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22nd INAUGURAL LECTURE

$$x_t = \mathbb{E}(x_{t+1}) + \frac{1}{\sigma^c}[R_t + \mathbb{E}(\pi_{t+1})] + \varepsilon_t^c \quad (1)$$

$$\pi_t = \rho^{\pi}\mathbb{E}(\pi_{t+1}) + \psi x_t + \varepsilon_t^{\pi} \quad (2)$$

$$R_t = \rho_1^R R_{t-1} + \rho_2^R \pi_t + \rho_3^R x_t + \varepsilon_t^R \quad (3)$$

RETHINKING THE METHODOLOGICAL APPROACH TO CONTEMPORARY MACROECONOMIC ANALYSIS IN NIGERIA

PHILIP O. ALEGE

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The Chancellor, Chair, Board of Regents Sir; Vice-Chancellor, Deputy Vice-Chancellor, Registrar and other Principal Officers of Covenant University; Dean, College of Business and Social Sciences, Deans of other Colleges present, Directors, Professors and other members of Senate; Head, Department of Economics and Development Studies, Heads of other Departments, Learned Colleagues, Administrative and Technical staff of the University, Members of my family both nuclear and extended, Beloved Kings and Queens in Hebron, Gentlemen of the Press, Distinguished ladies and Gentlemen.

1.0 Introduction

1.1 The Economic Environment

It is with an infinite bundle of joy that I stand before this prestigious gathering ordained by the Almighty God to present the 22nd Inaugural Lecture of this Great Citadel of Learning from the College of Business and Social Sciences where I recently handed over the baton of leadership as Dean to one of our senior colleagues. It is also the number three from the Department of Economics and Development Studies. To God alone be all the Glory! I understand that inaugural lectures constitute avenues where Professors present to the University Community and the general public a synthesis of their research works, their teaching

accomplishments over the years as well as highlight their current area of research.

This inaugural lecture is coming at a time that Nigeria is experiencing hard economic-socio-political turbulence. Recall that the whole world recently exited the 2007-2009 global financial crisis described as the "Great Recession" and Nigeria entered its own recession in 2016. As at this moment, one cannot say categorically with convincing statistics that we have left the period of contraction behind us. In the face of daunting economic challenges, it is imperative to take a critical look at the tools and processes of economic policy making and particularly its implementation in order not to be disrupted.

Chancellor Sir, in the last decade (2010-2019), some indicators showed that Nigeria has witnessed dwindling economic fortune. The economy has witnessed high unemployment rate averaging about 23.1 per cent of the work force (NBS, 2019), government budget deficit about 2.84 per cent of the GDP by 2018, falling foreign exchange reserve put at about US$ 43.97 billion American dollars (CBN, 2018), poor infrastructure for productive activities, weak manufacturing sector, depreciation of the Naira, managed inflation, dwindling real wage rate and unbearable dependency on revenue from crude oil. In addition, the country is bedeviled with other challenges including the following: non-functional institutions, poor health facilities, falling quality of education,

worrisome demographic projections, inadequate funding of research, political immaturity and of course, alleged corruption in high places, to mention a few. These are sufficient issues to derail any economy from the steady growth path even if we had a concrete strategic plan.

During the period 2000 to 2014, the economic growth of the country reached 7 per cent per annum at a stage. However, there was nothing to show for this remarkable growth. We experienced no significant development. It was a 'jobless growth'. Our participation in international trade in all directions: bilateral, multilateral, regional economic agreements, "spaghetti unions" did very little to change our fortune, we have been experiencing immiserising growth. This could not be a surprise to anybody as we export non-value added primary products such as cocoa, groundnut, hides and skin, palm oil and most shamefully crude oil.

In the face of these problems, successive governments employed different macroeconomic approaches to turn the fortune of the country. Permit me to mention a few of these policy packages. Nigeria witnessed the first comprehensive IMF-backed macroeconomic package christened Structural Adjustment Programme (SAP) in 1986. The programme was, in my view, badly implemented perhaps due to lack of capacity as well as political will. It thus derailed and failed woefully as there were considerable gaps between targets and performances. The

nefarious consequences of that policy are yet to be attenuated in Nigeria and this has generated into other "experimental" policy packages in order to correct the negative trends observed.

Chancellor Sir, permit me to mention a few others: The National Economic Empowerment Development Strategies (NEEDS) under President Olusegun Obasanjo. The Medium Term Expenditure Framework (MTEF) of President Umaru Yar'Adua in 2007. There was also the Medium Term Sector Strategies (MTSS) under President Goodluck E. Johnathan; and the Economic Recovery and Growth Plan (EGRP) 2017-2020 under President Muhammadu Buhari which was a response to the 2016 economic recession in Nigeria. These were essentially homegrown policy interventions.

These policies at best were to work within other international agenda. Prominent among these are the Millennium Development Goals (MDGs), which was implemented albeit without appreciable indices of success, the ongoing Sustainable Development Goals (SDGs) and most recently the African Continental Free Trade Area (AfCFTA) signed in March 2018 in Kigali Rwanda.

It should be noted that recent statistics show that the Nigerian economy is still plagued by low growth rate of the GDP, unemployment of over 20 per cent of the work force (Nigerian Bureau of Statistics (NBS), 2019), volatile oil prices in the

international market, fiscal imbalance, incidence of poverty, weak agriculture sector growth, and impeded improvements in household welfare especially low-income (World Bank (WB), 2019). Meanwhile, the contemporary economy is apparently being disrupted and system sustainability is shaky due to uncertainties and both internal and external shocks are on the rampage.

1.2 The Choice of My Research Focus

The choice of what should be my area of research was somehow a herculean task. While doing my Ph.D course work, I toyed with choosing among regional trade agreements, industrial economics and macroeconomics as possible areas of my concentration. The decision would have been a difficult one except for heavenly intervention through my little daughter. I was playing with her, sometime in 2004, on the rug in our living room. Holding my unpaged macroeconomics notes in my hands, I slept off. She had a filled day in scattering the notes. It was during the attempt to collate and rearrange those sheets of papers that I got deeper understanding and subsequently fell in love with macroeconomics and international trade. That marked the beginning of my present status.

Chancellor Sir, the role of international trade in a country's growth and development cannot be overemphasized. From history,

international trade is known to promote economic growth and welfare of the citizenry. Also, growth is the *raison d'etre* of any economy and trade is one of the major determinants. Therefore, countries engage in all forms of trade regimes including bilateral, multilateral, regional trade agreements and free trade areas. One of the attractions of the recently established African Continental Free Trade Area (AfCFTA) is its potential to improve the welfare of Africans through the exchange of goods and services, therefore, resulting in economic growth.

The issues around International trade, economic growth and methodology in economic research have dominated my research landscape over the years. With the latter, I have endeavoured to understand the place of evidence-based research through modelling in order to approximate the real economy in answering policy concerns. In particular, I have taken special interest in an economy-wide study using Dynamic General Equilibrium (DGE) approach and the Dynamic Stochastic General Equilibrium (DSGE) variant. This has informed the direction of my current research in quantitative economics. My entry into the area was not by accident: it was the result of a dogged and deep examination of the current trauma facing our modern economy. National economies have been plagued by shocks of various amplitudes and directions compelling macroeconomists to turn their approach to policy analysis from mere “fine-turning" to a more theoretically

and quantitatively realistic method: the approach described in this lecture is one of the possible frameworks.

Therefore, in this lecture I am going to draw extensively from my perspectives in the areas of international trade and economic growth and a methodological approach to economic policy analysis. I will be showing this audience very briefly the beauty of this modeling option. This is not as a result of my love for mathematical economics but for my belief that an evidence-based model capable of incorporating the dynamics and various shocks observed in recent times will deliver more realistic alternative policy choices for decision-makers. I have laboured tirelessly over the years to encourage as much as I can young economists from undergraduate to postgraduate levels to venture into the areas of DGE and DSGE as I perceived that they are useful quantitative analytical tools for policy-oriented research. However, it is a known fact that the cost of entry into the club is very high.

2.0 Contemporary Macroeconomics

Permit me, Sir to begin my presentation from a historic perspective. Niehan (1990) in his History of Economic Theory asserts that

> "…problems of social organization, the production and distribution of material goods are more amenable to quantitative

> analysis, because flows of money and goods are measurable, and because systems of exchange can be characterized by tractable linear equations".

Niehan then suggested three periods: Classical Era, 1630-1830, where economic theory first achieved a higher level of analytical rigour in social science by focusing on questions about the flows of goods and money among interdependent sectors of the economy. The Marginalist Era, 1830-1930, saw "economic theorists worked to develop a deeper theory of the determinants of supply and demand for goods based on an assumption of rational decision-making by producers and consumers, using differential calculus to characterize optimal production and consumption plans". In the third "Era of Models", 1930 and beyond, the principles of rational-choice analysis that the Marginalists used to explain supply and demand for goods have been extended to characterize decisions by individuals in more complex competitive situations, which may involve more than just production and exchange of goods. This has developed into a more general theoretical framework as we know it today. It is in this Era of Models that I hereby situate my research endeavours.

Macroeconomic policy as we know it, originates from the theoretical contributions of John Maynard Keynes as he attempted to proffer policy advice that could pullout the economies of the

United States and Europe from the Great Depression that occurred in the 1930s culminating into the second World War (WWII). The Great depression was characterized by a drastic slump in economic output and employment in the industrialized economies. It also marked a significant ideological distinction into the Classical and the Keynesian views because the policy prescriptions of the Classical school had failed to revamp the slumped economies in the wake of the Great Depression. Drawing from the works of Adam Smith and David Ricardo among others, the central focus of the Classicals was on the nature and sources of economic growth in a nation. Their contributions were built on the assumption that an economy could attain full employment and also on the liberalist assumption that an economy had the capacity to re-adjust itself to equilibrium when perturbed by shocks. In this instance, the Classicals called for minimal government interventions since the invisible hand, they believed, could help the economy correct itself.

Chancellor Sir, the beauty of the economics profession is the process that leads to arguments and counter arguments virtually on all issues. This has led to the emergence of several schools of thoughts in the discipline culminating in substantial progress in the profession. Most of them are variants of the orthodox mainstream economics- Classical and Keynesian from which

other schools emerged. Permit me to mention some of these schools: Neo-classical, Monetarist and New Keynesian. The other schools including Austrian, Marxian, Behavioural and Post Keynesian belong to the dissenters or heterodox schools. I belong to the mainstream but of the New Keynesian variant.

2.1 What is Macroeconomics?

Macroeconomics is a mainstream field in economics that studies the behaviour of the economy as a whole. Macroeconomics has been concerned with several issues including short-term cyclical fluctuation, medium to long-term economic growth, output, inflation and unemployment. As a field, macroeconomics has over time, analysed aggregate economy outcomes using macroeconomic models that are highly stylized and abstract from reality. The use of macroeconomic models started with simple theoretical models that were used to describe and postulate macroeconomic relationships and phenomena based on abstract assumptions that were empirically unverified. The next wave in the use of macroeconomic models began in the 1940s and 1950s with the development of large-scale macro-econometric models by economists such as Lawrence Klein, James Duesenbery and research at the Cowles Commission.

The models were a system of equations (15 to 100 or even thousands) showing the interrelations among economic variables.

They possessed co-efficients that were empirically estimated and simulated based on actual data of the United States economy. The computed coefficient values were after that used to describe and infer about the state of the economy for economic policy analysis and design. The large-scale macro-econometric models remained the state-of-the-art tool of economic analysis until the publication of the Lucas (1976) critique in which he stated that the coefficients estimated from such empirical model varied whenever policy changed, thereby rendering them unreliable for policy analysis and forecast. Lucas argued for the formulation of structural econometric models possessing a robust theoretical base and micro foundation that captures an economy's structure. This required developing models that capture the forward-looking and optimizing behaviour of economic agents in the macroeconomic models to be used for policy analysis.

