CENTRAL BANK OF NIGERIA

MODELING THE EXTERNAL SECTOR OF THE NIGERIAN ECONOMY
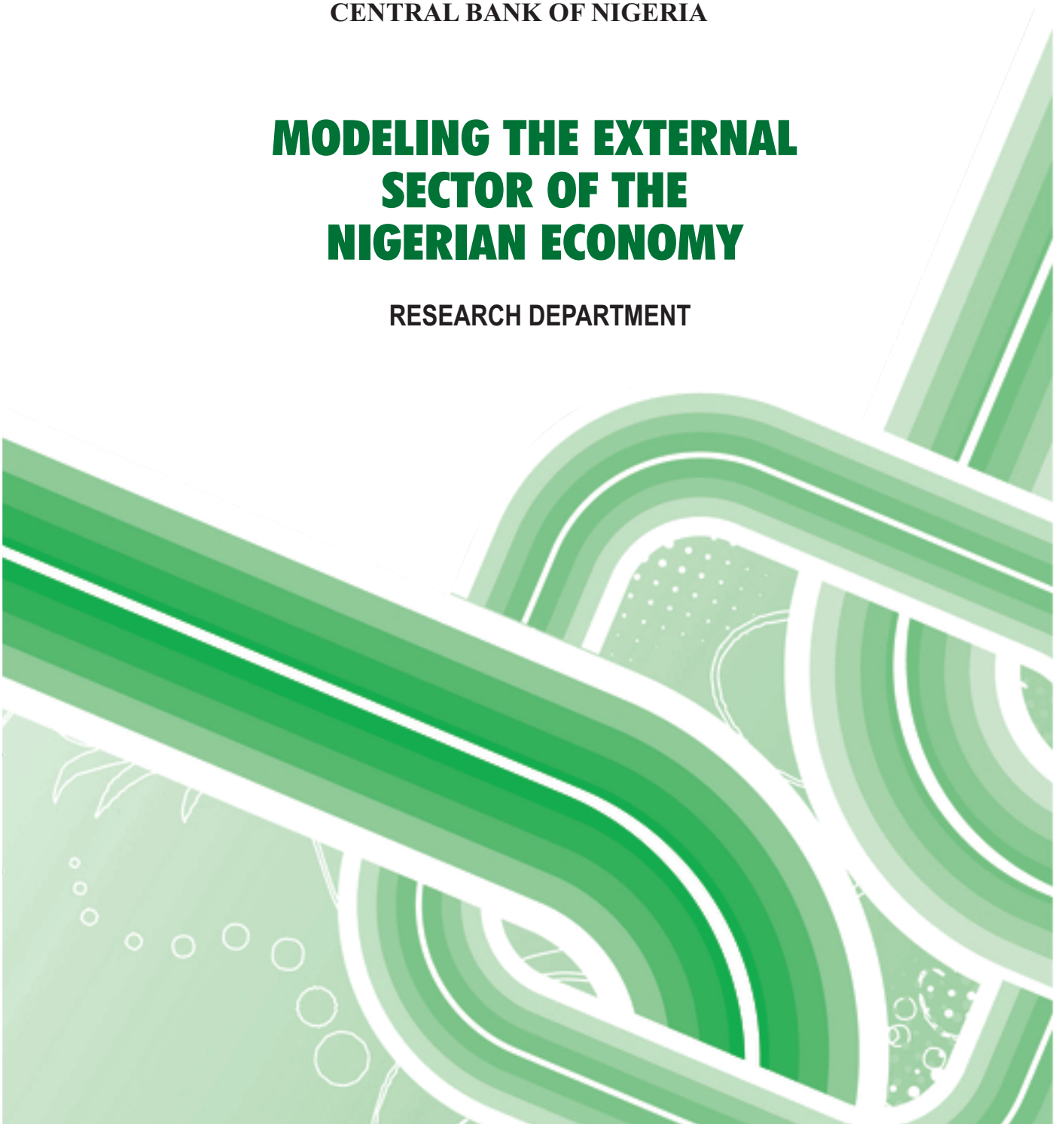
RESEARCH DEPARTMENT

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Executive Summary

1. *Analysis of external sector of the Nigerian economy as measured by the overall balance of payments, revealed instability since 1960 due to persistent high demand for foreign goods and services in the face of dwindling foreign exchange earnings. Though the current account had remained in surplus, the pressures were reflected in high import bills, depreciating exchange rate, huge external debt and relatively low levels of foreign direct investment flows. Despite the strategic role and influence of external sector on the overall performance of the economy, past analysis had been based on annualized and aggregate data. With the rapidly changing international environment, dynamic and robust model of the sector will provide a strong basis for projecting the current state of the sector into the future. Thus, leveraging on the general framework for analyzing external sector, the balance of payments account forms the bedrock for the external sector model with equations specified for the key indicators.*

2. *Against this background, the objective of the study is to build and estimate external sector model of the Nigerian economy which can serve as a veritable tool for assessing and making forecast of external sector indicators.*

3. *To achieve this objective, the study reviewed a number of studies, including those on Nigeria. It was observed from the literature that despite the diverging views on the external sector models, trade flows, transfers, service flows, direct and portfolio capital flows should be endogenised to show the effects of dis-equilibrium in the sector on the rest of the economy (Pauly, 2000; Pandit, 2000). Also, a typical external sector model must reflect the degree of the openness of the economy, exchange rate regime, bilateral and multilateral trade arrangement and degree of capital mobility.*

4. *The external sector model consisted of seven behavioural equations and three identities. The behavoural equations included oil export, non-oil export, total imports, reserves, exchange rate and foreign direct investment and the model reflects the dominance of oil in the bulk of*

transactions. Employing system mode, the ordinary least square technique was used to estimate the six equations for the period 1990:1 to 2012:1, and the following findings were identified:

5. *Global oil demand, crude oil production, foreign direct investment in the oil sector and international price of crude were determinants of the value of oil export in Nigeria. The presence of foreign investors in the sector, rising oil prices and crude oil production stimulated higher oil production and export. Also, a 1 per cent increase in previous non-oil output would induce a 0.15 per cent increase in non-oil exports. The increase in output fed into non-oil export through increased availability of funds for investment in the sector. The result also explained that a 1 percent increase (depreciation) in real exchange rate led to 0.09 percent increase in non-oil export and vice versa.*

6. *The response of imports to income was strong and positive. A 1 per cent increase in domestic income would raise total imports by 0.36 per cent. Since Nigeria is an import-dependent economy, marginal propensity to import increases as the level of income increases. Intuitively, a higher marginal propensity to consume raises the demand for imports, given Nigeria's high import propensity. Tariff was identified as the most important driver of imports in the model with a coefficient of 1.0 with average tariff level higher than the one in the sub-Saharan Africa (SSA) for many years.*

7. *An estimate of the external reserves equation showed that the huge level of Nigeria's imports was inversely related to reserves, reflecting imports as a significant source of vulnerability in the country's current account. Hence, a 1 per cent jump in imports would concomitantly reduce reserves by 0.66 per cent. Enhanced domestic output growth, especially in the tradeable sectors of the economy, could result in a proportionate increase in reserve accumulation. The result showed a strong correlation between reserves' accumulation and oil exports, a 1 per cent rise in the price of oil led to a 0.67 per cent increase in reserves.*

8. *The findings on nominal exchange rate indicated that its past values, reserves level and price of crude oil were the principal determinants of nominal exchange rate in Nigeria. For example, 1 per cent depreciation in the lagged value of exchange rate triggered 0.98 per cent depreciation*

in the current exchange rate. This implies that past depreciation in exchange rate triggers further depreciation in the current exchange rate due to the influence of speculators in the foreign exchange market. The result also showed that 1 per cent decrease in oil price at the international market caused exchange rate to depreciate approximately by 0.1 per cent.

