



EXTERNAL ECONOMIC SHOCKS AND POLICY RESPONSES: EVIDENCE FROM DSGE MODELS FOR NIGERIA

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Abstract

This study examines the macroeconomic effects of external economic shocks on the Nigerian economy and the impact of various macroeconomic policies responses to these shocks. The types and channels of shocks that affect macroeconomic performance are identified. The analysis of the effects of shocks that occur while the economy is open is conducted within the framework of the dynamic stochastic general equilibrium model (DSGEM) in this paper. DSGE model is used to evaluate the effects of external shocks and test the effectiveness of different



policies applications. The Impulse response functions and Variance decomposition analyses, traced the response of the following macroeconomic variables; the general price level, the foreign interest rate, the real exchange rate, and foreign inflation. The foreign interest rate shock leads to much more persistent responses in both domestic and foreign variables. The foreign supply and inflation shocks increase domestic output gap, inflation and interest rates. Higher interest rate and real exchange rate appreciation reduce aggregate demand as well as a fall in output gap and inflation. The policy responses of domestic variables to external shocks have been captured by the method analyses. However domestic policy distortions amplify economic effects.

Keywords: External Economic Shocks, Policy Responses, Dynamic Stochastic General Equilibrium Model, Macroeconomic Effect, Nigeria

INTRODUCTION

The pattern of economic shocks in Nigeria is complex. Generally, the vulnerability of the economy to shocks reflects its weak macroeconomic fundamentals and institutions. At the macroeconomic level the very high volatility recorded in price, inflation, real exchange rate, and terms of trade shocks results from among others, currency overvaluation and fluctuations in international oil prices closely reflect the pattern of Nigeria's external economic shocks. The reaction in terms of economic policy, to deal with these shocks can either potentially expand or mitigate those (Cespedes *et al.*, 2005). But different strategies may yield similar results in the long run, during the transition, the behavior of the main macroeconomic variables can be quite different, and the choice between strategies would naturally have to depend on the government's macroeconomic objective function. Therefore, a robust monetary policy which mirrors the realities of the Nigerian economy coupled with proper coordination with fiscal authorities remains a necessary condition for better macroeconomic management of the economy (Ekpo, 2013).

Available data indicates that the net credit to government for the period 2009 to 2011 was quite high which could result in fiscal risk. The broad money supply ratio of gross domestic product (M2/GDP) was at its peak in 2009 and declined thereafter reflecting low financial development of the economy. The external sector was under pressure in 2010, as reflected in huge import bills, a large draw down on external reserves and a declining foreign direct investment (FDI). The challenge of the external sector remained the overdependence on the oil sector and the non-competitiveness of the non-oil sector. This is crucial to interest and exchange rates. The more volatile these rates are, the higher the interest and foreign exchange

risks are for institutions. Consequently, vulnerability of the financial system would be higher if; there is a high external debt burden and a higher share of foreign portfolio investments in aggregate economy investments. In the 1970s, the Nigerian economy expanded due to large inflow of crude oil income and by the period 1981-1985, at the wake of the falling oil revenue, the economy declined, precipitating a rapid deterioration of the living standard of Nigerians. The economy is still characterized by structural distortions, which manifest in the form of recurring deficits in trade balance, unfavorable terms of trade, rising inflation, exchange rate depreciation and instability, even after the adoption of the economy structural adjustment reforms in (1986-1993); Guided deregulation Policy of (1994-1997); National Economic Empowerment and Development Strategy (NEEDS); National Poverty Eradication Programme (NAPEP); Vision 20-2020(2008); Transformation Agenda (2011). The legacy from the 1970s as a result of oil boom revenues also included ideas and beliefs about the economy and economic policy that were not supportive of macroeconomic stability and sustained economic growth.

The crises that have pervaded the Nigerian economy since the early 1980s posed considerable challenges to policy makers and economists. There existed a correspondingly strong skepticism among many Nigerian economists and policymakers towards increasing the role of markets. Major economic changes that have posed challenges include; free-floating exchange rate policy; the deepening of the foreign exchange derivatives(forward) market; the implementation of a full-fledged inflation-targeting policy; the introduction of an explicit fiscal policy rule for the central government; privatization of Public enterprises and economic liberalization policy. At each turn of these events efforts have been made to design and implement appropriate policy response. After more than three decades of the application of economic reform policies, structural imbalances in the macro economy still persist and abound. In general, not only has the economic stabilization measures and reforms proved inadequate in dealing with the seemingly intractable problems of the economy, some of them, have also been to a large extent, counter-productive, thus defeating every attempt to use them successfully in addressing the challenges of macroeconomic instability of the country.

Also, the policies adopted have not been far-reaching because they come with persistent macroeconomic fluctuations. In spite of the fact that the what, why and how of the past efforts have been examined thoroughly, the effects of the shocks still persist. There is, however, a growing recognition of the importance of governance and institutional set up of a country in responding effectively to financial crises and other similar shocks. What is perhaps less clear is how, in reality, these affect policy responses and their implementation. There is lack of evidence on the incentives for more sustainable and effective reform processes, beyond the immediate crisis, and on the blockages that might prevent such reform.

Given, the above, this study thus investigates the dynamic effect of external shocks on selected macroeconomic variables like domestic output, domestic inflation, domestic interest rate, exchange rate. And also, to examine the appropriate macro policy strategy (macroeconomic policy response) for Nigerian economy, given its structural characteristics and the pattern of the external shocks.

Closely following this introductory section is the literature review. Section three discusses the study's methodology while section four contains the result findings. Section five concludes the study.

REVIEW OF SELECTED LITERATURE

The nature of economic shocks depends on the structure of the economy, the extent of commodity diversification and the underlying country-specific characteristics. Countries with similar economic and production structures tend to face symmetric shocks, while those with different production and economic structures are seemingly characterized by asymmetric shocks (Khamfula & Huizinga, 2002). Given this assertion, there have been numerous studies in the economic literature on this issue especially as it relates to the methodology used.

In terms of the methodology used, in recent times, shocks scenarios are estimated using the Dynamic Stochastic General Equilibrium (DSGE) methodology. The DSGE macroeconomics characterize the economy not only with discipline of equilibrium, but in fact the discipline of a unique equilibrium, (Mehrling, 1996). The outcomes have shown a new wave of dynamic and stochastic models that integrate aggregate supply and demand responses based on microeconomic theory. This is referred to as Dynamic Stochastic General Equilibrium Models (DSGEMs) and was developed by Nason and Cogley (1994); Schorfheide (2000); Kydland and Prescott (1982); Smets and Wouters (2003); Bergeoning and Soto (2002). This technique is an improvement on the real business cycle (RBC) technique because of its potential to combine explicit microeconomic foundations with nominal factors (Christiano, Martin, & Charles, 2005). Peiris and Saxegaard (2007) identify some features that make DSGE models unique. The emphasis on shocks and thus on Impulse Response Functions (IRFs) distinguishes the new neoclassical synthesis (new Keynesian) models from the original RBC literature. First, DSGE model is structural and has the characteristics of a general equilibrium model. Apart from the fact that the systems of equations are interpreted based on economic theory, the main variables of interest are also endogenous variables.