Several economists responded to this critique by constructing macroeconomic models built upon the optimizing decisions of microeconomic agents called the Real Business cycle model by New Classicals and Dynamic Stochastic General Equilibrium models by the New Keynesians. For instance, the New Keynesian Dynamic General Equilibrium Models adopts rational expectation assumptions of forward looking and optimizing economic agents. They deviate from classical assumptions of frictionless markets, flexible prices and neutrality of money and believe in nominal and

real rigidity. They recognize that both real and nominal shocks can perturb an economy.

3. **The Modern Dynamic Macroeconomics**

3.1 The Basic Framework

Chancellor Sir, I had reiterated earlier in this presentation that our economy is plagued with numerous uncertainties that could make policy making a herculean task in the face of old methods of analysis. In practical terms, policy making involves trade-offs between competing alternative forces. There was, therefore, the need to move away from piecemeal approach to a more realistic dynamic general equilibrium method. According to Christiano et. al. (2018), "DSGE models are the leading framework that macroeconomist have for dealing with the problems in an open and transparent manner".

The basic framework is the Dynamic General Equilibrium (DGE) model that gave credence to the Computable General Equilibrium (CGE), Real Business Cycle (RBC), the Dynamic Stochastic General Equilibrium (DSGE) and the Overlapping Generation (OLG). I have chosen to be associated with the DSGE approach whose theoretical background is rooted in the New Keynesian school of thought.

In the words of Taylor (2016),

> "models are indeed dynamic, stochastic, and characterize the general equilibrium of the economy. They make three strategic modeling choices: First, the behaviour of consumers, firms, and financial intermediaries, when present, is formally derived from micro-foundation. Second, the underlying economic environment is that of a competitive economy, but with a number of essential distortions added, from nominal ties to monopoly power to information problems."

Taylor (2016) continues,

> "model is estimated as a system, rather than equation by equation as in the previous generations of macroeconomic models. ... Current DSGE models are best seen as large-scale versions of the New Keynesian model, which emphasizes nominal rigidities and a role for aggregate demand."

3.2 Perspectives on DSGE Modelling

It will be difficult to run a modern economy in the globalized world with the rule of thumb if the government does not have appropriate quantitative framework or an evidence-based approach to understand, estimate, simulate and forecast trends in the economy in order to take appropriate policy decisions. DSGE models are the immediate response for several reasons. For instance, DSGE is useful as a workhorse for macroeconomic research; a tool for economic policy analysis; helps in optimal allocation of natural resources for countries like Nigeria; helpful tool of analysis for monetary and fiscal policies in order to engender effective management of exchange rate, interest rate and prices; useful in assessing new investment strategies; and help in improving budgetary processes for optimal allocation of resources (Ncube, 2017).

This framework is also adequate to study the effects of stochastic multiple shocks hitting the economy and can also be used to study structural changes in the economy (for instance, a tax change or the introduction of a new tax). The implications of the above are that DSGE models are useful in the following areas: provide insights into policy making; forecasting; scenario analysis; optimal policy exercises; counterfactual simulations; and policy evaluations that are immune to the Lucas critique.

What makes DSGE unique after all? The issue of policy analysis is

crucial. Macroeconomic policy questions do involve trade-offs between competing forces in the economy. The major problem is how to assess the strength of those forces for the particular policy question at hand. DSGE helps in this matter. For example, consider the following scenario: will exchange rate depreciation stimulate an economy? There are possibilities. First, it may stimulate demand for domestic goods since the price of exports will reduce and increase the price of imports. In another vein, it may reduce the net worth of firms or even households that have un-hedged foreign debt. In the case of Nigeria where there is total dependence on imported intermediate inputs, capital as well as consumption goods, activities in the productive sectors will be dwindling. The problem now is to choose from these options the one with stronger effects. DSGE is useful in this context.

The failure of Real Business Cycle (RBC) to account for nominal shocks led to the emergence of DSGE method of analysis. However, the DSGE method also failed to predict the Global Financial Crisis. There are established reasons for this in the literature. One of them is that the pre-crisis DSGE failed to consider financial frictions. We now turn to the second criticism against DSGE models, namely that they did not sufficiently emphasize financial frictions. In practice modelers have to make choices about which frictions to emphasize. One reason why

modelers did not emphasise financial frictions in DSGE models is that until the recent crisis, post-war recessions in the U.S. and Western Europe and indeed the world economy, did not seem closely tied to disturbances in financial markets.

For the records Sir, Prof. Chukwuma Soludo, the then Governor of Central Bank of Nigeria (CBN) once boasted that the Nigerian economy was so immuned that it could not be affected by the global financial crisis. The rest is history. It affected the economy through the capital market as some banks and credit houses invested in foreign bonds. Hence, contemporary DSGE modelling incorporates financial frictions which can loosely be shared between papers that focus on frictions originating inside financial institutions and those that arise from the characteristics of the people who borrow from financial institutions.

This area of research has not gained sufficient currency in our environment. Nigerian Universities and indeed research centres in the country have not exploited this approach, except the Central Bank of Nigeria (CBN) where it should be seen as an imperative additional tool in achieving its macroeconomic policy objectives. Adebiyi and Mordi (2010), Adebiyi and Mordi (2016), Olayeni (2012), Adegboye (2015), Oye (2018) are some of the researchers in this respect.

3.3 On the Structure of DSGE Model

Imagine the new policy of the government of Nigeria to close all the borders nationwide. Government expects an upsurge in domestic production, employment, welfare improvement and poverty reduction. It should be expected that there would be loss in tariff revenue and inflation in the short run. In this little scenario, consumers, producers, institutions are involved. There is bound to be losers and gainers. Therefore, there is the need for quantitative assessment of the interactions between the different agents in the Pareto sense.

This method of analysis began with the Real Business Cycle model as pioneered by Kydland and Prescott (1982) and Long and Plosser (1983). These early real business cycle models imagined an economy populated by households who participate in perfectly competitive goods, factor, and asset markets. These models took the position that fluctuations in aggregate economic activity are an efficient response of the economy to the one source of uncertainty in agents' environment, exogenous technology shocks. The associated policy implications are clear: there is no need for any form of government intervention. Government policies aimed at stabilizing the business cycle are welfare reducing (Linde, 2018).

A typical DSGE model is constructed on the following three blocks: Household, Firms and Government. It could be extended to include: Households, Final goods producers, Intermediate

goods producers, central bank, fiscal authorities, Market clearing conditions and the Shock processes.

One of the strong points of DSGE models over others is the ability to incorporate uncertainties or shocks in a dynamic form. These shocks may be exogenous or endogenous depending on the phenomenon under study. Permit me to mention a few of them as follows:

3.3.1 Shocks, Uncertainties and Innovations

Chancellor Sir, this methodology was influenced by the presence of uncertainties or shocks that distort the trajectory of the economy. These shocks are possible sources of disruption to our economy. If not adequately tamed, our economy could be disrupted. The method being discussed was prompted by these multiple of uncertainties. To some of these shocks I now turn in the following paragraphs:

Technological shocks: This explains the changes experienced in production functions overtime. For instance, modern technologies including computers and machinery alter production processes positively by increasing overall productivity. Thus, breakdown of these modern facilities will reduce productivity and negatively affect output. Hence, technological shocks change is not always smooth.

Monetary Shocks: This is experienced through the real effects of

monetary policy in an economy. Hence, expected random changes to interest rates and money supply are potential sources of economic fluctuations.

Weather and natural disaster shocks: Many sectors in our economy, in particular, agriculture are susceptible to weather changes. This may generate fluctuations in final output. This is also similar in the case of natural disaster like erosion and earthquakes. It could trigger cyclical fluctuations.

Political Shocks: The government as a significant stakeholder influences the economy directly through her agencies and parastatals, and indirectly through laws and regulations. Changes in government expenditure and tax laws among others, are potential sources of economic fluctuations.

Trade Shocks: Government can influence trade with her partners through tariffs, qualitative trade restrictions and other non-tariff barriers. This will come to the receiving partner as unplanned policy shift and, therefore, may cause business cycle fluctuations. The case of the Republic of Benin is a good reference.

News Shocks: These are news items that could influence the behaviour of economic agents in an economy. In the race towards the 2019 general elections various news items prompted investors to divest from the Nigerian economy. This could have generated the loss of jobs and fall in production observed. This phenomenon could drive cyclical fluctuations.

Resource Shocks: An unexpected discovery of mineral resources could lead to higher income generation and, therefore, greater spending by government. This may cause business cycle fluctuations as the discovery of a new source of revenue may lead to the phenomenon of Dutch disease in the economy.

Environmental Shocks: Environmental economics is defined as the study of the economics of natural resources from both sides of their extraction and use, and the waste products returned to the environment. These activities could subject the economy to cyclical fluctuations in case of any shocks to those variables.

While these shocks could hit any economy, the degrees at which they impact the individual economy differs. However, irrespective of their degrees in developed economies, economic shocks and disturbances are mostly more significant in developing economies like Nigeria to serve as a direct explanation of business cycles. In the same vein, these shocks are amplified and propagated overtime in an economy through different mechanisms such as intertemporal substitution within an efficient market mechanism, frictions in financial sector and sticky prices.

3.3.2 The Return of Real Shocks

Recall that the quantitative model of Kydland and Prescott (1982) was assumed to be propagated by technological shocks and constituted the beginning of the first phase of Real Business Cycle Research. We are in the 21st century and the era of 4th industrial

revolution. The 1st Revolution was tagged mechanized/agriculture. The 2nd was the electrical/mass production. The 3rd was named internet/jet age while the 4th is tagged digital revolution. The 4th Industrial Revolution is characterized by Robotics, Artificial Intelligence, Machine Learning, Virtual Reality and augmented Reality to mention a few (Schwab, 2016). These technologies will shape future world of production and employment and all other human and economic activities. The modern approach should incorporate these shocks into a framework such as the DSGE models to avoid disruption or to welcome it with robust preparedness.

Chancellor Sir, I observe that the Nigerian nation has witnessed some of the shocks highlighted above. However, the nation is susceptive to more intractable shocks in the form of Boko-haram insurgency, banditry, kidnappings, and armed robbery, to mention a few. These are seemingly socio-political issues but with dare economic consequences. However, I imagine another one that is not a shock but an early warning signal to probable recession or even depression: that is non-functionality of Nigeria's Steel Industry. I have said it in another forum in the past, let me say again, that a nation without this all important industry, depending much on imports for consumers, intermediate inputs and capital goods is doomed if not in the short run but the long run. I believe that it is challenging to be dependent on imports and not experience cyclical fluctuations.

3.3.3 Canonical DSGE Model

Recall that economics is about theory and measurements and economists do this through models (Sergi, 2017). These models help to understand, forecast and help in suggesting policy advice to decision makers. However, today it has become difficult to separate economics training from mathematics, statistics and econometrics emphasizing sound economic theory. Dynamic stochastic general equilibrium modelling (DSGE) is a method in macroeconomics that attempts to explain economic phenomena, such as economic growth and business cycles. It could also be used to study the effects of economic policy, using econometric models based on applied general equilibrium theory and microeconomic principles. It is built on the New Keynesian school of thought, as mentioned earlier.

Permit me, Sir, to present a simple/canonical DSGE model in order to show how it works. The model, being envisaged, is an abstraction from the reality. These models are compelling framework for macroeconomic research addressing economic growth, business cycle and monetary policy. In that wise, the underlying assumptions are: perfect competition in all markets; all prices adjust instantaneously; rational expectation prevails; no asymmetric information; firms are identical and price takers; and infinitely lived identical price-taking households to mention a few.