9. *From the results, the contemporaneous component impacted more positively on foreign direct investment, suggesting a strong adaptive movement in the dependent variable and that a 1 per cent increase in the foreign direct investment in the past period would, on the average, lead to about 0.74 per cent increase in current FDI inflows. Similarly, a 1 per cent increase in per capita income induced foreign direct investment flows by as much as 0.35 per cent, given the positive relationship.*

10. *The in-sample simulation indicated that the model tracked the time paths and turning points of the endogenous variables reasonably well. Out-of-sample forecast were conducted under five different scenarios, which included: (i)oil price rule - $75; (ii) oil price declines to $70; (iii) increase in current oil production from 1.88 to 2.48 million barrels per day (mbd); (iv) current oil production falls to 1.5 mbd; (v) budget benchmark (Oil price at $75 and Oil Production at 2.48 mbd); and decrease in oil price and oil production to $70 and 1.5 mbd, respectively. The simulation results showed:*

   a. *The simulation result showed that a decline in the price of oil negatively affected most of the variables in the model significantly. From a marginal influence on total exports, the decline in price oil translated to a decrease in the external reserves, capital flows and foreign direct investment. However, imports increased contrary to economic expectations, signaling the import-dependent nature of the Nigerian economy.*

   b. *Similar results were also obtained when there was a further reduction in the price of crude oil from $121 per barrel to $70 per barrel. For example, the decline in the price of crude oil to US$70 further exacerbated the exchange rate, reserves, FDI and exports movements, all of which mirrored the trends exhibited in the first scenario when oil price was US$75 per barrel.*

11. *From the empirical findings, it is evident that allowing the exchange rate to adjust to a negative shock to price of crude oil is a potent policy in building up external reserves for the country.*

12. *Also, the findings justify the need to overhaul and correct domestic conditions to kick-start production and stem the continued decline in industrial output in Nigeria. The development of core value chains in manufacturing and agricultural sectors and, improvements on the deplorable state of infrastructure would be key turning points for growth in non-oil exports and hence, foreign exchange earnings.*

Chapter One

1.1   Introduction

Nigeria's external sector reflects the economic transactions between the residents of Nigeria and the rest of the world. The sector can be in equilibrium or disequilibrium (surplus or deficit). A deficit outcome represents a situation where receipts are inadequate to accommodate the payments, while a surplus position reflects a situation where receipts are in excess of the payments. An ideal external sector is one that is stable and in equilibrium over time. Equilibrium is achieved when external receipts and payments are equal, the exchange rate is stable and external reserves are adequate. However, in more practical terms, such a perfect system hardly exists.

Analysis of external sector of the Nigerian economy as measured by the overall balance of payments revealed instability since 1960 due to persistent high demand for foreign goods and services in the face of dwindling foreign exchange earnings. Structurally, the sector, which had been dominated largely by crude oil export remain unaltered for over three decades. The sector was dominated largely with export of crude oil. For instance, crude oil exports accounted for 93.8, 98.4, 95.8 and 96.6 per cent of the total exports in 1979, 1999, 2009 and 2011, respectively (CBN, 2000, 2011). For the same periods, the volume of imports has been consistently on the increase. Dependence on oil exports, exposed Nigerian economy to the vagaries of the international crude oil market.

Despite the strategic role of the external sector on the overall performance of the Nigerian economy, past analysis of developments in the sector had been largely aggregative and devoid of in-depth empirical analysis, (Akinlo and Yinusa, 2007). The desire to have a better understanding of the workings of the external sector and its impact on the Nigerian economy motivates this study. Reliable qualitative information and appropriate policy would address constraints facing the external sector of the economy. Thus, well-articulated model of this nature would provide a strong basis for future projections on the sector. The framework for external sector model is based on the balance of payments account that captures the transactions on goods, services and financial flows between a domestic economy and the rest of the world. With this framework, equations on the external sector are specified from key variables such as imports, exports (oil and non-oil), exchange rate, foreign direct investment and external reserves.

1.2   Objective of the Study

The consideration for external economic environment in sectoral econometric modeling is underscored by the fact that the macro economy is built on four key

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sectors, namely real, financial, fiscal and external. An understanding of the macro economy therefore requires a thorough analysis of the linkages among these sectors. The linkages between external sector and the rest of the economy are commonly explained by the Keynesian model of open economy. In the context of developing countries, open economy exhibits high dependence on external factors such as trade, production, capital flows, technology and consumption of imported goods.