There have been some studies using this methodology. For instance: Benes, Hledick and Vavra (2005) have revealed that characterization of DSGE model is so broad with the innovative features. These are international currency pricing scheme permitting flexible

calibration of import and export price elasticities along with the disconnect of nominal exchange rate. The study uses Quarterly data with the sample range of 1996:1 to 2004:4 for the Czech economy. The main variables are GDP, import prices, export prices, investment, labor, consumption expenditure, labor participation, wage rate, exchange rate, interest rate and inflation. An empirical analysis of this DSGE model is presented in terms of calibration strategy and impulse response setup. This model policy with a parametrized forecast horizon and a generalized capital accumulation equation with imperfect intertemporal substitution of investment provide useful forecast of Czech Republic monetary policy variables.

Liu (2006), designed DSGE based New Keynesian framework to describe the key features of a small open economy. Particularly, the model focuses on the transmission mechanism of monetary policy to provide a tool for basic policy simulations. Data from 1991Q1: to 2004Q4 for New Zealand are used. Key variables are GDP, overall inflation, import inflation, nominal interest rate, competitive price index, real exchange rate, foreign output, and foreign real interest rate. In this study, the Bayesian estimation technique provides comparison between non-nested models and parameter uncertainty explicitly. The Bayesian inferences are in terms of probabilistic statements rather than the notional repeated samples of classical hypothesis testing procedures. The main empirical findings are; (a) the inter-temporal consumption substitution is very little which implies that the New Zealand does not produce close substitutes of the foreign goods. (b) Immobile labor force is backed by the low elasticity of labor supply decisions. c) Price contracts were estimated around four quarters for import retailers and five quarters for domestic producers. (d) Impulse response functions depict the dynamic behavior of shocks and the monetary transmission mechanism for the rest of the economy. This model, however, shows the capacity to stimulate the monetary paths and to analyze the policy outcome in uncertainty.

Da Silveira (2006) presents DSGE model of a small open Brazilian economy with special reference to monetary policy analysis. This model is estimated on quarterly data derived from the Brazilian and U.S., economies for the periods from 1999: Q3 to 2005: Q3. Variables utilized are real GDP, CPI Inflation, 3-month T-bills rate, Real exchange rate as a proxy of short-term interest rates, Terms of trade, U.S. real per capita GDP and U.S., CPI Inflation. This small open economy DSGE framework is empirically evaluated through calibrations and estimated using the Bayesian approach utilizing information from the previous studies as priors. The main empirical findings are a). a higher Terms of Trade (TOT) improves its external competitiveness, shifting the world demand towards its goods. The consequent higher output hits the labor market, pushing the real wage and marginal cost up. B). Other factors held constant, a higher TOT increases the real wage and marginal cost in terms of the domestic goods, leading each

firm to adjust its nominal price up in order to increase its relative price-in terms of the other domestic good-and thereby preserve their markup. A distinctive feature of the model is that the terms of trade enters directly into the new Keynesian Phillips curve as a new pushing-cost variable feeding the inflation, so that there is no more the direct relationship between marginal cost and output gap that characterizes the closed economies.

Hamann, Perez and Rodriguez (2006) develop a DSGE model for small open economy of Colombia. The model used take into account two main sectors that are categorized as tradable and non-tradable sectors with three agents; households, firms and government sector. Quarterly data for the period of 1987: to 2005:4 has been used in estimation. The variables are inflation, nominal interest rate, and real output and exchange rate. Methods used in the analysis are, Calibration, minimum Distance Spectral Analysis and the Bayesian technique. The results show that the policy shocks explain only 3-7 percent variation in inflation, 2.2 percent in real exchange rate and just 0.1 percent in output. The largest source of variation comes from the shocks in Total Factor Productivity (TFP) of the non-traded sector. Foreign shocks are also taken into account, while the terms of trade account for 62 percent in the variation of real exchange rate and about third of volatility in output, interest rates and inflation. It is also disclosed in the study that the DSGE model outcome does not show good degree of forecasting ability as compared with MTYNO. Finally, this model exhibits two features, first nominal rigidities in the form of Calvo pricing in the non-tradable sector and second perfect/imperfect pass-through of exchange rate movements into imported goods prices.

Tovar (2006) focuses on the analysis of effects of currency devaluations on output in Chile, Colombia and Mexico using an estimated DSGE model. This study also provides comparison basis across these three economies by utilizing the estimated parameters. Seasonally adjusted quarterly series have been used with the range from 1989:1 to 2005:4. The variables are inflation, output, labor, private consumption, changes of the nominal exchange rate, interest rate, and the level of nominal exchange rate. The method of analysis used is Maximum Likelihood. The study claims that this method is optimal in estimating DSGE model for small open economy. Estimation through the technique, however, creates problem of stochastic singularity. Therefore, additional shocks were created to address this problem. In the second stage estimation is done by introducing measurement errors. The estimates and the impulse response analysis show that during the last two decades devolutionary policy shocks have been on average expansionary in terms of output. It also depicts that contractionary balance sheet transmission mechanism has been dominated by the expenditure-switching effect. While the balance sheet transmission mechanism has been weaker in Mexico than in Chile and Colombia.

Dcacio and Nelson (2007), replicate the DSGE model of (Chistiano, et al., 2005), in which both the nominal frictions and dynamics in preferences and productions are incorporated. The sample period is 1979:2 to 2005:4. Variables employed are, UK treasury bill rate, real GDP, private household consumption, gross fixed capital formation, business investment as an alternative investment series, productivity and inflation. In the first stage of analysis, the authors estimate monetary policy shock from a VAR and then use the minimum-distance estimation procedures for estimating this DSGE model. The study finds out that the results are consistent to policy regime changes. These regime changes include shifts in the role assigned to monetary policy, for example policy changes made investment decision mirrors closely based on the market forces. It also shows that price stickiness is more than wage stickiness as a major source of nominal rigidity in the UK. Peiris and Savegarrrd (2007), present DSGE model to evaluate monetary policy tradeoffs in low-income countries under certain assumptions. The model is estimated on data for Mozambique in Sub-Sahara Africa except South Africa. The model is estimated on quarterly data covering the period of 1996:1 to 2005:4 Variables utilized are GDP, consumption, exports, imports, the real exchange rate, inflation, export price inflation, import price inflation, M2 currency in circulation, deposit rates, lending rates, foreign currency reserves, government spending, and lending to the private sector. Results show that an exchange rate peg is significantly less successful than inflation targeting in stabilizing the real economy due to higher interest rate volatility.

Haider and Khan (2008) estimate a small open economy Dynamic Stochastic General Equilibrium model for Pakistan using Bayesian simulation approach. To estimate the model parameters, data over the quarterly frequencies from 1984:1 to 2007:4 (post floating period) is used on eight macroeconomic variables; domestic output, foreign output, domestic overall information, imported inflation, domestic interest rate, foreign real interest rate, real exchange rate and term of trade. The model set up is based on new Keynesian framework, characterized by nominal rigidity in prices with habit formation in household consumption. Several interesting results, shown by the study, include;(a) high inflation in Pakistan do not hit domestic consumption significantly; (b) the central bank of Pakistan responds to high inflation by increasing the policy rate by 100 to 200 bps; (c) exchange rate appreciates in both the cases of high domestic and imported inflation; (d) tight monetary policy stance helps to curb domestic inflation as well as imported inflation but appreciates exchange rate significantly (e) pass through of exchange rate to domestic inflation is very low; and finally, parameter value of domestic price stickiness shows that around 24 percent domestic firms do not re-optimize their prices which implies averaged price contract is about two quarters. The estimation results of structural parameters and model impulse response functions yield useful quantitative vis-à-vis

qualitative information. The exogenous shocks impact on endogenous system variables in the right direction, so that the model seems to be helpful as a complementary tool for monetary policy analysis in the Pakistan economy.