According to Chari, Kehoe and McGrattan (2009), "there is no other game in town"

> …any interesting model must be a dynamic stochastic general equilibrium model. From this perspective, [...] A useful aphorism in macroeconomics is: If you have an interesting and coherent story to tell, you can tell it in a DSGE model.

Therefore, a canonical DSGE model in the spirit of New Keynesian School consists of a three-equation system derived from decentralised optimisation of the respective agents:

$$x_t = \mathrm{E}(x_{t+1}) + \frac{1}{\sigma^c}[R_t + \mathrm{E}(\pi_{t+1})] + \varepsilon_t^c \quad (1)$$

$$\pi_t = \rho^{\pi}\mathrm{E}(\pi_{t+1}) + \psi x_t + \varepsilon_t^{\pi} \quad (2)$$

$$R_t = \rho_1^R R_{t-1} + \rho_2^R \pi_t + \rho_3^R x_t + \varepsilon_t^R \quad (3)$$

Equation (1) describes the goods market equilibrium, as a function of the expected output gap x_t the elasticity of consumption σ^c and the expected real interest rate, R_t. Equation (2) sets the evolution of aggregate prices, as a function of expected inflation $\mathrm{E}(\pi_{t+1})$ and the degree of price rigidity ψ. Equation (3) accounts for central bank's behaviour in setting

nominal interest rate R_t (P_i^p i=1,2,3) being sensitivity parameters). The dynamics of the model economy around its steady state results from stochastic identical, independently distributed (i.i.d) disturbances on preferences, technologies and monetary policy.

I will now use Fig. 1 to show how the model works in a real economy. In that figure, there are three rectangular blocs representing the demand, supply and monetary blocks which are interrelated. The interactions between these agents lead to market-clearing per time. Hence, the term: general equilibrium. The demand block determines output, Y, as a function of real interest rate and expectation ofoutput. When interest rate is high, people and firm will prefer to save, consume or invest. Under such condition, people are willing to spend more when the future prospect is high regardless of high-interest rate.

The connections between demand and supply show that the level of output, Y, resulting from demand is a key factor in the determination of inflation as well as the future expectation of inflation, π^e. In the period of boom, wages must rise to induce workers to work long hours. This will lead to an increase in marginal cost and therefore, higher inflation. The third rectangle represents the monetary policy block where the interest rate is determined by output and inflation already determined from the other two blocks. The central bank can raise the short-term interest rate when the economy is overheated or when inflation

rises and vice-versa in case of contraction. In effect, any adjustment brought to the nominal interest rate will cause changes in output and inflation as indicated by the interactions of this block with the other blocks. The policy rule closes the cycle, thus providing a complete model of the endogenous variables: Y, π, i. Sbordone (2010) reiterated that the conduct of monetary policy has a large influence on the formation of expectations. In DSGE models expectations is the main channel through which policy affects the economy. Hence, the need to promote confidence in the economy. This is why financial markets and the general public pay attention to the pronouncement of central banks on their likely course of action.

The last component of a DSGE model is the presence of stochastic processes. In each period, random exogenous events perturb the equilibrium conditions in each block provoking uncertainties in the evolution of the economy and thus generating economic fluctuations. Without these shocks, the economy would evolve along the long-run growth path without booms or bursts. This is represented by parallelograms with arrows pointing in the direction of equilibrium conditions.

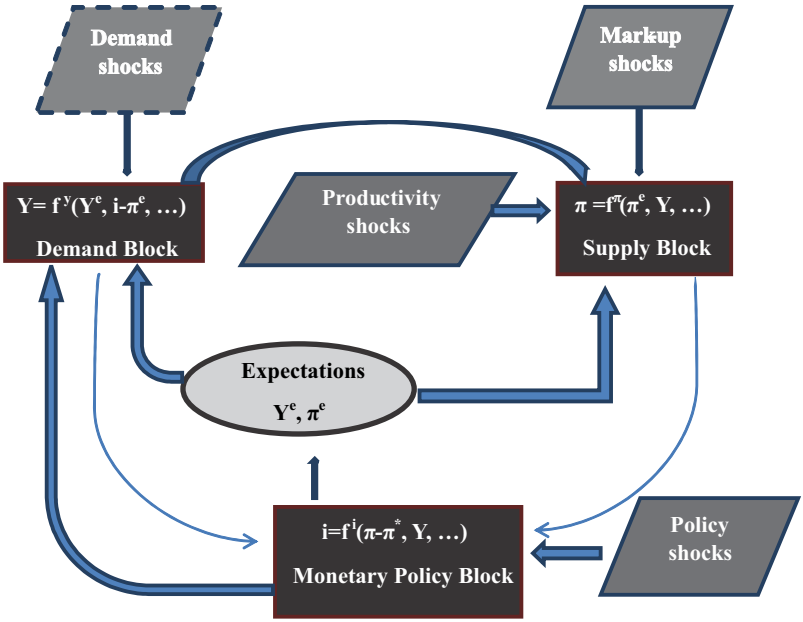

Fig. 1: Basic Structure of DSGE Model
Source: Sbordone *et al.* (2010)

According to Goodfriend and King (1997, 232),

> …DSGE models are new neoclassical synthesis. The new synthesis involves, methodologically, the systematic application of intertemporal optimization and rational expectations as stressed by Robert Lucas. In the synthesis, these ideas are applied to the pricing and output decisions at the

heart of Keynesian models, new and old, as well as to the consumption, investment, and factor supply decisions that are at the heart of classical and RBC models.

3.3.4 Current State of Art of DSGE Modelling

Blanchard (2008) opines that DSGE models have become ubiquitous. In the recent times, there has been dozens of teams of researchers, in different institutions that are involved in the construction of these models. Most of the central banks have one or striving to have one. They are used to evaluate policy rules, to do conditional forecasting, or even sometimes to do actual forecasting. In view of its flexibility, it has gained incursion into other areas of economic discipline. This includes: international trade, informal sector, energy and environment as well as agriculture.

4.0 My Contributions to Knowledge

4.1 My Current Research Focus

The study of the causes of fluctuations and different cycles of growth is embodied in business cycle research. This is the cyclical movement in the pattern of production, trade and general economic activities involving periods of expansion and contraction. It is also the upward and downward movement of the Gross Domestic Product (GDP), and it basically covers four

stages: expansion/boom, peak, recession/burst, trough (Fig. 2). The boom is the period of higher productivity, sales and wages, which may result into inflation. The reverse of this state is the slowdown phase where there is lower market demand, sales and GDP. When this decline goes on for two successive quarters, then it becomes a recession. The expansion or recovery period occurs when the economy starts to improve while depression is a long term decline of economic activity which is a more persistent and severe recession. This cyclical nature of an economy overgrowth is depicted in Fig. 2. A number of factors contribute to these fluctuations.

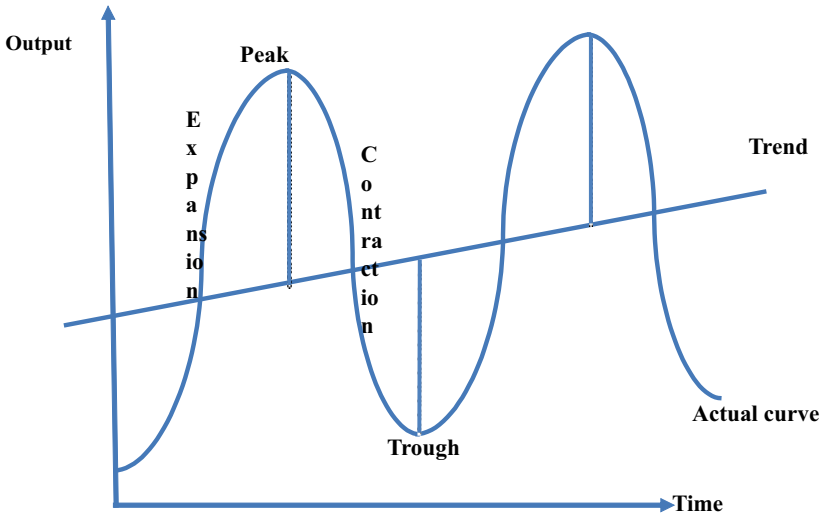

Fig. 2: Phases of a Business Cycle
Source: Author

4.1.1 Some Key Concepts

It is essential to understand the statistical tools used in characterizing the existence of business cycle fluctuations. I have briefly discussed the major ones, below:

Measurement of the amplitude of fluctuations: This is concerned with determining the volatility or relative volatility of a country's GDP and its key components. The volatility is measured in the per cent of the standard deviation of the variable being considered. Also, the relative volatility is measured by the ratio of standard deviation of the variable to that of the real GDP. In terms of interpretation, a high mean value and relative volatility greater than one show that such variable is undergoing very high fluctuations.

Measurement of the direction of movement of a variable: This has to do with the direction of movement of a variable with respect to the real GDP. From this, we can ascertain whether some macroeconomic variables are countercyclical, pro-cyclical or acyclical.

Measurement of phase shift: This helps us to identify whether a variable is leading, lagging or is a synchronised (co-incident) indicator with GDP.

4.1.2 Some Stylized Facts of the Nigerian Economy

This sub-section draws heavily from several published and

unpublished papers by me and my associates in the field of business cycle dynamics or as we may call it: the stylised facts of the Nigerian economy.

From my research over the years, findings point out that there is very high volatility between the deviation in real GDP and deviations of the other variables in Nigeria. A striking feature of the real GDP is the observed high volatility at about 7.95 per cent (Table 1). This figure is very high in the case of Argentina and much higher than that of the United States of America (USA).

Findings also show that the volatility of consumption is larger than that of real GDP, although this result is contrary to theoretical prediction, it is not uncommon by international standards (Kydland and Zarazaga, 1997). Consumption expenditure was found to be pro-cyclical to the real GDP given the positive contemporaneous correlation. However, we discovered that the low correlation observed might be an indication that Nigeria's business cycle is indeed not different from other countries in the sense that shocks are as permanent as in other countries.

In terms of investment, its relative volatility is very high at 4.25, but it is pro-cyclical in line with theoretical prediction. The variable leads the real GDP, thereby providing evidence to growth theories that investment drives economic growth.

Government expenditure is subject to high fluctuations in Nigeria, given the relative volatility and considerably higher than

international figures. It is also pro-cyclical whereas it is acyclical in Argentina and USA. This high correlation between real GDP and government consumption attest to the fact that government is heavily involved in economic activities in Nigeria. In effect, government expenditure had constituted a significant component of GDP over time.

Total import and exports are both pro-cyclical with the business cycle in Nigeria. Furthermore, evidence shows that they are both subject to tremendous volatility. This is expected given the high dependence on commodity items in driving our trade.