Against this background, the objective of the study is to build and estimate an external sector model of the Nigerian economy with a view to exploring the functional relationships among the external sector variables. Thus, the model would be a veritable tool for simulation and making forecast of external sector indicators. The model, therefore, is expected to address the following key issues:

- The effect of oil price shocks on some selected macroeconomic variables;

- The impact of tariff on imports, among others; and

- The impact of the external sector developments on the Nigerian economy.

1.3   Output
The main objective of the project is to develop an operational and an up-to-date external sector model of the Nigerian economy. The specific deliverables would include:

- provide insights on external sector relationships; and

- estimate and solve model that could be used to simulate future time paths of selected external variables

1.4   Overview of the Study
To accomplish these objectives, the study is divided into six parts. Following the introduction, is a survey of literature in section two. Section three, focuses on the overview of the Nigerian external sector while section four contains the methodology, covering data requirement, model specification and flowchart. Section five, discusses the model estimation results, while section six, conducts simulation scenarios and forecast test. Summary, conclusion and the need for further study are considered in section seven.

Chapter two

2.0 Review of Literature

2.1 Theoretical Review

2.1.1 The External Sector in Macroeconomic Models

Within macroeconomic models, different techniques have been employed in the modeling of the external sector arising from theoretical underpinnings, accounting systems and definition of variables (Matlanyane, 2005). In principle, the estimation of the external sector should reflect trade flows, services flows, transfers as well as direct and portfolio capital flows (Pauly, 2000). Pandit (2000) was of the view that the discussion of the external sector should focus on the analysis of the disequilibrium in the sector and how it impacts on the economy. This can be achieved by integrating the demand and supply analysis in the trade flows.

In developing economies, the estimation of the external sector has been premised on the small country assumption that makes it possible to model only the demand side, thereby, excluding supply condition. Exchange rate regime, openness of the economy, institutional arrangements and the degree of capital mobility are some of the other important considerations in modeling the external sector.

Khan (1974) provided a basis for analyzing import and export demand in developing countries. Conventionally, export demand is specified as a function of the relative price of exports and foreign income, while import is normally defined as a function of relative price of imports and domestic income (Krueger, 1997). For sectoral analysis, modeling of exports and imports is usually decomposed to reflect the importance of different sectors. This approach was adopted by Soludo (1995) for export of oil in Nigeria, Ghartey and Rao (1990), for export of cocoa in Ghana, and Beenstock (1995) for oil importing developing economies. Pauly (2000) has opened the need to include tariff as an explanatory variable in the export and import demand function. In the specification of macroeconomic models for developing countries, Haque, *et al* (1990) specified real imports as a function of real exchange rate and real domestic output.

In macroeconomic modeling, exchange rate is commonly endogenised in developing countries. This arises from the historical exchange rate control prevalent in these economies. Similarly, in the modeling of exchange rate, researchers are faced with some challenges which include the extent to which exchange rate movement is explained by economic variables, the focus of the

time series property of exchange rate and the behavior of economic agents operating in the market (Devereux, 1997; and Aron, et al, 1997). For example, Basdevant (2000) revealed that exchange rate movement in Russia was explained by expectations and interest rate differentials; while modeling of exchange rate in Kenya was in line with uncovered interest rate parity condition with the possibility of over-shooting (Geda, *et al*. 2001).

Matlanyane (2005) identified international trade in goods and services in the balance of payments (BOP) framework as the main channel that links the domestic economy with the global economy. The advent of economic liberalization and globalization seem to be altering the link between trade and economic development. This section reviews relevant theories of external sector such as open economy theory, foreign balance framework, Mundell- Fleming model and the balance of payments theory.