Sadeeq (2008), uses a small open economy DSGE model for central Europe Transition economies, EU-15; Czech Republic, Hungary, Poland, Slovakia and Slovenia. Quarterly data for the sample range 1996:2 to 2007:2 has been used for empirical analysis. Variables from each country are selected. These include real GDP, household consumption, nominal wages, CPI Inflation, and nominal short-term interest rates. This model is estimated by utilizing the Bayesian techniques. The estimation results of this illustrate some differences from the Euro area results in structural parameters. However, the results exhibit some similarities across countries, notably in some shocks, volatilities and high habit formation of consumption. The results also illustrate an important degree of rigidity of imported goods prices, which implies a low pass-through of the exchange rate fluctuations. Kolassa (2008) presents a two-country model linking Poland and euro area. The sample period is 1997:1 to 2006:4. The model uses GDP growth, consumption CPI Inflation, real wages, investment, nominal exchange rates and interest rates variables. This open economy DSGE framework is empirically evaluated through calibrations and estimated by the Bayesian approach utilizing information from the previous studies as priors. Overall, results of the model can be seen as rather inconclusive about the differences in parameters describing agent's decision making in Poland and in the Euro-area.

Beidas-Strom and Poghosyan (2011) estimated Dynamic Stochastic General Equilibrium Model of the Jordanian Economy. Their model features nominal and real rigidities, imperfect competition and habit formation in the consumer's utility function. Oil imports are explicitly modeled in the consumption basket and domestic production. Bayesian estimation methods are employed on quarterly Jordanian data. The model's properties are described by impulse response analysis of identified structural shocks pertinent to the economy. These properties assess the effectiveness of the pegged exchange rate regime in minimizing inflation and output trade-offs. The estimates of the structural parameters fall within plausible ranges, and simulation results suggest that while the peg amplifies output, consumption and (price and wage) inflation volatility, it offers a relatively low risk premium. Linardi, (2016) estimated a small open-economy dynamic stochastic general equilibrium (DSGE) model using Brazil's economy data for the inflation targeting period. The model includes a number of shocks that are important to explain the macroeconomic fluctuations of emerging markets economies. Then the empirical fit of different specifications of the model is tested in a Bayesian framework. The potential model misspecification is also assessed by comparing it to a more general reference model using the DSGE-VAR approach. The results show that the model with no price indexation fits the data

better than the fully specified one. The DSGE-VAR approach indicated some degree of misspecification in the stylized small open-economy model.

Bazhenova, and Yuliya (2016) explored the dynamic stochastic general equilibrium model to study the impact of external shocks on the economy of Ukraine. The dynamic stochastic general equilibrium model is constructed for a small open economy that includes households, firms (domestic manufacturers and importers), government, the National Bank and external sector. The model assumes the new-Keynesian approach that includes the so-called “rigidities” of prices and wages, the existence of the households’ consumption habits and investments with adjustment costs. Also, it takes into account the country’s significant dependence on mineral products imports. All goods in the economy are divided into the domestic ones (that are exported and consumed in the country), imports and mineral products. They found that a rise in world output provokes the growth of domestic output, due to the growth of demand for traditional Ukrainian exports, an increase of the attractiveness of domestic firms that encourages the inflow of investment to the economy and exerts pressure on the interest rate towards its reduction and further intensification of investment and innovation. Increase in interest rates abroad provokes a rise in interest rates in the country, indicating the dependence of the Ukrainian banking system from foreign capital. In the short term, increase in interest rates abroad leads to a drop in household consumption, due to the large part of consumption lending, and reduces the demand for real money balances. The aggregate demand for goods and services, as illustrated by the results of simulations, shows the instantaneous inertial growth accompanied by a further fall, which in the long run does not reach the previous level. The growth of the world aggregate demand leads to the growth of aggregate demand for domestic goods and services, especially the investment demand for goods. In the short run, there is a switching demand from consumer goods to the investment one. As a result, a fall in the overall aggregate demand is observed, then - its growth and stabilization in the long run.

Palic (2018) study was on Croatia and the aim of the study was to test the compliance of monetary policy shock in calibrated dynamic stochastic general equilibrium (DSGE) model which includes financial frictions with the empirical impact of monetary policy shock in Croatia estimated using vector autoregression (VAR) model. After the DSGE model is calibrated, the VAR model is estimated for Croatia. The comparative analysis of impulse response functions of DSGE and VAR model was conducted. In both models, it was found that monetary policy shock has positive initial impact on interest rate and negative initial impact on house prices and output gap. Furthermore, the study’s results indicate that empirical impact of the monetary policy shock adequately reflects the impact of monetary shock in DSGE model with financial frictions.

In Nigeria, some of the studies on external shock include: Akinleye and Ekpo (2013) examined the macroeconomic implications of symmetric and asymmetric oil price and oil revenue shocks in Nigeria, using the vector autoregressive (VAR) estimation technique. Their study found that both positive and negative oil price shocks influence real government expenditure only in the long run rather than in the short run, while examining positive and negative shocks to external reserves revealed stronger implications for expenditure in the long run, with positive rather than negative oil price shocks having stronger short and long run effects on real GDP, and therefore triggering inflationary pressure and domestic currency depreciation as importation rises. This implies that the country exhibits the Dutch disease syndrome in the short and long run. However, results obtained show that oil revenue shocks are capable of impeding economic growth only in the long run while raising general price levels marginally in the short run after the initial shocks, with evidence of serious threat to interest rate and the domestic currency in the short and medium term, as the volume of imports increases significantly along with the external reserves. Their findings on the asymmetric effects of oil revenue shocks revealed that positive shocks to oil revenue stimulate expansionary fiscal posture in the Nigerian economy in the short run in line with theory, thereby creating inflationary pressure and domestic currency depreciation. The combined implications of these discoveries suggest the need for proper coordination of fiscal and monetary policy for sustainable macroeconomic stability to be achieved.

Oyelami and Olomola (2016) study investigated the macroeconomic responses of Nigerian economy to external shock between 1986 and 2014. They examined the effect of oil price shocks and macroeconomic shocks from developed trading partners on Nigerian macroeconomic performances in order to establish pattern of reactions to these shocks in the country. They utilized the global vector autoregression (GVAR) comprising of the US, EU, China, Japan and Nigeria as the reference country. Their findings based on the impulse response function show that oil price shocks have direct effect on real gross domestic product and exchange rate in Nigeria but variables like inflation and short-term interest rate do not show immediate response to the shocks. Furthermore, their results indicate that macroeconomic variables such as short-term interest and inflation show immediate responses to shocks to counterpart variables in developed countries. They concluded that the Nigerian economy is vulnerable to external shocks and such shocks are not limited to oil price shocks while other form of shocks such as growth spillover and financial shocks from developed countries are also relevant in shaping the macroeconomic performances in Nigeria.

Adefabi, and Rasak (2018) investigated the effects of external shocks on economic growth dynamics in Nigeria using a structural vector autoregression (SVAR) technique. They considered six external shocks - external debt, foreign interest rate, foreign output, oil price, foreign input price and real interest rate shocks. Their findings indicate that external shocks impact economic growth in Nigeria and among the external shocks, foreign interest rate shocks, foreign input price shocks and external debt shocks are the most important shocks impacting economic growth in Nigeria. They stated that the importance of foreign interest rate shocks and foreign input price shocks suggest the significance of external financial shocks and foreign supply shocks on economic growth in Nigeria. Additionally, their findings, however, show that oil price shocks, foreign output shocks and real exchange rate shocks have limited impact on economic growth in Nigeria.