Table 1: Cyclical Behaviour of Real GDP and its Main Components: A Comparative Analysis

	***Nigeria**	****Argentina**	****United States**
Real GDP Volatility	7.95%	4.59%	1.71%
Total Consumption	Pro-cyclical	Pro-cyclical	Pro-cyclical
Contemporaneous Correlation Volatility	0.076 20.44%	0.96 ----	0.82 ----
Relative Volatility	2.57	1.19	0.73
Phase Shift	Lagging	Coincidental	Coincidental
Gross Fixed Investment	Pro-cyclical	Pro-cyclical	Pro-cyclical
Contemporaneous Correlation Volatility	0.311 33.79%	0.94	0.90

Relative Volatility	4.25	2.90	3.15
Phase Shift	Lagging	Coincidental	Coincidental
Government Consumption	Pro-cyclical	Acyclical	Acyclical
Contemporaneous Correlation Volatility	0.205 67.60%	0.20	0.05
Relative Volatility	8.50	3.19	1.21
Phase Shift	Leading	Lagging	Lagging
Government Revenue	Pro-cyclical	----	----
Contemporaneous Correlation Volatility	0.682 34.61%	----	----
Contemporaneous Correlation Volatility	0.682 34.61%	----	----
Relative Volatility	4.35	----	----
Phase Shift	Lagging	----	----
Total Imports	Pro-cyclical	Pro-cyclical	Pro-cyclical
Contemporaneous Volatility	0.120 30.78%	0.81	0.71
Relative Volatility	3.87	4.05	2.88
Phase Shift	Lagging	Coincidental	Coincidental
Total Exports	Pro-cyclical	Countercyclical	Pro-cyclical
Contemporaneous Volatility	0.501 33.94%	-0.61	0.34
Relative Volatility	4.27	1.68	3.23
Phase Shift	Lagging	Coincidental	Lagging

Note: The figures for Argentina and United States are indicative only

Cyclical Behaviour of Real GDP and Other Macroeconomic Variables

In this sub-section, we consider how the cycle of real GDP interacts with other major macroeconomic variables. The first thing to observe is the high volatility of the variables considered under this group. The figures show that monetary aggregates, RM1 and RM2, are pro-cyclical. However, RM1 is slightly weakly contemporaneously correlated; RM2 is contemporaneously uncorrelated with the cycle. Table 2 also shows that both are leading the cycle. Besides, they are highly volatile with relative volatility at about 5.74 and 4.68, respectively. The up- and down-swings of these aggregates reached a crescendo in 1999.

Inflation rate has the weakest link with cross-correlation coefficient of about 1.7 per cent in absolute terms. Interest rate is pro-cyclical and leading. However, inflation rate with negative correlation with the real GDP indicates a countercyclical variation. This behaviour suggests that supply shocks may have been a key determinant of domestic macroeconomic fluctuations. The exchange rate also displays a countercyclical profile with real GDP in Nigeria.

These results are in no way surprising. First, the frequent and cumbersome changes in fiscal and financial regime experienced during the period cannot be overstated. In effect, the oil price

shocks of the period had consequences for monetary policy and money supply. Second, reforms in the monetary sector affected interest rate determination and hence, the interest rate cycle.

Table 2: Cyclical Behaviour of Real GDP, Monetary Aggregates and Prices

	*Nigeria	**Argentina	** United States
Real GDP Volatility	7.95%		
RM1	Pro-cyclical	Countercyclical	Pro-cyclical
Contemporaneous Correlation Volatility	0.130 45.64%	-0.36	0.31
Relative Volatility	5.74	15.13	1.00
Phase Shift	Leading	Lagging	Leading
RM2	Pro-cyclical	Countercyclical	Pro-cyclical
Contemporaneous Correlation Volatility	0.142 37.23%	-0.40	0.46
Relative Volatility	4.68	12.51	0.88
Phase Shift	Leading	Lagging	Lagging
Prime Interest Rate	Countercyclical	----	----
Contemporaneous Correlation Volatility	-0.093 22.11%	----	----
Contemporaneous Correlation Volatility	-0.093 22.11%	----	----

Relative Volatility	2.78	----	----
Phase Shift	Leading	----	----
Average Wage Rate	Pro-cyclical	----	----
Contemporaneous Correlation Volatility	0.98 52.92%	----	----
Relative Volatility	6.66	----	----
Phase Shift	Lagging	----	----
Inflation Rate	Countercyclical	Countercyclical	Countercyclical
Contemporaneous Correlation Volatility	-0.222 88.74%	-0.47	-0.57
Relative Volatility	11.16	16.92	0.82
Phase Shift	Leading	Lagging	Leading
Exchange Rate	Countercyclical	Countercyclical	----
Contemporaneous Correlation Volatility	-0.036 33.30%	-0.61	----
Relative Volatility	4.19	16.04	----
Phase Shift	Leading	Lagging	----

Note: RM1 is Narrow Money; RM2 is Broad Money

Business Cycle Stylized Facts: A Summary

In this sub-section, the main findings of this section which is to document business cycle stylized facts for Nigeria are summarized. The summary is based on the computations earlier discussed, and some level of international comparison is engaged.

The results are as follows:

Economic activity in Nigeria, as measured by the real GDP, is volatile. The volatility is the standard deviation of the filtered cyclical component. It is much higher in Nigeria than in Argentina and USA.

Private consumption in Nigeria is pro-cyclical. This is consistent with international standards.

Gross fixed investment, though it has high relative volatility, is pro-cyclical, which conforms with the theoretical prediction.

Government consumption expenditure is pro-cyclical, although with very high relative volatility while government revenue is also pro-cyclical with the cycle. This corroborates the Nigerian economic environment of the period under study.

Nigeria's external trade as measured by total import and total export is pro-cyclical to the cycle. This is consistent with the economy that is highly import-dependent on the one hand and highly mono-cultural depending on oil export for foreign exchange earnings on the other.

These results show that there exist business cycle fluctuations in Nigeria, and thus, quantitative models were built for the economy. These business cycle statistics and others should be established before envisaging the construction of a DSGE model.

4.1.3 My Contribution to Research in DSGE Modelling

Chancellor Sir, permit me to now turn to my current area of research which is centred on dynamic macroeconomic modelling. I have discussed this extensively in the previous section of this presentation. I contend that the pursuit of a widely accepted analytical macroeconomic core for discussions and extensions, maybe a pipe dreams. However, it is a dream surely worth pursuing (Taylor, 2016). One of the growing advantages of this modelling style is its flexibility for an extension to many other areas of economic research. I will, in the following paragraphs, present my incursion into renewable energy economics, energy demand, continental free trade, commodity pricing and minimum wage issues using this approach.

Macroeconomic modelling for empirical research in the past has focused and put more emphasis on the partial equilibrium approach, which seemingly has less rigour compared to the general equilibrium approach. Hence, my interest to capture the interactions between economic agents as active players in empirical modelling and using a different methodological approach inspired my research interest in business cycle fluctuations and by extension Dynamic Stochastic General Equilibrium (DGSE) modelling.

Convergence, also known as the catch-up effect, was developed by Clark Kerr. It postulates that developing nations will more rapidly

than the industrialized countries when technology is introduced to them in the early stages of industrialization and money is sent to them from the developed countries. In testing the veracity of this hypothesis, I carried out research on the topic: Are There Any Feasible Anti-Cyclical Policies for Nigeria in the Era of Global Economic Crisis? (Alege, 2010) to examine the role of Nigerian domestic macroeconomic policies in managing the pro-cyclical effects of externally generated boom-bust cycles and estimate the responses of monetary and fiscal policy to unanticipated shocks over the different horizon. Moreover, since Nigeria is trading with other nations, it is essential to understand the implications of the global economic crisis on the Nigerian economy.

The findings of this research shockingly reveal that Nigeria is far from converging towards a sustainable equilibrium in the short run analysis. However, when the analysis was carried far into the horizon, there was an indication that the variables converged uniformly to the steady- state equilibrium. It also shows that both monetary and fiscal policies could be used to address the impact of global crisis.

A Business Cycle Model for Nigeria (Alege, 2008) empirically tests and shows that productivity shock, money supply growth shock and export supply growth shock contributed in the statistical sense in explaining business cycle as driven by both real and nominal shocks. In effect, it is a known fact that the Nigerian

economy is highly dependent on her export earnings, especially crude oil exports. Foreign currency generated from this source is injected back into the economy without being sterilised for long. The consequence of this is the unprecedented growth rate of money supply into the economy. The impact of this confirms theoretical underpinnings in the sense that price increases, engendered by high money supply into the economy, have manifested in high nominal wage and interest rate over the most of the period under study. High growth rate of money supply in the economy may also be explained by excessive non- sterilization of foreign exchange earnings to finance expansionary monetary and fiscal policies.

The magnitude of the parameter estimates is reinforced by the results of similar studies using the same methodology (DSGE) and the same variant (cash-in-balance) (Nason and Cogley, 1994 and Scorfheide, 2000) (See Tables 1 and 2). This shows that not only do business cycles exist in the Nigerian economy; modern computational methods can be used to capture the phenomenon. The results also suggest that productivity shock is relevant to the Nigerian economy in the same way that Kydland and Prescott (1982) proposed. The results also confirm the New Keynesian analysis (which forms the theoretical base of this study) that both real and nominal factors do explain business cycles.

A significant finding of the study is the fact that the export sector,

which is supposed to be the engine of growth of the economy, is exhibiting weak linkages with the rest of the economy. This may not be unconnected with the outward-looking nature of the Nigerian economy with import value almost matching the export value. This is one of the consequences of Dutch Disease syndrome, which has affected the economy in two ways: resource movement effect and spending effect. Going by the results obtained in this paper, and given the methods of estimation applied a more elaborate model for the study of business cycle fluctuations in Nigeria can be envisaged.

In a paper titled Changes in Head of Government and Macroeconomic Fluctuations in Nigeria, Oye and Alege (2015) investigated the effects of changes in heads of government on economy-wide fluctuations of macroeconomic variables in Nigeria. However, the empirical evidence revealed that changes in heads of government are insignificant and negative in explaining fluctuations in economic growth. Therefore, our findings do not support the existence of political cycle such that changes in government have had no significant effect on inducing changes in the economy. In short, government turnover exerted a negligible but negative effect on economic growth.

On the one hand, the negative relationship between economic growth and the political dummy variable representing changes in

government supports the hypothesis that frequent changes in government (a measure of the extent of political instability) can negatively impact the aggregate economy. On the other, the negligible impact of political (dummy) variable measuring government turnover can be explained by three plausible reasons. Firstly, a political shock is negligible as a source of fluctuation in Nigeria. The second reason is that the Nigerian economy may be resilient to absorb readily, politically induced shocks; while the third and most important reason is that changes in government have no direct impact on the economy but exert an indirect effect via changes in the economic policy choices that accompany changes in heads of government over time (Hicksen, Satyanath and Sergenti, 2005).

In any regional trade agreement (RTA), the potential for tensions exist. Such conditions need be addressed if the regional trade body would achieve its objectives. In a recent paper Alege, Oye, Adu, and Ayodele, (2019) examined the potential sources of tension in AfCFTA using business cycle methodology with the aim to establish and compare business cycles across the continent. The paper employs the HP-detrended macroeconomic data for some African economies in the computation of the business cycle statistics. In the course of the study, cross-correlation coefficients were derived using the de-trended GDP data from a sample comprising of the most significant 10 African economies. There is a direct relationship between Gross Domestic Product (GDP) and

other selected macroeconomic variables further reaffirming the presence of procyclical relationship. More evidence from the study was in support of the presence of business cycle harmonization among African economies. The two findings validate the fact that African economies exhibit the same cyclical patterns. This result provides the platform for macroeconomic policy interactions cutting across the African continent and for the success of trade policies within the continent, example AfCFTA.

Using the summary statistics, the study's evidence supports the existence of business cycles with documented business cycle facts for 39 selected African countries. HP-filtered macroeconomic variables that covered the aggregate economy, domestic demand were also used. Fiscal policy and trade were modelled in the cyclical analysis. The findings from the study revealed a similar cyclical pattern for the countries captured in the study indicating that African countries exhibit the same cyclical patterns. The study provided a documentary approach to contemporaneous correlation coefficients, relative volatility and phase shifts, and the procyclical pattern of African economies was validated with the incidence of recurring evidences among the sub-samples of the selected African countries. It was observed that the selected macroeconomic variables portray positive correlation with GDP, suggesting that household consumption, investment, government spending and exports are expanded by the African economies.

