing and services by 2.95, 3.03, 2.59 and 3.51 percent respectively. These increases in output would exert influence on prices in the post COVID-19 era in Nigeria.

Similarly, in (b), increase in government expenditure by 21.3 percent under the ESP would continuously reduce unemployment in the country over the forecast horizon. This reduction in unemployment is consistent with the Keynes' General theory of Employment, income and Interest. Again, the simulated results as shown in the table have validated the Keynesian postulations; since, increase in government expenditure has significantly increased output in oil, agriculture, manufacturing and services sectors with its implications for reduction in unemployment by 0.71 percent over the forecast horizon in the post COVID-19 era in Nigeria. This finding is in tendon with that of [17] who found that increase in government expenditure on critical areas stimulates economic activities that lead to employment expansion in the economy.

In (c) increase in government expenditure by 21.3 percent under the ESP

shows that GDP would increase by 3.50 percent in 2020 and this will increase continuously to 3.78 per in 2025 representing 7.41 percent increase over the forecast horizon in the post COVID-19 era in Nigeria. Empirically, this corroborates the findings of [19] who found that increase in government expenditure has positive effect on GDP growth in Nigeria.

Finally, in (d), it is evident that increase in government expenditure by 21.3 percent under ESP would increase imports and exports by 3.71 and 3.60 percent, respectively in 2020. These increases would continue such that imports would increase by 4.18 percent and exports by 4.04 percent in 2025. This represents 11.2 and 10.9 percent increases in imports and exports over the forecast horizon in the post COVID-19 era in Nigeria. The increase in imports over exports may be ascribed to the import dependent nature of the Nigerian economy and the quest to diversify the economy away from oil which requires the importation of capital and intermediate goods.

5. Conclusions and Policy Recommendations

Arising from the findings, the study concludes that increase in government expenditure under the Economic Sustainability Plan would have significant impact on the macroeconomic performance of the Nigerian economy, especially on economic growth, employment, inflation and balance of payment in the post COVID-19 era.

Based on the findings, the study has made the following policy recommendations: First, as a fiscal measure, the government should mobilize resource to finance the Economic Sustainability Plan in order to stimulate the economy in the post COVID-19 era. To achieve this, government can maximize revenue and streamline expenditures to the provision of critical infrastructure that can assist in agricultural, manufacturing and MSMEs. Again, the government can grant tax holidays to investors in areas of agriculture, manufacturing and MSMEs to help sustain local production and safeguard existing jobs.

Second, government should ensure that the intended stimulus packages get to the target beneficiaries as contained in the policy document of the ESP. Furthermore, concerted efforts should be made to ensure that beneficiaries put to maximum use the resources gotten from the ESP in order to avoid diversion of funds to other non-essential expenditures. Finally, in terms of monetary policy measures, the Central Bank of Nigeria (CBN) should ensure that all financial institutions saddled with the responsibility of disbursement of intervention funds under ESP reduce the interest rate from 9 percent to 5 percent as contained in the ESP document. Also, the CBN should authorize banks to restructure the payment terms of loan of the affected sector.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix I

Notation	Definition	Type	Unit
CGDMB	Credit to Government by deposit Money Banks	Exogenous	Million Naira
CPI	Consumer Price Index	Exogenous	Index
CPS	Credit to the Private Sector	Exogenous	Million Naira
CREA	Credit to Agriculture	Exogenous	Million Naira
CREM	Credit to Manufacturing	Exogenous	Million Naira
CRES	Credit to services	Exogenous	Million Naira
CUA	Capacity Utilization in Agriculture	Exogenous	Million Naira
CUM	Capacity Utilization in Manufacturing	Exogenous	Million Naira
CUS	Capacity Utilization in Services	Exogenous	Million Naira
DDS	Domestic Debt Stock	Exogenous	Million Naira
PLR	Prime Lending Rate	Exogenous	Percent
EDS	External Debt Service	Exogenous	Million Naira
EMP	Employment	Endogenous	Percent
EXB	External Borrowing	Exogenous	Million Naira
EXR	Exchange Rate	Endogenous	Percent
FDI	Foreign Direct Investment	Endogenous	Million Naira
FDII	Foreign Direct Investment in the Industrial Sector	Exogenous	Million Naira
FDIN	Non-oil Foreign Direct Investment	Exogenous	Million Naira
GEX	Government Expenditure	Exogenous	Million Naira
GRE	Government Recurrent Expenditure	Endogenous	Million Naira
GKE	Government Capital Expenditure	Endogenous	Million Naira
GRV	Total Government Revenue	Identity	Million Naira
GRVN	Non-oil Government Revenue	Endogenous	Million Naira
GRVO	Oil Government Revenue	Endogenous	Million Naira
INF	Inflation Rate	Endogenous	Percent
INTR	Interest Rate	Exogenous	Percent
IEP	Index of Electricity Production	Endogenous	Index
IRD	Interest Rate Differential	Exogenous	Percent
M	Imports	Endogenous	Million Naira
MK	Import of Capital Goods	Exogenous	Million Naira
M2	Money Supply	Exogenous	Million Naira
NER	Nominal Exchange Rate	Exogenous	Percent

Continued

OPN	Index of Trade Openness	Exogenous	Index
OPEC	Oil Production by OPEC Quota	Exogenous	Million Naira
PI	Private Investment	Endogenous	Million Naira
PO	Oil Price	Exogenous	Million Naira
PPT	Petroleum Profit Tax	Exogenous	Million Naira
PC	Private Investment	Endogenous	Million Naira
RNF	Amount of Rainfall	Exogenous	Index
Y	Real Gross Domestic Product	Exogenous	Million Naira
YN	Non-oil Real Gross Domestic Product	Identity	Million Naira
YA	Agricultural Output	Endogenous	Million Naira
YM	Manufacturing Output	Endogenous	Million Naira
YS	Services Output	Endogenous	Million Naira
YO	Oil Real Gross Domestic Product	Endogenous	Million Naira
RES	External Reserves	Endogenous	Million Naira
RMT	Personal Remittance	Endogenous	Million Naira
TAR	Tariff Rate	Exogenous	Percent
TBL	Trade Balance	Exogenous	Million Naira
TDS	Total Debt Service	Identity	Million Naira
X	Total Exports	Identity	Million Naira
XA	Exports of Agriculture	Endogenous	Million Naira
XM	Exports of Manufacturing	Endogenous	Million Naira
XS	Exports of Services	Endogenous	Million Naira
XO	Oil Exports	Endogenous	Million Naira
YD	Real Personal Disposable Income	Exogenous	Million Naira