Adedokun, (2018) investigated investigate the effects of oil shocks (price and revenue) on the dynamic relationship between government revenues and government expenditures in Nigeria and how it transmits effects on major macroeconomic variables using structural VAR (SVAR) on key variables, and also employed unrestricted VAR and Vector Error Correction (VEC) Models on expanded number of variables. His study used data from 1981 to 2014 and the findings from the SVAR shows that oil price shocks could not predict the variation in government expenditure in the short-run, while the predictive power of oil revenue shocks is very strong both in the short-run and in the long-run. The VAR and VECM also substantiate the results of SVAR and provide further insight which shows that short-run fiscal synchronization hypothesis is evidenced between the oil revenues and total government expenditures, while spend-tax hypothesis exists in the long-run between total expenditures and total revenues. It is also evidenced that oil shocks highly affect policy variables in the short-run and transfer the effects on the other macroeconomic variables in the long run. He suggested expedient government actions to redirect the economy from oil revenue dependency towards diversifications along other less volatile sources of revenues so as to prevent long-run transmission of effects of oil shocks on broader macroeconomic variables.

Asaleye, et al, (2019) investigated the impact of oil shock on macroeconomic performance in Nigeria using Structural Vector Autoregression and normalized equation was used to establish the long-run equation. They found from the long-run relationship that employment has a negative relationship with aggregated output, exchange rate and oil prices. The interest rate and consumer price index have a positive relationship with employment. Variation in oil shock affects most of the macroeconomic variables. More explicitly, the oil price shock shows more variation across the time horizon for employment. They opined that the consequence of the result is that dependence on the oil sector has not promoted employment

generation over time; there is a need to consider an alternative means to ensure sustainable growth and development.

Oladunni (2019) employed a sign-restricted Bayesian structural vector autoregressive (BSVAR) model to analyze how global demand, oil price and the US monetary policy shocks impact the Nigerian business cycle. He found that global demand and oil price shocks are the principal foreign drivers of the Nigerian business cycle. The global demand shock elicits the strongest responses from output growth and inflation; while oil price shock impacts the terms-of-trade and interest rate the most. The historical contributions of the global demand and oil price shocks to the evolution of output growth are significant and comparable, while that of oil price shock to inflation and interest rate is dominant. Furthermore, his sensitivity analysis of pre-crisis period of 2008/09 suggests that macroeconomic risk arising from global demand shock is systematic, owing to the comparable impact on output growth and similar interest rate response in the two estimations. Additionally, evidence suggests that the GFC may have contributed to the more volatile inflation response to global demand shock in our full sample estimation. He concluded that given the strong and pervasive impact of the global demand shock on output growth, Nigeria can manage its vulnerability by shrinking the size of oil exports in its terms-of-trade, while growing non-oil exports progressively through sustained economic diversification and viable industrialization strategy.

Abere, and Akinbobola (2020) examined the relative contributions of external shocks and institutional quality to macroeconomic performance in Nigeria, using Structural Vector Autoregressive (SVAR) approach. Their study established the dominance of the relative contributions of external shocks measures over institutional quality to macroeconomic performance in the country. They opined that even though the dominance of terms of trade and foreign aid is highlighted, the role of institutional quality is equally important as it also has significant positive effect on performance. Their study concluded that both external shocks and institutional quality play significant roles, and hence, posits the existence of favorable institutional environments as a panacea to successfully absorbing the influence of external shocks which are exogenous to the economy.

Many of the studies on Nigeria, for instance, used the theory of the business cycle. This theory assumes that economic fluctuations are determined by supply shocks, especially productivity and technological shocks. The inability of the canonical model of business cycle to reproduce some features in labor market is however, a well-known shortcoming of these models. Recent past studies by Collard (2002), Hairault (1999), and Benassy (1995) have attempted to introduce monetary and demand shocks in the canonic Real Business Cycle (RBC) model. In recent years, the new Keynesian dynamic stochastic general equilibrium model

of monetary analysis has rapidly developed. This study thus differs from other in Nigeria by using the Dynamic Stochastic General Equilibrium (DSGE) model. In fact, recent past studies results have been found inadequate in explaining macroeconomic policy responses to both internal and external shocks in Nigeria.

METHODOLOGY

Dynamic Stochastic General Equilibrium (DSGE) models have become a standard tool in today's macroeconomic analyses. Very view have been applied to small open economies (Tovar,2006; Medina& Soto, 2005; Ambler, Dib & Rebei, 2003; Bergin, 2003; and Lubik & Schorfheide, 2003) with the main focus being on relatively developed economies. But this study, estimate, using Impulse Response Functions and Variance Decomposition analyses, a DSGE model based on the characteristics of the Nigerian economy. The main purpose of this study as stated in the objective is to investigate the dynamic effect of external shocks on domestic output, domestic inflation, domestic interest rate, exchange rate and to examine the appropriate macro policy strategy for Nigerian economy, given its structural characteristics and the pattern of the external shocks.

A Stylized DSGE Model

The theoretical model of DSGE is based on rational expectations and microeconomic foundation and usually summarized in four equations that depict the optimizing behavior of economic agents in the economy. These are the aggregate demand curve or the traditional Keynesian IS curve; the aggregate supply which takes the form of money demand relationships; forward-looking version of the Phillips curve. In general, DSGE characterizes the dynamic behavior of output, inflation and nominal interest rate; and an exogenous world economy block. The framework that we follow is in compliance to the Small Open Economy (SOE) New Keynesian models developed from first principles in, Monacelli (2005), Bergib (2003), Clarida et al. (2001, 2002), McCallum and Nelson (2001), Obstfeld and Rogoff (2000) and Svensson (2000), making it redundant for us to go through its micro-foundation.

As with many other SOE models, the core structure of the system consists of two blocks: domestic block comprising an IS equation, a Phillips curve, a monetary policy rule and an uncovered interest parity (UIP) condition; and an exogenous world economy block. The economy is subject to eight different shocks. Firms face technology and cost-push or mark-up shocks. Households face a preference shock that enters the Euler equation linking consumption with the real interest rate. International disturbances arise from shocks on export demand or from the international risk-free interest rate. Finally, the interest rate rule is subject to three type

of shocks: on inflation, output, and nominal exchange rate targets. This last shock is key in the analysis as it is meant to capture a devaluation of the nominal exchange rate, as discussed later.

The domestic economy

Let $E_t x_{t+1}$ denote the rational expectation forecast of x_{t+1} conditional on the information set available to the forecasting agent at time t . Aggregate supply (AS), i.e., the equation describing inflation dynamics in the domestic economy is modeled by the following hybrid Phillips curve:

$$\Pi_t = \rho_{\Pi} E_t \Pi_{t+1} + (1-\rho_{\Pi}) \Pi_{t-1} + \lambda_1 y_t + \lambda_2 q_t + \epsilon_{AS,t} \dots \dots \dots (1)$$

Where, Π_t and y_t are respectively inflation and the output gap in the domestic economy, q_t is the real exchange rate and $\epsilon_{AS,t}$ is a stationary, but serially correlated, supply shock. The term hybrid relates to the fact that the Phillips curve is backward as well as, forward looking in inflation. Allowing for an inertial effect by giving a non-zero weight to Π_{t-1} in Equation (1) was initially empirically motivated but can also be derived from a staggered price setting mechanism, where a proportion of firms use a naïve, backward looking rule to forecast inflation. It thus arises as a consequence of a Calvo (1983), type price setting mechanism, with partial indexation to last's inflation. An explicit derivation of the hybrid Phillips curve is given in, amongst others, Clarida et al. (2002), Christiano et al. (2001) and Smets and Wouters (2003). The empirical usefulness of the hybrid specification has been advocated in e.g. Rudd and Whelan (2005) and Linde (2005). Notice also that the impact of the real exchange rate q_t on domestic inflation represents the first transmission channel of world shocks into the domestic economy.