One of my most recent studies, focused on examining the challenges of low commodity prices in developing economies (Adoh, Alege and Adu, 2019). The study applied a Dynamic Stochastic General Equilibrium (DSGE) model, estimated by Bayesian procedure, capturing the case of Cote d' Ivoire to evaluate the relevancy of different forms of shocks in explaining fluctuations in macroeconomics. The model contains four stochastic shocks consisting of productivity, the international price of cocoa, state expenditure and interest rate on external debt. The model incorporated the behaviour of three main macroeconomic variables of GDP growth, consumption, and investment. The Bayesian result shows that the price of cocoa at the international level constitutes the dominant source of macroeconomic instability experienced in Cote d'Ivoire. Notably, the study discovered that productivity shocks are insignificant and transitory, particularly in respect to real GDP growth. Another important finding from the study is that Fiscal policy is pro-cyclical, and there was no significant role associating it with the Cote d'Ivoire economy. Further evidence from the conditional variance decompositions and smoothed shocks validates that the model adequately explained policy shocks emanating from the analysed data.

The study made an essential contribution to the paucity but increasing level of knowledge on business cycles in sub-Saharan

African economies. The purpose was to relatively and quantitatively assess the role of important varieties of shocks in the high level of volatility noticed in these countries with the application of the DSGE model. Cote d'Ivoire was chosen as a case study for the analysis because of its importance in West African region. Previous studies in this area focused on a few sub-groups of potential sources or applied a variant model in its analytical approach, such as structural vector autoregression (SVAR). We were able to complement the single-sector neoclassical growth model of a small open economy with shocks that are transitory shocks productivity, taxation and interest rate in examining the contribution of all sources of fluctuations.

Recently, the Federal Government of Nigeria (FGN) consented to the implementation of a newly enacted Minimum Wage repeal and Enactment Act (2019). It is expected to have varying macroeconomic effects on the economy, including wage effects, employment effects, distributional effects, welfare effect and price effects, among others. Therefore, this new minimum wage, ₦30,000 from ₦18,000 raises questions like which of these macroeconomic effects will it impose on the economy and to what extent?

On the one hand, an increase in the minimum wage is expected to enhance the standard of living of the people; and positively affect the productivity of employees, increase consumer spending and

aggregate demand in an economy (Cuong, 2011). On the other hand, evidence subsists that an increase in the minimum wage might not itself induce any welfare increase to workers. This may occur when firms attempt to hedge cost by reducing non-cash components (labour employment) or even respond by increasing the price of their goods and services.

The result obtained from the estimation and simulation of the Dynamic Stochastic General Equilibrium Model carried out by Alege, Oye, Adu and Ogundipe (2019) revealed that the 2019 minimum wage was 66.67 per cent higher than the 2011 wage price. This result is only 5 per cent higher in terms of impact on the Nigerian economy signifying that ₦30,000 wage price is not sufficient to increase the poor standard of living of Nigerians. More so, the 2019 minimum wage has only short-term benefits for the Nigerian economy.

In the area of energy demand, Alege, Oye, Adu and Jolaade (2019) built a DSGE model in order to investigate the macroeconomic effect of energy shocks on the Nigerian economy. With this model, we simulate how relevant macroeconomic variables respond to shocks in the energy and fiscal sectors. The DSGE models are increasingly being used in the literature in order to capture the effects of shocks in the economy. The interactions among the different economic agents are identified in a DSGE framework in such a way that mirrors realistic events in the economy. The

relevant model used in the study entails several extensions of a basic DSGE model by incorporating some essential features to an emerging economy such as Nigeria. The model is assumed to comprise of a household sector and both energy and non-energy firms. The presence of the Nigerian government is also captured in the model. Also, the study documents some salient business cycle characteristics of the Nigerian economy concerning energy sources.

The results indicated that renewable energy sources in Nigeria, such as energy from combustible renewables and waste and energy from hydroelectric sources have a countercyclical relationship with output in Nigeria, while that of alternative and nuclear energy is seen to have a pro-cyclical relationship. From a more general perspective, renewable energy consumption in Nigeria is pro-cyclical, suggesting that the consumption or demand for renewable energy tends to increase during periods of economic expansion and growth. This is not surprising given the relative cost of energy prices. In terms of the non-renewable energy sources, all of them are pro-cyclical and seen to exhibit relative volatility higher than one indicating that they are highly susceptible to macroeconomic fluctuations.

Having estimated the DSGE model, the Bayesian results revealed the existence of a procyclical fiscal stance, which is typical for an oil commodity-exporting country like Nigeria (Alege, 2009). The

result also indicates that energy shock transmits in a moderately slow manner onto the economy. Furthermore, both energy-specific technology and debt shocks were found to have a macroeconomic impact. The output from the Bayesian impulse response analysis showed that the energy-specific technology shock has a direct and positive impact on the economy while the energy price shock has an indirect impact through the channel of energy revenue. The results generally reveal that positive energy shocks impact the economy favourably but also in a trivial manner. This implies that gains from the energy sector are not sufficient conditions to spur economic growth. The energy sector should be complemented by growth in other sectors. There is also a need for immediate attention by the government to make energy accessible to both household and firms as energy impacts economic development positively.

It is a fact that the energy sector is a determinant of overall economic growth and development of a nation. Consequently, Alege, Oye and Adu (2018) explored the issue of renewable energy demand using the Bayesian estimation to test the validity of the associated DSGE model. The results showed that the renewable energy sector in Nigeria is labour-intensive while the fossil fuel sector was found to be capital-intensive. This shows that the alternative energy sector needs more labour relative to capital in its production. The alternative energy sector unlike the fossil

fuel sector, therefore, has the potential to generate more employment for the teeming Nigerian population. The study also found that shocks to the renewable energy sector have more impact on the Nigerian economy compared to shocks to the fossil fuel sector.

In specific terms, the result of the study showed that technology and investment shocks in the renewable energy sector are the most significant sources of fluctuations relative to investment and labour shocks. This means that the adoption of technology and financial investment are critical to the development of the renewable energy sector in Nigeria. The results from the impulse response analysis showed that shocks to alternative energy have a positive ripple effect on the Nigerian economy. However, household consumption responds negatively to investment shock in the renewable energy sector. This means that households that invest in renewable energy must give up their consumption when they invest in this sector. The results confirm that the Nigerian government's commitment to renewable energy holds positive potential for economic development. This study recommends the creation of an enabling environment for the initiation and adoption of renewable technology. Furthermore, government should provide financial incentive to boost investment in this sector and to address necessary investment gaps such as shortage of investment capital and high-interest rates for renewable energy.

Countries saw trade liberalization policy as a means to harness the benefits embedded in international trade in the 1990s. While the empirical link between trade liberalization and its economic growth outcomes in Nigeria has received considerable attention in the literature, the household welfare implications or effect of income distribution of this policy remains under-researched. In a paper that linked economic growth and trade within a DGE model, Okodua and Alege (2014) did a study titled "Household Welfare Impact of Trade Liberalization in Nigeria: A Computable General Equilibrium Model" that examined the various household welfare scenarios that will result from the imposition of shocks on import taxes in the Nigerian economy. The paper utilizes the computable general equilibrium model based on a 2006 social accounting matrix for Nigeria to conduct macro-micro simulations of the economy.

The study examined the welfare implications of trade liberalization policy for households in Nigeria. Two simulation scenarios involving complete removal of import tariffs and a 24 per cent reduction of import tariffs was conducted. The results revealed that trade liberalization policy would not be consistent with the welfare expectations of households in Nigeria at least in the short run. The results also reveal that the agricultural sector will be worse off under a trade liberalization policy, thereby suggesting a problem of vulnerability of this sector to external

trade competition. We concluded, therefore, that it will be helpful to pursue a trade liberalization policy on a sectoral basis with an emphasis on those sectors that will not severely undermine the welfare needs of Nigerian households.

4.2 International Trade

I have also done extensive work in the area of international trade. Venables (2001) refers to international trade and economic issues as the study of goods and services' flow across international boundaries from supply and demand factors, economic integration, international factor movements and policy variables such as tariff rates and trade quotas. In the contemporary world, no country can exist in autarky, and modern economies depend on one another by the principle of comparative advantage. Many factors influence the flow of trade. One of them is an institution which is not generally considered in orthodox trade theories until recently.

The paper "Export and Growth in Nigerian Economy: A Causality Test", Alege (1993) applied Granger causality test to examine the issue of pairwise causality relationship between oil export and GDP of Nigeria. The study employed both simple and instantaneous causality test in line with Pierce and Haugh (1977). The evidence from the study's results indicates that there exists strict econometric exogeneity between export and GDP with a

unidirectional causality from GDP to Oil export. This, therefore, suggests the non-acceptance of the export promotion policies as effective strategies that enhance development in Nigeria. However, a feedback effect is noticed from the instantaneous framework, which contemporaneously validates the export promotion hypothesis. The study advocates the adoption of policies that are important in characterizing cause-effect relationship with the domestic economic activities. This study further suggests that test for the validity of export promotion hypothesis should not be evidence of mere correlation, but it should be extended to confirmation of causation.

The result of the study also lends credence to the dependent nature of the Nigeria export market. The sector is predominantly made up of primary product export without much value addition. It is more of crude oil and a small proportion of non-oil products. The demands for these export are Non-competitive at the international market. Hence, the demand for naira currency is relatively low compared to foreign currencies. For instance, the export of manufacture and agriculture are relatively low. The increase in demand for export is not necessarily as a result of growth in real export. Thus domestic supply conditions could be seen to be quite different from foreign demand factors. In the process of ensuring effective export promotion policies that are endogenous to the system, the role of power generation and consumption cannot be

overemphasised due to it pivotal role in economic production process. Consequently, we conducted a study to ascertain whether environmental constraint and domestic industrialisation exhibit threat to future energy supply and generation at the regional level.

The challenges of African economies are multifold: underemployment of resources, unstable fiscal and monetary policies, poorly managed institutions, poor access to credit facilities, non-competitiveness of the Nigerian economy in the world market and political/social instability. According to Rodrik (2007), addressing all these problems simultaneously is tantamount to signing for chaos. What could be done is to identify a central issue where reform will yield maximum returns. We contend that in a global economy, a successful growth strategy begins with the identification of the most binding constraints. In the paper, **G-**Localization as a Development Model: Economic Implications for Africa, Alege and Osabuohien (2013) address the issue of provoking and managing increased economic activities. In effect, growth cannot be generated without an increase in economic activities. To achieve this, there must be a substantial influence of adequate capital and labour in quantity and quality, and the private sector must be willing to produce. Technology created domestically or transferred from abroad must be encouraged in value addition ventures. Significant external sector macroeconomic variables such as exchange rate must be

monitored to ensure competitiveness in the international markets.

In that paper, we investigated the postulation that developing economies can achieve stable economic growth by active participation in the global economy while exploring the virtue of intraregional trade. The importance of trade was captured by adopting the notion of degree of openness, OPN, measured as the ratio of the sum of total export and total imports to the GDP. African economies can be regarded as mostly open given OPN at an average of about 104.85 per cent over the period of study and 82.26 per cent in 2007 only. Open economies are preferred by market-seeking and efficiency-seeking investors since there are fewer trade restrictions, broader market access, numerous advantages from the international division of labour and more extensive economic linkages. Also, openness encourages economies of scales through international markets and open economies enable countries to capitalize on new technologies and technical expertise that can be gained from international exposure. Hence, the hypothesis here is that the greater the extent of openness, the higher the growth rate of African economies.