2.1.2   Theory of Open Economy

External sector modeling starts with a simple open economy model, where total spending in the domestic economy is divided into domestic and foreign components.

$$Y = (C - C^*) + (I - I^*) + (G - G^*) + EXP \tag{1}$$

Where C is domestic consumption of goods and services, C* is consumption of foreign goods and services, while *I* is domestic investment in goods and service and *I** is investment in foreign goods and services. G and G* are government purchases of domestic and foreign goods and services, respectively. EXP is exports of domestic goods and services. Further re-arrangement of the identity gives:

$$Y = C + G + I + EXP - (C^* + I^* + G^*) \tag{2}$$

$(C^* + I^* + G^*)$ represents total expenditure on imports (IMP), therefore, components of total output becomes:

$$Y = C + I + G + EXP - IMP \tag{3}$$

Interaction between EXP and IMP reflect the external sector performance, if EXP exceeds IMP, external sector is said to be in surplus, but where the reverse holds, external sector is said to be in deficit.

2.1.3 The Foreign Balance Framework

The foreign balance framework is built on the assumption that the economy is open and too small to influence the prices of goods and services as well as interest rate in the global market. The framework further assumes all trade-partner countries as the rest of the world. Based on these assumptions, IS curve equation is given as follows:

$$INV(r) + G_o + EX = SA\ (r,\ y) + IM + TT \tag{4}$$

Where INV represents investment, G_O stands for exogenous government expenditure, SA represents savings, EX is exports, IM is imports, TT are taxes or tariffs, y represents income and r represents interest rate. The mode of exchange between domestic economy and the rest of the world is the real exchange rate and is computed as eP_f / P_d, where e stands for nominal exchange rate, P_f represents the foreign price level and P_d is the domestic price level. The relationship between exports and the real exchange rate is assumed to be positive i.e when real exchange rate goes up or depreciates, domestically produced goods become cheaper and attractive to foreigners, thereby increasing domestic exports. This relationship is expressed as

$$EX = f(+eP_f / P_d) \tag{5}$$

Whereas, the real exchange rate and the real domestic income function for imports become:

$$IM = f(-eP_f / P_d, +y) \tag{6}$$

Equation (6) implies that while real exchange rate is negatively related with imports, but positively related with income. This suggests that a rise in exchange rate (exchange rate depreciation) makes import more expensive, while home goods become more attractive to domestic residents, thereby reducing imports. On the other hand, a rise in the domestic income increases the demand for imports under the assumption that the imports are normal goods with positive income elasticity of demand.

Introducing the concept of capital flow, the framework assumes that net inflow of capital is derived as follows:

$$CF = f(r - r^* - E(\Delta e / e)) \tag{7}$$

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Where CF is the capital flow, r is domestic interest rate, r* is foreign interest rate and $E(\Delta e / e)$ is termed expected appreciation of the foreign currency. Under the assumption of small open economy, r* is assumed to be constant, and that $E(\Delta e / e) = 0$, therefore,

$$CF = f(r) \tag{8}$$

Combining equations (5), (6), and (8), we derived net foreign balance as follows:

$$FB = EX(+eP_f / P_d) - IM(-eP_f / P_d, +y) + CF(r) \tag{9}$$

The implication of equation (9) is that external sector balance is a function of exports, imports and capital flows, and that these variables are driven principally by factors such as movements in real exchange rate, national income growth, and interest rate (Jah, 2003).

2.1.4 Mundell-Fleming Model

The Mundell-Fleming theory was developed in early 1960s by Mundell (1962) and Fleming (1973) to show the link between monetary policy and external balance under floating exchange rate and perfect capital mobility. The theory assumed that capital flows respond to domestic interest rate; import has a positive relationship with income; exports are determined exogenously; and monetary policy is related to interest rate. Under these conditions, an expansionary monetary policy decreases interest rate and in turn increases capital outflow resulting in a deficit in the balance of payments. The deficit in the balance of payments leads to exchange rate depreciation under a flexible exchange rate regime, and depreciation automatically induces higher demand for domestic goods in the foreign country and thereby, raising domestic output and income. The reverse holds when monetary policy is contractionary in a floating regime with perfect capital mobility (Jhingan, 2003).