The output gap is described by the following IS equation:

$$Y_t = \rho_Y E_t Y_{t+1} + (1-\rho_Y) y_{t-1} - r_t (r_{t-1} - E_{t-1} \Pi_t) + q_t q_{t-1} + p y_t^* + \epsilon_{IS,t} \dots \dots \dots (2)$$

Where r_t is the monetary policy instrument y_t^* is the US output gap, which is our proxy for world demand and $\epsilon_{IS,t}$ is a serially correlated aggregate demand shock. One can see from Equation (2) that the output gap depends on its expected value one-period ahead and its lagged value, where the relative impact is determined by the size of ρ_Y . The forward-looking term is due to households inter temporal optimizing behavior and the lagged term arises as a result of external consumption habit formation, or due to a costly adjustment of the capital stock (see, for example, Clarida et al., 2002; Christiano et al., 2001; Smets and Wouters, 2003, for more details).

The presence of the real exchange rate q_{t-1} and the foreign output gap y_t^* in (2) denotes the second and third transmission channel of foreign shocks into the domestic economy.

In the specification of the monetary policy (MP) reaction function, we follow the arguments put forth in *Clarida et al.* (2001) and Svensson (2000) that a Taylor-type rule that considers only the

domestic output gap and domestic inflation is optimal even for an open economy, and that it is reasonably robust to different model structures. Empirical validation of this can be sought in, for example, Giordani (2004), who includes r_t^* , Π_t^* and y_t^* , but nevertheless finds that only r_t^* receives a non-zero weight in the MP reaction function in his model for Canada. In the models estimated by Lubik and Schorfheide (2007) and Lubik (2005), changes in the nominal exchange rate were included in the MP reaction function of the central bank, however, no statistical evidence was found to suggest that the MP authority reacted to exchange rate fluctuations.

A forward-looking version of the Taylor-rule is employed to emphasize the RBA's focus on future inflation when adjusting its MP instrument, taking the form

$$r_t = \rho_r r_{t-1} + (1-\rho_r) (\psi_1 E_t \Pi_{t+1} + \psi_2 y_t) + \varepsilon_{MP,t} \dots\dots\dots(3)$$

Where $\varepsilon_{MP,t}$ is assumed to be distributed i.i.d. An i.i.d. specification of the monetary policy shock is a common assumption in the literature, see Smets and Wouter (2003) and *Del Negro et al. (2005)*. One can notice from the specification in (3) that monetary authority responds to one period ahead expected inflation and the current output gap, while at the same time it adheres to a certain degree of inertia in r_t , making the response flexible and empirically justifiable.

To be able to close the model, the evolution of the real exchange rate and the foreign economy needs to be specified. Real exchange rate thus formulated, such that it evolves according to real UIP. The UIP condition is generally stated as an identity over the log of the exchange rate and interest rates, with the exchange rate being expressed as the ratio of domestic to foreign currency units. Since the model becomes stochastically singular if UIP is left as an identity in (4), it is necessary to either add shock, or to compute the log-likelihood excluding the exchange rate equation. Giordani (2004), for example, opts for the latter, while prefer the former (see also Justiniano and Preston (2004), Leu (2004) and McCallum and Nelson (2001), who adopt a similar approach). Equation (4) below describes how the real exchange rate evolves.

$$E_t \lambda q_{t+1} = (r_t - E_t \pi_{t+1}) - (r_t^* - E_t \pi_{t+1}^*) + \varepsilon_{RER,t} \dots\dots\dots(4)$$

We allow $\varepsilon_{RER,t}$ in (4) to be serially correlated, in order to accommodate findings in the related literature that UIP tends to hold over longer horizons of 1-2 years (see the studies by Chinn and Meredith (2004) and Mark and Moh (2001) for more details regarding the empirical properties of UIP).

The foreign economy

The US economy, which is used as a proxy for the world economy, is modeled according to NKPM that was recently employed by Cho and Moreno (2006).

This model consists of the following three equations:

$$\begin{aligned}\Pi_t^* &= \rho_\pi^* E_t \Pi_{t+1}^* + (1-\rho_\pi^*) \Pi_{t-1}^* + \lambda^* y_t^* + e_{AS,t}^* \\ y_t^* &= \rho_y^* E_t y_{t+1}^* + (1-\rho_y^*) y_{t-1}^* - \delta^* (r_{t-1}^* - E_{t-1} \Pi_t^*) + e_{IS,t}^* \\ r_t^* &= \rho_r^* r_{t-1}^* + (1-\rho_r^*) (\psi^* E_t \Pi_{t+1}^* - \psi_2^* y_t^*) + e_{MP,t}^*\end{aligned}\quad (5)$$

The specification of the closed economy model for the US is analogous to the one employed for the domestic economy, with the impact of foreign variables on domestic inflation and the output gap completely removed. Notice that the effect of the real interest rate on the output gap was set in line with the domestic economy model, i.e., with a one period lag, rather than with a contemporaneous effect as in the original formulation in Cho and Moreno (2006). Following a specification of the US block as in Equation (5) enables us to give structural identification to the foreign shocks.

Equations to be Estimated

The model used in this study is the Buncic and Melecky (2007) model. This model extends the work of Clarida et.al. (1999), and Lubik and Schorfheide (2005) in its simplified form to the small open economy case, which has become standard and vastly used in the literature. The model comprises the following variables: y_t , π_t , q_t , r_t , y_t^* , π_t^* , r_t^* representing domestic output, domestic inflation, real exchange rate, domestic nominal interest rate, foreign output, foreign inflation, and foreign nominal interest rate respectively. Consequent upon this, to establish New Keynesian framework, one has to Log-Linearize DSGE models consisting of the alternative market clearing and optimality conditions in the neighborhood of a non-stochastic zero condition steady state will lead to a canonical representation of the equilibrium of the model consisting of a dynamic IS curve, a New Keynesian Phillips Curve (NKPC) and some form of fiscal and monetary policies model at domestic level, as well as equations for the external sectors. This makes it possible for the fully micro-founded New Open Economy Macroeconomic literature to tie in with traditional Open Economy Macroeconomic models of the Mundell-Fleming-Dornbusch type.

The model is already in log-linear form: The model analyzed consists of a set of linearized equations so that each variable in the model is in percentage deviation from its steady state value. That is $x_1 = (X_1 - X)/X$ is in log-deviation and X is the steady state value. The variables with asterisks are the foreign variables. The open economy model we shall be estimating for Nigeria is Buncic and Melecky (2007). As in other variants of the SOE model, there are basically six key equations and some set of exogenous variables.