In conclusion, for the African region to be competitive in the world economy, it is necessary that there must be policy convergence in the some areas. This includes incentives on capital accumulation;

improvement in human capital development; aggressive revival of the manufacturing sector; technology invention, innovation, adoption and adaptation; balanced domestic and foreign trade policies, in particular, the exchange rate policy. All these will boost interdependence within the region and, therefore, strengthen the position of the region in the global economy.

The realization for globalization depends on international trade. Meaning a country should be able to produce and sell to other nations what they need. In comparative economic systems, countries like China as an emerging economy or Newly Industrialized country, serve as a role model given her emergence from almost nowhere into a world power in trade. This model informs the idea of opening up new trade channels for Africa. In the light of this, I undertook a research on Multilateral Trading System and the Potential for Sino-African Trade published in Alege (2011) to analyse the trend, intensity and potential of Sino-Africa and investigate the effect of multilateral trade system in influencing seeming changing pattern of African trade.

The result of this research showed that based on geographical distance, China would be better off if it trades with her immediate neighbours. This tends to suggest that African economy may likely emerge once again as peripheral economies to China, thereby repeating the old and present order of African trade with the

developed industrial economies. A shift in trade within the South-South framework will still be beneficial to China than to Africa. China does not encourage the importation of raw materials into their country. Hence, in order to render this trade channel beneficial, Africa should encourage the transformation of its raw materials to intermediate and finished goods for export. Therein, lies the potential for Sino-African trade.

In a study titled: "International Trade, Do Institutions Matter? Evidence from Regional Studies" conducted by Ojeaga, George, Alege and Ogundipe, (2014) the crucial research question posed was: if institutions matter in the trade promotion nexus? The findings answered the question. It was found that institutions probably, significantly affected exports across regions from the results. The results of institutional quality effectiveness (i.e. the interactive variable) in promoting exports, showed that international institutions were probably improving market size through developing regional market potential. However, domestic institutions were not. Also domestic institutions had no effect on tariffs reduction across regions, while international institutions were also found to be promoting regional integration through tariffs reduction in the regions. This shows again that institutions matter, in the export promotion equation.

The question regarding the effectiveness of institutions in reducing the transaction cost associated with trade, through the

development of regional markets and facilitation of access to local and foreign markets was also answered in the affirmative, since international institutions were facilitating all three factors. However, domestic institutions were found not to be effective. They were probably increasing tariffs and protecting domestic businesses from hostile competition associated with international trade by driving up the final cost of imported goods.

The policy implication of this study is that adequate attention should be paid to domestic institutions with the aim of finding ways through which they can facilitate international trade. This can be done through market development strategies, tariffs reduction, reduction of transaction cost associated with exports through infrastructural development and reduction in bureaucracy surrounding export document processing at ports. Also, transparency in the exports and imports regulation process to make international trade less cumbersome for exporters and importers. Finally, this paper also contributes to the body of knowledge by offering insight to the difference between the effect of domestic institution on trade and those of international institutions. This, thus, establishes if there were differences in their contribution to the regional trade promotion process. The paper concludes its existence.

In another of my international economics research, the role of services trade in economic development was explored (Alege and

Ogundipe, 2013). From various statistical sources, the paper established that the service sector is increasing in importance in the developing world, contributing to production, output and employment. Global trade has been on the increase and has benefited the developing countries although the distribution of services trade is lopsided in favour of the developed economy. Statistics also indicate that services export and import of Sub-Saharan Africa (SSA) are the lowest in the world. However, while the developed countries are net importers of services, SSA countries are net exporters in services trade.

Based on the fixed effect regressions, the paper found that services trade in export and import enhance the economic development of SSA countries. In particular, from the export model, it finds out that travels and other services contributed significantly to the economic development of SSA. Similarly, from the import model, it finds out that transport and other services also contribute significantly to the economic development of the region.

Furthermore, the trade–exchange rate nexus in Sub-Saharan African countries was explored with evidence from panel co-integration analysis, and the results showed that export and import are inelastic to changes in the exchange rate. It follows that depreciation of currencies in the region may not have the expected results in given the structure of the economies and export compositions. In the same vein, depreciation would not depress

imports but only aggravate the balance of payments position. Thus, in the light of the study's findings, a policy of exchange rate stability that hinges on long-run considerations, capital accumulation and technological capacity as well as the maintenance of a comprehensive, coherent macroeconomic policy package remains a critical factor in ensuring that exchange rate policy performs its central role as a trade facilitation tool.

The study also indicated that apart from monetary and fiscal policies, which are often suggested in the literature to addresss exchange rate volatility, other factors, such as capital growth, could help in stabilising the currencies of countries in the sub-region and engender competitive trading relationship with the external world. This policy should be carefully implemented in view of the fact that the traditional approach of focusing on import compression, excessive dependence on a few traditional export products while importing manufactured goods and machinery that are critical inputs in the production process has perpetuated the low responsiveness of imports and exports to changes in the real exchange rates in SSA economies.

The reliance of the Nigerian economy on imported goods tend to play down the effectiveness of exchange management and control measures in the country. This implies that the variations in the exchange rate appear not to play a determinant role in the regulation of the level of import and export activities in the

economy. For instance, the exchange rate devaluation of the local currency is expected to be accompanied by increased export and higher foreign demand for local goods which can be purchased at a lower exchange rate. Conversely, it is expected that import demand will significantly decline due to the cost of importation and cost of imported products in relation to domestic products.

This assertion was empirically tested in a paper titled "Trade–Exchange Rate Nexus in Sub-Saharan African Countries: Evidence from Panel Cointegration Analysis" (Alege and Osabuohien, 2015). However, the results from empirical analyses in this study showed that export and import are inelastic to changes in the exchange rate. It follows that depreciation of currencies in the region may not have the expected results given the structure of the economies and export compositions.

Our results also indicated that apart from monetary and fiscal policies, which are often suggested in the literature to eradicate EXR volatility, other factors, such as, capital growth, could help in stabilizing the currencies of countries in the sub-region and engender competitive trading relationship with the external world.

4.3 Economic Growth and Development

My research efforts were also envisaged from different aspects of growth and development. One of such areas is consumption pattern among consumers. Given the fact that the level of welfare

is a function of consumption, I decided to provide empirically-based evidence into the extent of the differential in consumption pattern between the rural-urban consumers in some states in Nigeria. In the light of this, Alege (1990) investigated the extent of rural-urban differential in consumption in Kaduna and Oyo States of Nigeria.

Consumption pattern among household also could determine the level of import of consumables and the volume of exports within the economy at any given time. This equally has implications for the exchange rate of the local currency about its dollar equivalent. When most of the consumables are imported, and fewer products are exported, this could create a significant imbalance in demand for foreign exchange resulting in a deficit of the balance of payments issues. In Nigeria, there is more preference for foreign goods despite the excessive cost associated with the demand compared to indigenous consumables.

Firstly, the analysis in the paper was restricted to investigating the determinants of consumption at a point in time, and no attempt was made for a dynamic analysis. The model provided a tentative estimation of the parameters which should be seen as approximations. It confirmed the existence of the rural-urban phenomenon in both Kaduna and Oyo states. However, the degree of determination of the variables varied between the states.

Secondly, the analysis showed that household size and sex,

classified determined consumption expenditure in Kaduna state, but to a lesser extent in Oyo state. Also, occupation appeared not to influence expenditure in the two states. We suspected that the income variable must have served as a proxy for the occupational variables.

Moreover, it appeared that feminine attribute affected the consumption expenditure more significantly in the rural than in the urban sector.

In the paper titled "Financial Sector Reforms and Growth of the Nigerian Economy", the importance of Finance to growth and how the reforms that take place in the financial sector influence economic growth were examined (Alege and Ogunrinola, 2008). In order to attain the development of the financial sector, there is a need for reform. The first significant financial reform dates back to the Structural Adjustment programme of 1986, which brought about financial liberalisation. Hence, our study focused on the post-SAP era to investigate the effect of these reforms in the financial sector as it affects Nigeria's economic growth. The financial sector reforms have had a positive effect on the Nigerian economy following the post SAP era.

According to Schumpeter, a nation will transform itself through innovation. While innovation is needed to augment the state of human capital development in Africa, innovation can also be a product of human capital development. This implies that there is a

need to go beyond education to developing the innovation capacity of human capital. Hence, we carried out a study titled "Innovation in Africa: Why Institutions Matter" (Oluwatobi, Efobi, Olurinola and Alege, 2014). In their studies on why nations fail, Acemoglu and Robinson (2012) identified institutions as being arguably the source of disparity between economies. An institution, by definition, means a system of procedures, regulations and customs that shape socioeconomic activity and behaviour. In other words, institutions are supposed to be the rules of the game, while economic agents are the players. I used the word 'supposed to' because in our economy, what you observe is that the economic agents tend to decide the rules of the game.

To this end, I carried out this research to determine the extent to which the level of institutional development in African countries affected her innovative outputs and the point where institutional development brings about innovative output enhancement in African countries. While paying particular attention to three broad indicators of institutional development: corruption, government effectiveness and regulatory quality, I discovered that government effectiveness and regulatory quality had the most equivalent effect that has a significant effect on innovation. Therefore, for innovation-led growth, there is a need for effective regulation even though the millennial generation understand freedom more than regulation.

Pertinent factors driving inclusive development were also captured in research carried out with other researchers (Oluwatobi, Oluwatobi, Oshokoya, Alege and Olurinola, 2019). This study reflects how technology can be used to address the gaps in availability, accessibility and affordability. More specifically, it shows that the use of mobile technology will enable the availability, accessibility and affordability of education. Records reveal that a significant percentage of SSA dwellers possess mobile phones, transferring knowledge via such means will help improve human capital and the quality of the people at large. SSA countries can, therefore, invest in mobile learning to drive inclusive development. This will help to increase the capabilities of several persons to contribute to the development process, thus, achieving inclusive growth and development.

The traditional model for delivering education has translated into increasing cost of education, which deprives the capabilities of those who cannot afford the costs. This study, thus, contributes to the existing literature by justifying the possibility of driving inclusive growth and development in SSA by empowering people, particularly those in the rural areas, through mobile learning, which improves the availability, accessibility and affordability of education.

For instance, an average household could afford to purchase a mobile phone for her family members given the various types of

mobile phones at an affordable cost. With the recent development in communication and technology, any inquisitive learner with an internet network-enabled telephone could easily lunch into the internet in search of vital information that could help the person facilitate the learning process. Once there is a facility to access the internet in mobile phone there is quite a large number of learning platforms and channels through which interested individuals can avail themselves of the opportunity to foster learning through e-learning known as electronic learning. A typical example of driving our point home is the Youtube channel that is accessible online.

There are many things students and educators stand to benefit by connecting to this platform and watch the tutor demonstrate the explanation of any concept they wish to understand. When a person can listen and watch many illustrations from different tutors, there is every possibility of enhanced understanding of the subject matter. This is achievable through mobile technology such that wherever the fellow is located, in as much as there is accessibility or network connectivity learning is taking place even while on transit. This helps to significantly facilitate learning process at any time and location, not necessarily that one must have to be in an organized institution of learning like the likes of higher institutions before active learning can take place.

Apart from the Youtube channels, there are still more platforms

such as the use of Google search engine using mobile phones to search for knowledge and information. These days it is possible to search for information about different concepts in different disciplines through the Google search engine. There are also opportunities to download printed and published materials for personal study at one's convenient time. It is important to note that the use of mobile phone has provided variety of opportunities for learners to harness necessary knowledge in fostering the frontiers of knowledge dissemination and enlightenment.