2.1.5 The Balance of Payments Theory

The balance of payments theory states that balance of payments position determines the value of a country's currency or exchange rate in a floating exchange rate regime. If the balance of payments is favourable, exchange rate appreciates and when it is unfavourable, exchange rate depreciates. Moreover, the adjustment in exchange rate occurs through the forces of demand and supply of foreign exchange. Unfavourable balance of payments occurs when the demand for foreign exchange exceeds its supply, thereby putting pressure on

the foreign exchange market ultimately depreciating the value of domestic currency relative to a foreign currency. In an adverse balance of payments situation, if exchange rate is below the equilibrium exchange rate, export of goods and service increases and equilibrium will be restored. On the other hand, if exchange rate is above equilibrium rate in a favourable balance of payments situation, exports decline to restore equilibrium in the balance of payments. The theory outline some key factors that determine the shape of the demand and supply of foreign exchange to include the domestic elasticity of demand for imports, and the elasticity of supply for imports. It, however, added that factors that influence demand and supply of foreign exchange are independent of the exchange rate (Jhingan, 2003).

2.2   Empirical Review

Empirically, different methods and variables have been adapted to model the external sector in the past. The variations in methodology and variables often reflect structure of individual economies and account for these differences in external sector model presentations. Despite the differences in the specification of external sector models, trade flows, transfers, services, direct and portfolio capital flows should be endogenised in the model and be able to show the effects of disequilibrium in the sector on the rest of the economy (Pauly, 2000; Pandit, 2000). Also, a survey of the literature reveals that a typical external sector model must take into account the openness of the economy, the exchange rate regime, bilateral and multilateral trade arrangements and degree of capital mobility.

Karnik and Fernandes (2005), constructed a macro-econometric model for United Arab Emirate (UAE), a country that has similar features with Nigeria, being oil-producing and an oil-dependent economy. Instrument Target Approach was used to capture the impact of the external sector on the rest of the economy. Twenty five equations were used to represent the four sectors of the economy (output, government, monetary and external), out of which three behavioural equations namely investment income, nominal exports, nominal imports, and two identities were used to represent the external sector of the economy.

Investment income $(INV) = (+USTKR, +WIR, -ASIA)$ (10)

Where INV is Investment income, $USTKR$ is the real return on the stock market in the USA, WIR is world interest rate, and $ASIA$ captures the effect of Asian currency crisis proxied by dummy variable.

$$XN = f(+GDP, -P, -WP) \tag{11}$$

Where XN is nominal exports, GDP is the nominal GDP, P is domestic prices, and WP is the world oil prices.

$$MN = f(+GDP, -TWER, -GDFD) \tag{12}$$

Where TWER is the trade weighted exchange rate of the USA and GDFD is the gross fiscal deficit.

The other two identities linked real exports to nominal export via the price deflator for exports i.e. (nominal export/deflator) and real import to nominal import via the price deflator for imports i.e. (nominal imports/deflator for imports).

$$XC = XN / PX \tag{13}$$

$$MC = MN / PM \tag{14}$$

The simulation results from the model indicated that the oil sector had a significant multiplier impact where a unit increase in oil production raises real oil sector by 1.29 million dirham. Also, it improved revenue from hydrocarbon sector and gross fiscal deficit at the same time leading to improvement in government expenditure.

The Lord and ADB (2002) presented a parsimonious representation of a small open economy capturing the interrelationships between the real and financial aspects of the Bangladesh economy for analytical and policy purposes. In the specification of the external sector, principal components of Bangladesh's current account balance, demand for imports, demand for exports and the overall equilibrium were explicitly derived. While the equilibrium values for the interest rates and aggregate demand were determined by the intersection of the IS and LM curves, the overall equilibrium of the Bangladeshi economy was achieved when aggregate demand equates aggregate supply in the model.

The primary monetary policy tools are the discount rate, the sale of Bangladesh Bank bills and, to a lesser extent the central bank's influence over bank lending practices. On the other hand, exchange rate adjustments serve as an instrument used for switching via real exchange rate changes that occur when nominal exchange rate changes. Therefore, the effectiveness of monetary policy as a tool

for macroeconomic management depends on level of capital mobility which is an adjustment mechanism.