The New Keynesian Phillips curve. This has become a standard medium of analyzing inflation dynamics. Equation (6) is an open economy New Keynesian Phillips Curve (NKPC). This curve is derived from the profit maximization decision of the domestic firms under the monopolistic competition and sticky prices. The NK Phillips curve is forward looking, as expectations about future inflation influence the current inflation. It also comprises a backward-looking element in inflation, so that past inflation matters for current inflation. This extension due to Gali and Gertler (1999) improves the inertia of the inflation. Since it is an open economy Phillips curve, the exchange rate also enters the equation.

$$\pi_t = \rho_\pi E_t \pi_{t+1} + (1 - \rho_\pi) \pi_{t-1} + \lambda_1 y_t + \lambda_2 q_t + \epsilon_{\pi,t} \quad (6)$$

The IS equation. The IS equation so described is structurally given. Equation (7) is an open economy IS curve. Since the IS curve results from the optimizing decision of household who maximize their lifetime utility, a forward-looking element appears. The backward-looking element is the result of either external habit formation or adjustment costs in capital (see Buncic and Melecky, 2007). Moreover, since it characterizes an open economy, the domestic output is influenced by both the real exchange rate and by the foreign output.

$$y_t = \rho_y E_t y_{t+1} + (1 - \rho_y) y_{t-1} - \partial_t (r_{t-1} - E_{t-1} \pi_t) + \partial_2 q_{t-1} + \partial_3 y_t^* + \epsilon_{y,t} \quad (7)$$

Exchange rate equation:

Equation (8) specifies the real exchange rate dynamics. The real exchange rate follows the uncovered interest parity to which a shock is added in order to take into account the measurement errors. The same approach was also followed by Justiniano and Preston (2004).

$$E_t \Delta q_{t+1} = (r_t - E_t \pi_{t+1}) - (r_t^* - E_t \pi_{t+1}^*) + \epsilon_{q,t} \quad (8)$$

Foreign economy equations:

Equations (9) - (11) specify the foreign economy, in this case the euro area- proxy world developed economies. The foreign economy is similar in structure to the domestic economy. Since the foreign economy is taken as a large economy, no open-economy elements appear in the equation that characterize it (see Buncic and Melecky, 2007).

$$\pi_t^* = \rho_\pi^* E_t \pi_{t+1}^* + (1 - \rho_\pi^*) \pi_{t-1}^* + \lambda^* y_t^* + \epsilon_{y,t}^* \quad (9)$$

$$y_t^* = \rho_y^* E_t y_{t-1}^* + (1 - \rho_y^*) y_{t-1}^* - \partial^* (r_{t-1}^* - E_{t-1} \pi_t^*) + \epsilon_{y,t}^* \quad (10)$$

$$r_t^* = \rho_{rf} r_{t-1}^* + (1 - \rho_{rf}) (\psi_{rf} \pi_t^* + \psi_{yf} y_t^*) + \epsilon_{m,t}^* \quad (11)$$

By this specification, we pin down the small open economy as a system affected by foreign and worldwide data-generating processes but which has little or no perceptible influence on the rest

of the world. It is in this sense that we interpret our SOE model - (Nigerian economy case in this study).

Data Sources

Secondary sources of data covering the period 1986Q1 through 2018Q4 were utilized. The choice of this study period, (1986Q1 through 2018Q4), is to enable us eliminate the possibility of structural breaks in the transmission mechanism of foreign shocks into the Nigerian economy. It also allows us to capture periods of liberalization and stabilization and more importantly, the major economic reform program, the Structural Adjustment Programme (SAP) which was introduced in 1986Q1, this ushered in a trend of both internal and external shocks in the economy.

A set of seven variables were considered in the model: Domestic output; Domestic inflation; Real exchange rate; Domestic nominal interest rate; Foreign output; Foreign inflation; and Foreign nominal interest rate. Our, Quarterly data were taken from the IMF's IFS data base and OECD Economic Outlook. Overall domestic inflation is the annual growth rates in consumer price index (CPI) for Nigeria. Data source of this variable was CBN statistical bulletin (various publications). Real exchange rate is calculated by multiplying nominal exchange rate with Nigeria-US price ratios where CPI of both countries is a suitable proxy of respected prices. Domestic nominal interest rate-Short term money market rate is taken as the proxy of nominal interest rate. The data source for this variable was Statistical Bulletins of the CBN. Foreign inflation is the annual growth rates in unit value of import index (UVIM). This series is taken from IFS-CD 2018. Foreign output is taken as annual growth rate in US. Finally, to eliminate the possibility of a structural break in the transmission mechanism of foreign shocks into the Nigerian economy due to the new economic programme (SAP) introduced, the study prefers to start the sample period in 1986Q1.

RESULTS AND DISCUSSION

Impulse Response Analysis

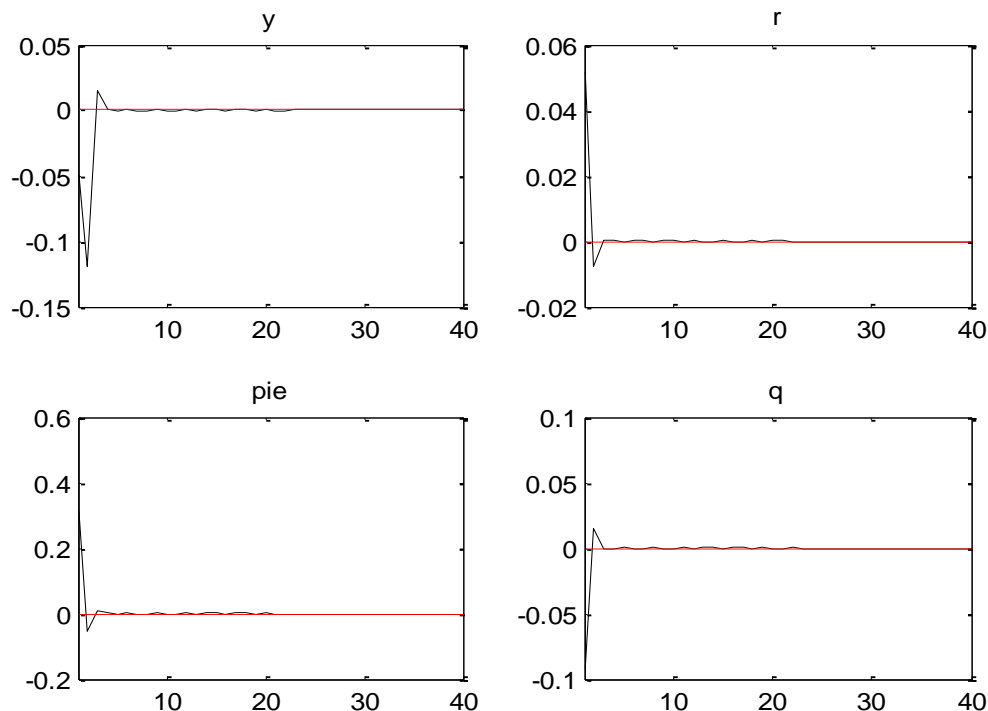
Having got the assurance for determinacy of the rational expectations equilibrium, it would be interesting to investigate how the endogenous variables of the model react to simulated transitory shocks abroad. This impulse-response analysis can also be viewed as additional robustness test for the goodness of the present model specification. An impulse response function depicts the trajectory of each variable away from the equilibrium initially perturbed. For this reason, it is zero when the variable is in the original equilibrium, while it technically reverts back to the steady state. Charts 1-4 illustrate the responses of domestic output, domestic

interest rate, domestic inflation and exchange rate in the system to different external shocks as presented.