Aside the importance of harnessing mobile technology in fostering learning, another macroeconomic issue we examined in the course of my academic career has to do with the ability of economies to control economic fluctuations that are exogenously determined. This has to do with strategies and macroeconomic policies that are implemented primarily by the developing economies to guard against external negative influences not determined within the system. This becomes very imperative with the increase in economic integration and globalisation. The level of self-reliance an economy attains has implications on how the economy reacts to external shocks and to the extent to which the economy becomes susceptible to negative impulses from the external context. It is essential that African economies must develop stable resistance to adverse external influences that might distort the normal functioning of their economies.

In the light of dampening effects of the global financial melt-down, Ojo and Alege (2010) examined the trends in financial flows, particularly foreign direct investment (FDI) and the possible effects of the global financial crisis and macroeconomic fluctuations on economic development in Africa. With some suggestions on the direction of policy to stimulate increased financial flows, the paper opines that there is the need for comparative dynamics of African economies in order to return to the path of sustainable growth and development.

Financial flows are an integral part of international transactions that promote globalisation and economic integration. The ability of an economy to attract and retain FDI through her absorptive capacity will determine the extent of her integration and the maximization of the benefits thereof. It is, therefore, pertinent that African economies build capacity and develop their human capital to be able to optimise the opportunities offered by financial flows and channel such towards the development of their economies. A typical example of the point explained here could be a reference to the benefit that a country like Nigeria has benefited from foreign direct investment (FDI) inflow into the country. Before the establishment of the telecom industries in Nigeria, communication had been abysmal and mostly inaccessible by the majority.

The establishment of Econet Wireless (now Airtel) and MTN in

the year 2000 has remarkably helped in the growth and development of Nigeria's economy. Multi-nationals corporations have created excellent employment opportunities for the Nigerians working in the telecom industries. There is equally skill enhancement and capacity building through cross-fertilization of ideas with foreign expertise in these fields. There are also corporate social programmes targeted towards the development of host communities. Most importantly, the barriers to effective communication and feedback mechanism have been considerably minimized, thereby creating the avenue for fast dissemination of important messages and information through phone calls. This has dramatically enhanced business execution and transactions over the last decade in Nigeria. The overall impact could be seen in the fast growth of the Nigerian economy and the increased rate of technological advancement and development in the Nigerian economy. Hence, the role of financial flows and macroeconomics dynamics across African economies in the development of the continent cannot be overemphasised.

The level of stability of the stock market of any economy plays a significant role in the attraction of foreign investors and the rate of growth of stocks and equity venture of such an economy. A robust stock market is, therefore, key to a sustainable equity financing for worthy investments and capital formation. Consequently, Oladeji, Ikpefan and Alege (2018) examined the volatility of the stock

market and the activities of the players in the market to broaden scholars' knowledge about the mechanism of the market and for better- informed policy decisions for policymakers. The pivotal role of the stock market in the growth and development of any economy necessitated the need to undertake studies on the determinants of stock market volatility. This targeted study will help in a better understanding of the operational process of the market and how best to maximize the potential benefits of the market. Given this scenario, we interrogated the non-macroeconomic determinant factors of stock market volatility in Nigeria, applying the vector error correction approach.

It could be deduced from the study of the market that by implication, the more educated the investors are in the market, the more volatile is the market. The average education level of investors can thus be seen as a vital non-macroeconomic variable that influences stock market price volatility in Nigeria. This is, however, contrary to the work of Xing (2004) that reported a negative correlation. It was also established that in the long run, the number of listed firms have hurt stock market price volatility. This denotes that the more the firms that are listed in the Nigerian stock market, the more diversification that is expected in the market. This may lead to downward trend of the prices of stocks in the market. The more firms are listed in the stock market, the more stability follows. This result agrees with the study carried out by

Xing (2004).

Another crucial macroeconomic variable that we investigated was the interest rate transmission process. Interest rate constitutes a dominant macroeconomic variable that is employed by the monetary authorities to trigger some economic transmission process. In a well-organized economic system, interest rate serves as a pivotal hinge upon which other economic variables such as savings and investment revolves. It is a monetary tool that could be used to bring about contractionary or expansionary policy effect on the economic system. It can also be employed to encourage savings mobilization and discourage reckless fiscal operations in order to control for inflationary pressure. Thus, the study examined the interest rate pass-through to macroeconomic variables employing evidence from the Nigerian experience.

We understand that activities at the stock market are influenced by the level of interest rate in any economy. Thus, Ogundipe and Alege (2014) investigated the issue of Interest Rate Pass-Through to Macroeconomic Variables in Nigeria. The primary goal of the study was to explore the effectiveness of the interest rate transmission from policy rate to retail banking rate. It also examined the effect of the policy rates on macroeconomic variables such as investment, savings, household consumption, and inflation in Nigeria. It is necessary to note that the assumption that households do not smoothen their consumption is

theoretically rooted in the consumption model by Modigliani (1963), Ando and Modigliani (1963) and the permanent income hypothesis by Friedman (1957).

The study examined the pass-through of Central Bank policy rate on commercial banks' retail rates and macroeconomic variables using the Johansen and Juselius maximum likelihood and Engle-Granger two-step procedures to obtain the short run and long-run estimates. The mean adjustment lag and Wald test were also employed to ascertain the asymmetric pass-through for the period 1970-2011. The study found evidence of downward stickiness in pass-through as retail bank rates exhibit slow and sluggish responses to changes in policy rates. The robustness of this evidence was examined using an alternative technique in examining the effectiveness of monetary transmission process, the Impulse Response Function (IRF) and Variance Decomposition (VD) analysis also supported the evidence of sluggish and incomplete pass-through to retail rates.

Chancellor Sir, the role of exchange rate cannot be overemphasized in Nigeria and indeed the African continent. Sequel to the mechanism of interest rate transmission and its effects is the study on the issue of exchange rate fluctuations and its contributory influence on macroeconomic performance, particularly in Sub-Saharan Africa. In a study by Ojo and Alege (2014), we utilized the dynamic panel co-integration analysis in

examining how fluctuations in exchange rate could be traced to other macro variables within the Sub-Saharan Africa (SSA). The study confirmed that high inflation rate had been a major underlying factor in the exchange rate depreciation in most SSA countries.

Many recent studies have examined the determinants of exchange rate, particularly that of exchange rate deregulation across the sub-region. The expectation is that a deregulated foreign exchange market will bring about a less volatile exchange rate. This paper has provided statistical evidences in support of the divergence and disparity between and within regions in SSA using descriptive statistics. In order to empirically test for the determinants of the exchange rate, the paper develops a dynamic panel data model based on system GMM that allows us to control for bias results from endogeneity and omitted variables. The results of the panel data estimations indicate that the model performed well as the estimated parameters are at least statistically significant at the level of 5 per cent and have correct signs suggesting the adequacy of our model to capture fluctuations in exchange rates. This result is contrary to some other findings that reported a weak relationship between the exchange rate and its determinants as observed by Bacchetta and Wincoop (2006) and Crosby and Otto (2001), among others.

The issue of exchange rate volatility is very germane to

macroeconomic analysis and particularly the understanding of its determinants. Exchange rate management and control to a large extent, determine the nature of foreign transactions undertaking by economies. The stability of exchange rate is critical in making macroeconomic policy decisions and government planning and budgeting process. A stable exchange rate will further help foreign and local investors in making long term investment decisions. High exchange rate volatility creates uncertainty in the macroeconomic environment that makes it challenging to engage in long term investment.

When there is depreciation in the exchange rate of the local currency against the foreign currency, it is expected that the country's export would be cheaper at the international market compared to dollar currency leading to increase in demand for such products while the importation from other economies will be more expensive. Hence, it is expected that the country should export more goods and services during depreciation in the exchange rate and import less due to its low purchasing power parity. Balance of payments (BOP) deficit occurs when a country's import exceeds its export as is the case in the Nigerian economy where there has been depreciation in local currency. This deficit owing to excessive importation against export, also has a negative implication on the country's external reserve.

It is, therefore, advisable that developing economies like Nigeria

improve on their macroeconomic performance by diversifying their economic base in order to expand their export base to incorporate more tradable goods that are globally competitive. Oil export is the major export commodity in Nigeria and fluctuations in oil prices have a significant effect on the Nigerian macroeconomic performance. However, by diversification of the economy away from many dependencies on oil revenue from oil export, the nation can harness more revenue from other non-oil exports. In a situation whereby the country has many commodity exports that are in high demand, this may lead to appreciation of the naira currency due to increase in demand of the exportable goods and more export revenue will be generated. This will enable the nation to diversify from her dependency on oil export.

Apart from fluctuations in exchange rates, the issues of shocks to the macro-economy have gained increased attention in the empirical studies. This is due to their possible impact on the economy. The effect of global shock on developing economies that are most vulnerable to its adverse impacts is due to their over-dependence on importation compared to export activities. The developing economies (like Nigeria) should build their internal shocks absorber to be able to shield their economies from distortions emanating from the external context. In this vein, Alege, Ojapinwa and Bello (2012) embarked on the study of the global shocks with specific focus on the global financial crisis and

the extent of its influence on Nigeria's economic outlook.

Though earlier studies analysed the effects of low revenue on the economy as orchestrated by the fall in oil price, this study focused on how the global shocks affected the capital flow and some macroeconomic fundamentals. Besides, the study was justified because there was no empirical research on how global financial crises affected decentralisation processes in foreign capital inflow in Nigeria (Karem, 2009). The study, therefore, focused on the empirical examination of the relationship between global shocks through an economic crisis and some selected macroeconomic variables in Nigeria. The study concluded that the common belief that global shocks through financial crisis do not have any impact on Nigeria's economy, is not entirely accurate.

The global economic crisis was able to impact the Nigerian economy through the macroeconomic variables: GDP, Consumption, interest rate, inflation, employment, export, import, to mention a few. This is possible because the Nigerian economy still depends on foreign economies for its growth and development. The financial crisis which was triggered by the bubble burst in the New York financial market also affected the Nigerian economy because of Nigeria's dependence on importation of goods and services from the developed economies in the sustenance of her economy.

Also, most of the multinationals companies operating in Nigeria

have their significant branches in the developed economies. Invariably, adverse shocks arising from the financial crisis in their significant operation domains could also affect other operations in Nigeria. However, the best strategy for the Nigerian economy would be to adopt policies that will foster local content development and self-sustaining economy that will be more resistant to foreign shocks. This could also be enhanced by encouraging entrepreneurial development and thriving for private investment. In the same vein, the public-private partnership could also be encouraged in order to establish active collaboration between public and private investment.

The adage 'Knowledge is power' cannot be overemphasized. I grew up hearing it, but a layperson would be interested in knowing how powerful knowledge is to the society in terms of putting food on his table? Nonetheless, literature establishes that knowledge plays a role in not only the development process but in the quality of innovation as well. This is what prompted my interest in Knowledge-driven growth.

The value of knowledge in any economy, therefore, would be the innovative opportunities it creates that will eventually lead to the growth and development of any society. I firmly believe that the rise of dynamic entrepreneurs should be motivated by the desire to implement the new knowledge generated by our research. This is the pure definition of innovation. These dynamic entrepreneurs

can end up investing in research and development activities. However, that is not the reality as seen with the limited collaborations between the industry and institutions to bring out industry problem-solving research.

From our research that generated a knowledge economy matrix, we were able to ascertain that Sub-Saharan Africa is a lean knowledge economy signifying that knowledge does little to drive growth in these countries as argued in Knowledge-driven Economic Growth (Oluwatobi, Olurinola, Alege and Ogundipe, 2018).