Similarly, Akanbi and Toit (2010) developed a full-sector macro-econometric model of the Nigerian economy, which incorporated the external accounts relevant to the real sector model. Engle-Granger two step cointegration approach was employed using annual data series from 1970-2006. The authors employed current account components of the balance of payments and specified three equations to represent external sector, namely real export, real import and exchange rate.

$$r \exp_t = f(+wY_t, - relp_t, + Oil\_p_t) \tag{15}$$

Where $rexp_t$ is real exports, wY_t is the real world (US) income, $relp_t$ is the real exchange rate (the ratio of domestic prices to US prices), and Oil_p_t represents world oil prices.

$$rimp_t = f(+Y_t, +relp_t, - exch_t) \tag{16}$$

where $rimp$ is real import, Y_t is the nominal GDP, and $exch_t$ is the nominal exchange rate.

$$exch_t = f(- relY_t, - relMS_t, + relp_t) \tag{17}$$

Where $relY_t$ is the relative income (the ratio of domestic GDP to US GDP), and $relMS_t$ is the relative money supply (the ratio of domestic money supply to US money supply).

The results from the model indicates that a 10.0 per cent shock to oil prices improves total GDP by 2.2 per cent and translated to improvement in domestic investment, infrastructural development and increased employment and social economic activities. However, 10.0 per cent negative shock to oil price has negative influence on the rest of the economy except on oil GDP which still recorded growth despite the shock.

2.2.1   Role of Remittances

In recent decades, the role of remittances in the economies of many developing countries has become very significant. Remittances which consist mainly of transfers by private agents in the economy is classified by the International

Monetary Fund (IMF), as: workers remittances gotten from migrants who have lived abroad for over one year; labour income plus wages including other forms of compensation from migrants who have lived overseas for less than one year; and the net worth of migrants who move from country to country. In addition, remittances are categorized as monetary and non-monetary transfers with non-monetary transfers including consumer and capital goods, as well as skills and technological knowledge.

In a study on the relationship between the informal remittance ratio and three macro-economic indicators in Southeast Asia, Athukorala (1993) revealed that informal remittances tended to prevail in economies with comparably less developed financial sector, high black market premium, as well as low real interest rate. Recipients were inclined to avoid official channels in order to circumvent significant losses that may be incurred from bank fees and exchange rates. Also, due to the low level of development of the financial sectors, deposit money banks in such jurisdictions might have not provided facilities for deposit savings in foreign currency. Other factors that may account for the low patronage of official channels included, recipients' quest to make profit from using unofficial exchange channels, particularly where there is a premium between the official rates and parallel rates.

The case of Nigeria showed that strong cultural behaviour and emotional links to the migrant's home of origin represented a critical factor in the determination of remittances. Migrants from Nigeria were inclined to remit money to relatives for festive reasons resulting in seasonal increases in foreign exchange inflows to the country. Such seasonal inflows of foreign exchange usually results in a surge in supply in the foreign exchange market which may positively impact on the exchange rate of the naira, (Obaseki, 1991).

Chapter Three

3.1 Overview of the Nigerian External Sector

Nigeria's external sector had remained unchanged since the 1970's with the sector dominated by crude oil exports. Prior to the 1970's, the major non-oil exports were palm-oil, rubber, timber, cocoa, tin and columbite and groundnut (CBN, 1970). By the mid-1970s, crude oil exports had dominated the Nigerian export sector owing to the increase in oil price in the international crude oil market. Similarly, the import structure of the Nigerian external sector had not shown any significant shift over the years, as capital goods and raw materials remained the bulk of total imports.

3.2 Current Account
3.2.1 Imports Structure

Since independence, the imports structure of the Nigerian economy had been characterized by high non-oil imports owing to domestic demand for foreign goods and services. The imports bill, at US$604 million in 1960, continued to grow and by 1977 the imports bill stood at US$10.9 billion. There had not been any significant structural shifts in the composition of imports since 1970 as the relative share of raw materials, capital and consumer goods in total imports remained unchanged. The categories of imports were, however, determined by prevailing domestic policies, exchange rate movements, consumer's reference for imported manufactures and increased domestic production gap. From 1985 to 1994 imports bills reduced drastically in line with Structural Adjustment Policy (SAP) measures taken. During 1992-1998, raw materials became dominant in the import basket due to improved incentives to the manufacturing sub-sector to shore up the level of capacity utilization (CBN, 2000). The upward trend in imports between 1995 and 1998 was attributable largely to the appreciation of the exchange rate of the naira vis-à-vis the US dollar. Other reasons include increased tempo in economic activities, especially the deregulation of the communication and downstream oil sectors as well as intense efforts by the government to rehabilitate infrastructure and boost the domestic capacity of the real sector.