The Foreign Interest Rate Shock

Chart 1 show the influence of foreign nominal interest rate on the (a) domestic output, (b), the domestic inflation (c) the real exchange rate and (d) domestic interest rate. The domestic interest rate increases less than 1% since the output gap and the inflation respond negatively from the first period to the interest rate shock. The impact of this on the domestic variables is not persistent. The inflation decreases by 0.3% but the effect lasts for about two quarters. The impact on the output gap is slightly more persistent. Output decreases by more than 0.15% and the negative effect lasts for about six quarters. One may notice that output reacts in a realistic way, with a hump-shaped response to the interest rate shock. The increase in the domestic inflation leads to increase in the domestic interest rate, which reacts strongly by 2%. This leads to a decrease in the output gap with a lag of one year. The foreign interest rate shock leads to much more persistent responses in both domestic and foreign variables.

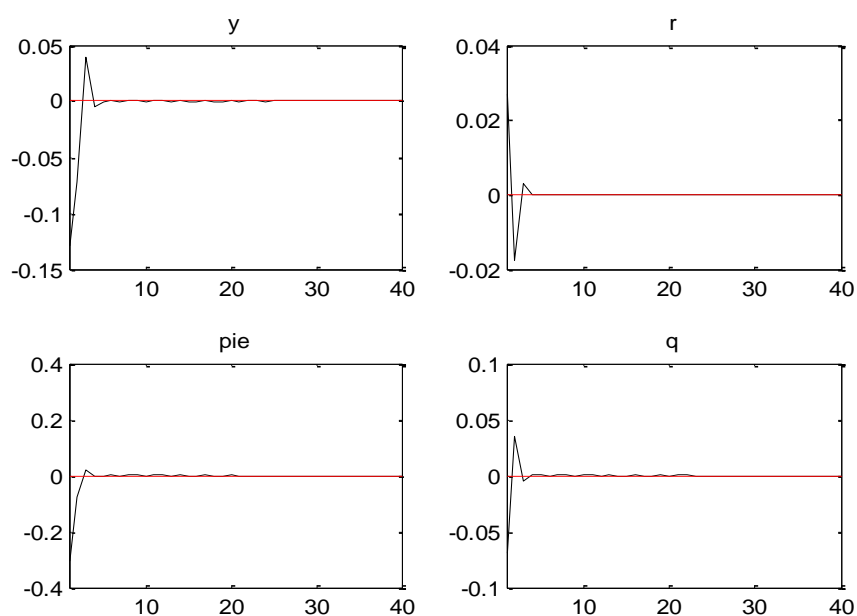
Chart 1: Response of y , r , π and q to mst



The Demand Shock

Chart 2, show that demand shock leads to a strong response of the output which increases more than one percent. The response is in line with economic theory. The percentage is moderate, as the effect completely dies out after five quarters. Through the Taylor rule, the interest rate reacts positively but moderately. The 0.3% increase in the interest rate leads to a negative response in the inflation that decreases by 0.3%. In response to the positive output gap and higher inflation, the Central Bank raises real interest rates, which leads to a depreciation of the exchange rate (Naira), vis-à-vis other international currencies.

Chart 2: Response of y , r , π and q to q



The Supply Shock

Charts 3 and 4, show the influence of foreign supply and inflation shocks on the (a) domestic nominal interest rate, (b) domestic inflation and (c) the real exchange rate. A one percent temporary positive supply shock leads to a 0.06% increase in the interest rate. The increase in the interest rate leads to an actual increase in the inflation of about 0.05%. The increase in the interest rate leads to a negative effect on the output gap. The output gap reacts again in a realistic way. The response is moderate and the maximum peak is reached after two quarters at about -0.2%. The result indicates that a shock to foreign output gap increases domestic output gap, inflation and interest rates. However, the impact on exchange rate and money supply is not noticeable in the short run. An increase in inflation leads to a rise in the real interest rate as well as in the appreciation of naira. As a result, higher interest rate and real exchange rate

appreciation reduce aggregate demand as well as a fall in output gap and inflation. The increase in the developed economy inflation leads to an increase in the developed economy interest rate. The increase in the interest rate is moderate, of 0.15%, but persistent, as it lasts for more than five periods.

Chart 3: Response of y, r, pie and q to yst

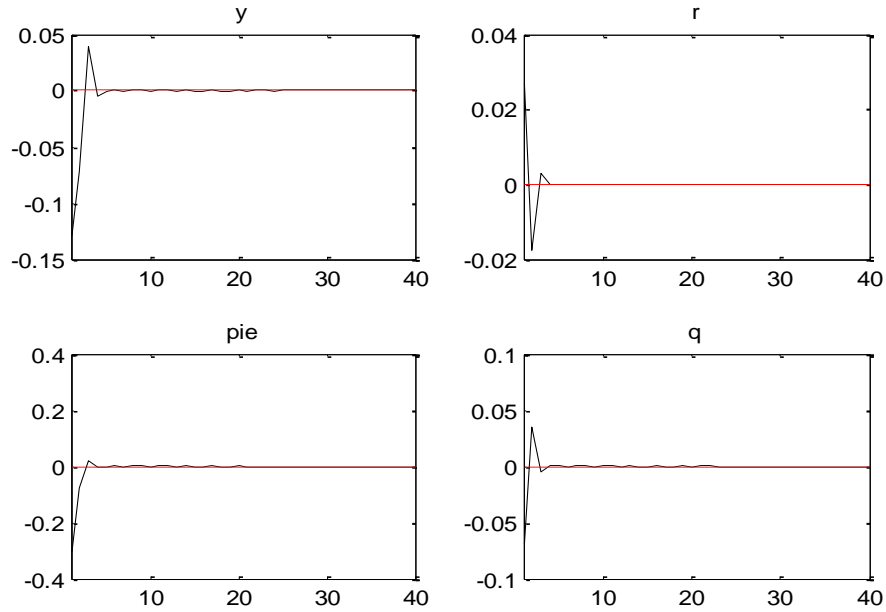
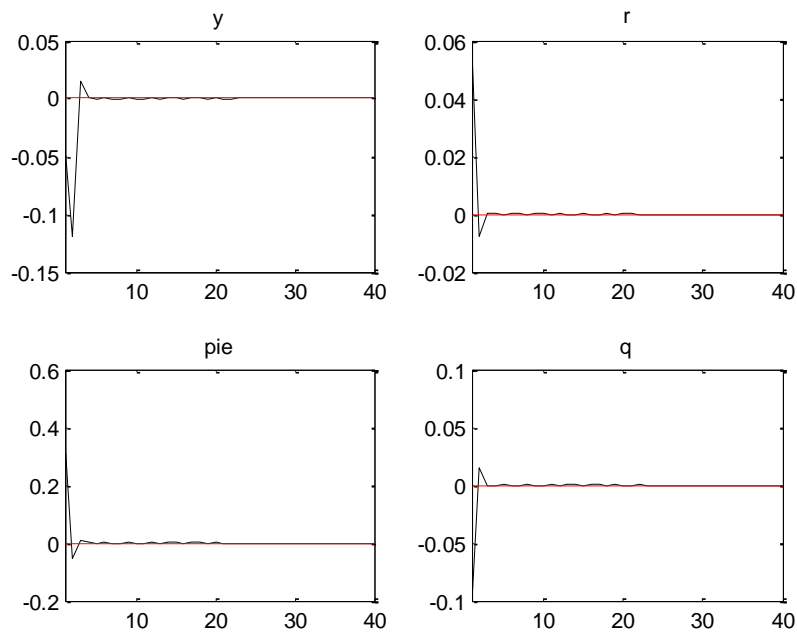


Chart 4: Response of y, r, pie and q to pist



Variance Decomposition Analysis

In order to analyze the long run impact of foreign shocks on the domestic variables, the study decomposes the variance of the variables. The decomposition is done for the long run, that is, for over 40-period planning horizons. Shocks are unanticipated and appear in period one and for the remaining periods considered. The impact of foreign shocks on domestic variables of interest – Output, Inflation, Interest rate and Exchange rate are tabulated in Tables 1 – 4, using Variance Decomposition Analysis.