4.4 Energy Economics and Environmental Economics

I have also worked in the area of energy and environmental economics while supervising some of my Ph.D students. In a research on energy economics titled "Rethinking Regional Energy Policy: Towards Averting another Energy Crisis. Do Threats Matter in the Supply and Generation Process?" Ogundipe, Ojeaga and Alege (2014) interrogated the potential factors confronting secured energy and sustainable production of electricity from a regional perspective. In the course of this investigation, various limitations to sustainable production and supply of energy through the application of Seemingly Unrelated Regression estimation process were identified. This approach solves two unrelated regressions simultaneously to yield efficient estimates. The study result indicates that the investigated threats play a significant role

in the study.

Energy security described as the level of diversification in energy generating sources of specific regions is possibly affected by the industrialisation and national energy consumption levels of specific regions. Most fundamentally, issues relating to much reliance on energy- specific sources of supply such as nuclear production supply were observed to have exerted a negative effect on the dependent variable (energy security) and possibly increase the risk of energy supply failure. Energy policy revealed a significant influence on the security of energy. The study also put into consideration the effects of different limiting factors on the production of electricity. Evidence from the study indicated that various environmental factors influenced the generation and consumption of electricity.

When the energy sources are diversified, it will further reduce the over-reliance on a particular source of energy for economic activities. It also helps to reduce the cost of power generation and distribution and the overall cost of doing business in the regions. Developing economies essentially need the energy to be able to boost production level and also embark on commercial production that supports commodity export and economic growth. When there is sufficient production to meet domestic demand, it will be possible for the economies to export. In such cases, the export promotion policies will be an effective policy that could be used to

drive development in the economy.

Akinyemi, Alege, Oluseyi, Amaghionyeodiwe, and Ogundipe (2015) working on climate and the environment, researched on how the removal or continuation of fuel subsidy might hamper the efforts at tackling climate change and environmental quality. Before the bold decision by the past president Dr. Goodluck Jonathan to remove it in 2012, the argument had been raging on how fuel subsidy affects the economy and no sooner had he announced than a protest ensued kicking against the decision.

In the study, three case scenarios were created in order to fully understand the effect of fuel subsidy on the quality of the environment. These scenarios include a case of subsidy payment, a case of effective subsidy and a case of no subsidy payment. What I found was that former President Jonathan was right to have removed subsidy even though it still exists partially as evidence showed that subsidy payment does nothing to enhance access or increase the consumption of fuel.

The study supported evidence of a long-run sustainable equilibrium model. However, the case for sufficient subsidy payment showed influence in fuel consumption. Therefore, if Nigeria wants to go back to the era of full fuel subsidy, a sound and effective institutional arrangement should be first put in place, without which subsidized consumption expenditure could exert any impact on the welfare of the economy.

In another study by Alege, Adediran and Ogundipe (2016), it was observed that countries desired economic growth but with changing times comes changing priorities and focus. The paramount desire of nations now is sustainable growth and development as global warming, and climate change pose controversial challenges with future adverse economic challenges.

This study examined the causal relationship between pollutant emissions, energy consumption and economic growth within a multivariate Johansen's cointegration and error correction framework. The findings from the research indicated that although the consumption of dirty fuel enhances per capita income, its increasing use jeopardizes the sustainable environment agenda by increasing the accumulation of CO_2 concentration. Therefore, for Nigeria to be among the countries that meet the Sustainable Development Goals by 2030, we need to start consuming cleaner energy as this creates a better platform for boosting environmental quality in the country.

Chancellor Sir, you have always said that life is in phases and men are in sizes. The Environmental Kuznets Curve (EKC) model infers that development is in stages, and so is pollution dynamics. That is, as pollution rises as a country develops, it reaches a certain threshold where pollution begins to fall with the rise in income. The study I carried out with my associates, Ogundipe,

Alege and Ogundipe (2015) examined the pattern and nature of EKC in Africa. The study employed income groups according to the World Bank income classification comprising low income, lower middle income and upper middle income in Africa.From our estimation results, we could not validate the EKC hypothesis in African countries (combined), low-income group and upper middle-income group but empirical and analytical pieces of evidence from lower-middle income countries support the existence of EKC. This is not unconnected with the reality that majority of countries in lower middle-income countries are oil-producing states. In those countries, oil proceeds contribute over 90 per cent of foreign exchange and constitute the largest portion of budget financing. However, the extractive processes of crude oil constitute the most significant contributors to CO_2 emission in these economies.

Akinyemi, Ogundipe and Alege (2014) observed that the current emphasis on the issue of climate change in the world has never sounded louder than it does since the 21st century. Without looking so far behind, the just concluded United Nations Climate Change summit in New York, U.S. focused on countries aligning their climate change and air pollution policies with SDGs by 2030. In the light of this emphasis on changing climate policies, I researched into how incidences on climate change affect the energy sector with a specific focus on energy supply. Upon

applying contemporary econometrics method to this study, the result surprisingly showed that there exists positive relationship between climate change and energy supply in Nigeria. This result was unexpected. I, however, concluded that this could be because Nigeria is an oil-producing economy with crude oil and natural gas reserves of 36.2 billion barrels and 166 trillion standard cubic feet (SCF). This enormous reserve has accentuated the reliance on oil and natural gas sources, which is less susceptible to climate change.

4.5 My Other Contributions

Chancellor Sir, I joined this great University in her first academic year of existence. Since then, I have been deeply involved in capacity building of students at undergraduate and postgraduate levels. I am glad to report that I have successfully supervised, by the grace of God, six (6) Ph.D theses and another ten were Co-supervised by me. It is a thing of joy that one of them, Dr. (Mrs.) Queen Esther OYE, won the Overall Best Postgraduate award of Covenant University at the 2019 Convocation Ceremonies. Another one is Dr. J. N. Taiwo, who rose to become the Registrar of Covenant. I must also mention Dr. Stephen Oluwatobi who currently is the Deputy Director at the Covenant University Centre for Research, Innovation and Discovery (CUCRID). Most of these people are in this system as lecturers at different levels.

Others are in State or Federal Universities.

Still talking about postgraduate education and my contributions, I have served as External Examiner for M.Sc, M.Phil and Ph.D examinations. These include Department of Economics, Obafemi Awolowo University, Ile-Ife; CPEEL, Department of Economics, University of Ibadan. I have on record 45 candidates under these categories. At Covenant University, I have served as School of Postgraduate Studies (SPS) Representative at various examinations across the Colleges and Departments. I have also served as Member of SPS Board at different periods.

I am also grateful to God for sparing my life in the period 2013-2015 when I served as the Head, Department of Economics and Development Studies. During that time, we obtained NUC accreditation for our two programmes (Economics, Demography and Social Statistics). Recently, I completed my 2-year term as the Dean, College of Business and Social Sciences. I return all glory to God.

5.0 Summary and Policy Recommendations

5.1 Summary

Chancellor Sir, distinguished ladies and gentlemen, I have in this lecture tried to showcase my passion for the need to prepare and equip future macroeconomists appropriately in dynamic settings

where everything is susceptible to changes and uncertainties are prominent. My contention is that these should be accompanied by evidence-based tools to address macroeconomic policy issues of the future. It is time to move away from the old tools of analysis in order not to be distrupted.

5.2 Policy Recommendations

5.2.1 Review of the Curriculum in Macroeconomics

Covenant University, as the Best University in Nigeria and West Africa, should lead the revolution for a holistic revision of the teaching of Macroeconomics in both undergraduate and postgraduate programmes. This will need the consent of the National Universities Commission (NUC), the Nigerian Economic Society (NES) and the departments of Economics in all Nigerian universities. It is my view that time has come to move away from static, piecemeal and more often single equation approach to a more robust dynamic view of the future based on the realities of the existence of uncertainties in our modern world. In the course of this lecture, I have mentioned the disruptive nature of the 4th industrial revolution.

5.2.2 Capacity Building in Macroeconomic Modelling

Covenant University should champion capacity building in the area of Macroeconomic modelling. My exposures around the

country and even with citizens of other African countries indicate a gap in capacity building in this area. This body will serve as policy making factory to our institutions including: CBN, Government agencies, The Banking Industry, Industries and other Research Centres. Closely related to this is the need to encourage the teaching of mathematics in our Secondary schools. According to Iyase (2018), the popularization of mathematics all over the country should be a priority…….Students leaving secondary schools heading to tertiary institutions are in most cases biased against mathematics. It is important to mention that sound knowledge of mathematics, statistics and econometrics is imperative.

5.2.3 Macroeconomics Research Laboratory

Chancellor Sir, we, once again appreciate you for the approval you gave for the establishment of the Centre for Economic Policy and Development Research (CEPDeR). However, discussion is in progress with a view to extend its activities to housing the type of capacity building suggested above, that is a Macroeconomics Research Laboratory (see CEPDeR's website for details http://cepder.covenantuniversity.edu.ng/). Since CEPDeR is already gaining commendable recognition within its less than two years of existence it is expected that the modelling outfit could take-off effortlessly within it. In addition, using an existing

platform will reduce costs for such a laudable venture. The proposed body will train and build useful models for policy advice for national and international institutions. It will be designed to solve our local research problems. The country is yarning for more evidence-based research Centres to address the developmental challenges facing our nation. The model proposed in this lecture comes very handy.

6.0 Concluding Remarks and Acknowledgements

6.1 Concluding Remarks

Chancellor Sir, in ending this lecture I wish to express my fear in looking for a future which we are not prepared for. The world is changing rapidly, factors and means of production are not static, and economies are perturbed by endogenous and exogenous shocks that need to be addressed. In response to societal problems, we need a framework that will lead to appropriate policy advice.

6.2 Acknowledgements

I want to appreciate God for His infinite mercy over my life since I was a baby. Who could have thought that I would reach this height in my discipline? His help at all times cannot be quantified. I appreciate the Chancellor and Chairman, Board of Regents of Covenant University, Dr. David Olaniyi Oyedepo for yielding to

God's instructions giving rise to the establishment of this great citadel of learning: the Best University in Nigeria as well as the 4th leading University in Africa. Sir, thank you for such a platform for raising new generation of leaders which have raised me.

I also appreciate those that God sent my way to guide my spiritual life. In this respect, I wish to mention all previous Chairmen of the Deacons Assembly since 2009 when I was ordained a Deacon in God's vineyard. My brother, Pastor Bello, I appreciate you. Pastor Akpofure, thank you for your prayers and the hand of fellowship since we met. Deacons and Deaconesses at The Deacons Assembly of Faith Tabernacle, Ota, I thank you for your support. My leaders in the Protocol Group; ask us any question. Pastor Olatunji, Thank you sir. All my Pastors too numerous to mention, the work of God will not fail in your hands.

I want to thank my Father in the faith and our dear Mama for the unique opportunity given to me to serve in the Faith Academy Governing Council as Vice-Chairman. This is a privilege that I do not take lightly. I want to thank the Chairperson of the Governing Council, Deaconess Olubunmi Durowaye, members of the Governing Council, Principal as well as other members of Management.

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I HAVE DOMINION!

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$$x_t = \mathbb{E}(x_{t+1}) + \frac{1}{\sigma^c}[R_t + \mathbb{E}(\pi_{t+1})] + \varepsilon_t^c \quad (1)$$

$$\pi_t = \rho^{\pi}\mathbb{E}(\pi_{t+1}) + \psi x_t + \varepsilon_t^{\pi} \quad (2)$$

$$R_t = \rho_1^R R_{t-1} + \rho_2^R \pi_t + \rho_3^R x_t + \varepsilon_t^R \quad (3)$$

$$x_t = \mathbb{E}(x_{t+1}) + \frac{1}{\sigma^c}[R_t + \mathbb{E}(\pi_{t+1})] + \varepsilon_t^c \quad (1)$$

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$$R_t = \rho_1^R R_{t-1} + \rho_2^R \pi_t + \rho_3^R x_t + \varepsilon_t^R \quad (3)$$

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