Table 1: Exchange Rate Shock

Domestic Variables	PERIOD 1	PERIOD 4	PERIOD 8	PERIOD 16	PERIOD 20	PERIOD 40
Output	13.75	23.86	23.88	23.88	23.88	23.88
Inflation	51.93	59.27	59.27	59.27	59.27	59.27
Interest rate	36.41	41.92	41.92	41.92	41.92	41.92
Exchange rate	53.85	61.50	61.50	61.50	61.50	61.50

Table 2: Foreign Supply Shock

Domestic Variables	PERIOD 1	PERIOD 4	PERIOD 8	PERIOD 16	PERIOD 20	PERIOD 40
Output	0.04	2.57	2.57	2.57	2.57	2.57
Inflation	0.00	0.00	0.00	0.00	0.00	0.00
Interest rate	0.00	0.00	0.00	0.00	0.00	0.00
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00

Table 3: Foreign Demand Shock

Domestic Variables	PERIOD 1	PERIOD 4	PERIOD 8	PERIOD 16	PERIOD 20	PERIOD 40
Output	3.58	5.89	5.89	5.89	5.89	5.89
Inflation	0.00	0.00	0.00	0.00	0.00	0.00
Interest rate	0.00	0.00	0.00	0.00	0.00	0.00
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00

Table 4: Foreign Interest Rate Shock

Domestic Variables	PERIOD 1	PERIOD 4	PERIOD 8	PERIOD 16	PERIOD 20	PERIOD 40
Output	96.39	91.54	91.54	91.54	91.54	91.54
Inflation	0.01	0.01	0.01	0.01	0.01	0.01
Interest rate	0.01	0.01	0.01	0.01	0.01	0.01
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00

The domestic output gap variance is determined mostly by the demand shocks. It has significant effect for all periods under consideration ranging between 34% to 29% on Inflation. Exchange rate is equally affected although to a minimum extent, but has significant impact on domestic output, while its impact on interest rate is low Domestic supply shocks. Impact is heavy on interest rate and about 11% on inflation and exchange rate 8%, while interest rate recorded the high impact during the periods considered and mildly in the rest of the periods. The influence on other domestic variables reflects similar impact.

The domestic interest rate shocks impacted much on domestic output, which this study believe it is normal because of the source of funds for investment in the production of real goods and services. Its impact on inflation and exchange rate is however low.

And exchange rate shocks also help explain the variance of Inflation, Interest rate, value of the domestic currency (Naira) and the output gap. In fact, all domestic variables are significantly affected by the exchange rate shock. It is often argued that a depreciating exchange rate can encourage exports and curb imports, but this will depend to some extent on the potential for growth in Nigeria's major export markets as well as on the price elasticity of demand for the country's imports. Growth in manufactured exports tends to be slow, and would be inhibited by any uncertainty regarding future exchange rates. Furthermore, majority of Nigeria's imports are of a capital or intermediate nature. These goods have a relatively low-price elasticity of demand and import volumes are unlikely to decline significantly in the face of higher prices. The exchange rate variance is mostly explained by its own shocks and by the domestic interest rate shocks, (Table 1). Both the foreign demand and supply shocks have significant impact on domestic output. This can be attributed to "Dutch Disease Syndrome" of Nigerians' consumption. All other domestic macroeconomic variables are equally affected but to a limited extent, (Tables 2 - 3). The foreign interest rate shocks contribute to the explanation of the interest rate variance. It has a serious impact on the level of domestic output. This may be because of the real economy production dependence on foreign capital inflows and external debt overhang, (Table 4).

Corrective Mechanisms

If external shocks are large and persist for long enough and if inconsistent domestic policies are maintained, the economy may go into a recession, if drastic action is not taken. Since individual developing economies can do little about changes in the external economic environment and has to take those as given, then efficient combination of external financing, the use of external reserves, and domestic adjustment via transparency and accountability of the public sector in connection with the bank would be called for at an early stage to offset or to minimize the effects of any external shocks that occur. Appropriate macroeconomic policy mix, should be applied to control both public and private spending, and a more market determined exchange rate policy would seem to be the relevant instruments of adjustment in the case of external shocks circumstances.

In addition, capital controls should be used in order to increase the autonomy of the CBN to set nominal interest rate according to domestic objectives, to avoid the appreciation of the real and to prevent financial and exchange crises.

Furthermore, the findings suggest that excess demand for goods and imported inflation are the major contributing factors to the overall inflation rate. It also suggests that, relative prices and real income have a significant influence on the level of imports, while capacity production is the major determinants of exports. In the absence of stabilizing mechanisms, input shock translates very quickly into an output shock and a fall in consumption. Policy distortions often amplify these economic effects. An economy facing external shocks requires that “adjustment” be made if previous projections of consumption, investment and income are to be realized in the medium to longer term.

CONCLUSION

This study examined the macroeconomic effects of external economic shocks on the Nigerian economy and the impact of various macroeconomic policies responses to these shocks. The types and channels of shocks that affect macroeconomic performance are identified. The analysis of the effects of shocks that occur while the economy is open is conducted within the framework of the dynamic stochastic general equilibrium model (DSGEM) in this paper. DSGE model is used to evaluate the effects of external shocks and test the effectiveness of different policies applications. The Impulse response functions (IRF) and Variance decomposition analyses, traced the response of the following macroeconomic variables; the general price level, the foreign interest rate, the real exchange rate, and foreign inflation. The findings from the IRFs, indicate that the domestic output is influenced in a moderate way by the foreign demand and interest rate shocks. The foreign supply and interest rate shocks have significant and

persistent impacts on the domestic inflation. With a flexible exchange rate and an agile response by monetary policy, the adverse effects are manageable. The simulations presented in the study, IRFs and VDC analyses, indicate that all seven of the simulated shocks (an exogenous domestic Supply and Demand shocks, domestic interest rate, foreign exchange, foreign interest rate, foreign level of supply and foreign demand.) would each have a significant effect on macroeconomic behavior in the short run. Although these positive empirical findings may not be immediately applicable for explaining the behavior of other developing economies, they nevertheless offer important lessons for developing commodity economies like Nigeria as she goes through the process of emerging market economies in its various economic policy reform programs since 1986.

SCOPE FOR FURTHER STUDIES

Further studies can be carried out to determine the impact of specific shocks on the Nigeria Economy whereby structural breaks in the transmission mechanism of foreign shocks into the Nigerian economy can be introduced. The specific impact of different external shocks like trade shocks, external financial shocks, foreign demand shocks and foreign supply shocks can be investigated. Also, the impact of weak institutional quality, inappropriate economic policies and bad governance can also be examined to help investigate the susceptibility of the economy to external shocks.

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