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Figure 1: Oil and Non-Oil Imports (US$ Million)
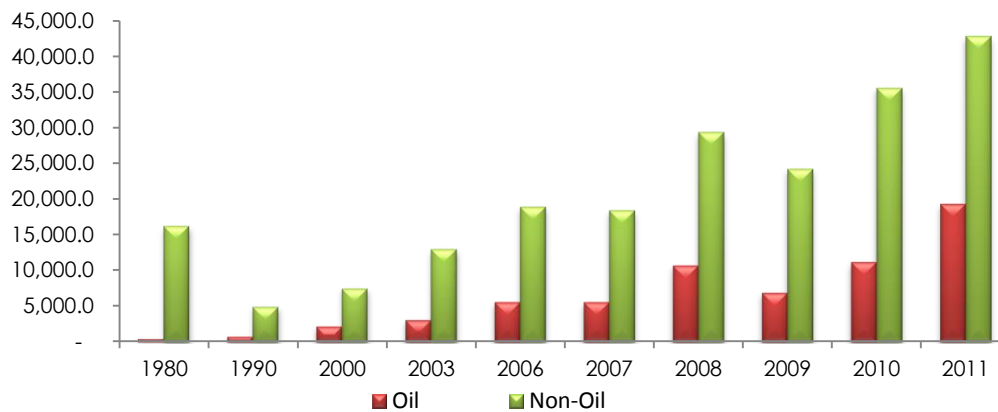
Prior to the Structural Adjustment Programme (SAP) in 1986, policies were relaxed to accommodate imports of essential commodities with some restrictive measures from 1982 when foreign exchange reserves drastically declined to US$1.1billion less than a month of import cover. The share of oil sector imports which averaged 3.1 per cent between 1970 and 1985 had increased to 16.7 per cent since SAP. Import bills, which averaged US$5.9 billion between 1986 and 1998, rose significantly on an average of US$31.8 billion between 2000 and 2011. In addition, oil sector imports also increased from an average of US$1.3 billion between 1986 and 1998, to an average of US$8.1 billion between 2000 and 2011.

Figure 2: Imports, Exports and Trade Balance
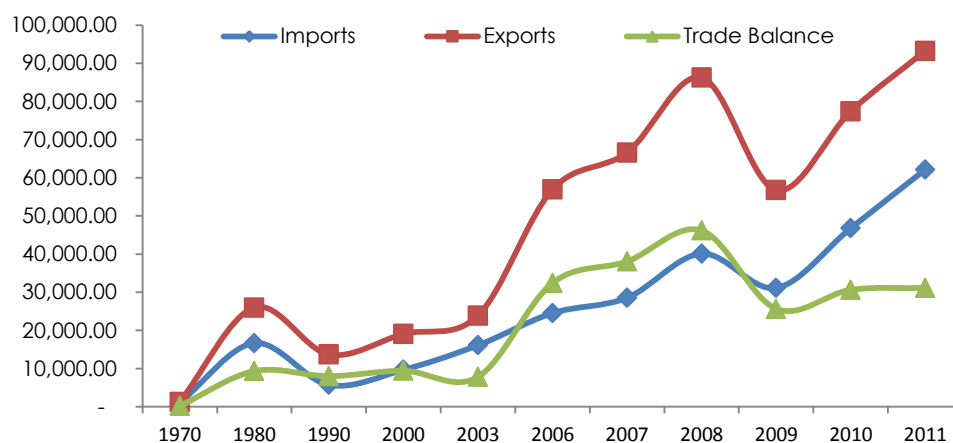
3.2.2   Exports Structure

Nigeria's major exports in the 1960s were agricultural produce accounting for over 80.0 per cent on average. The proportions of non-oil exports remained dominant in the 1960s until 1970s before crude oil exports increased remarkably to

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become the dominant export commodity. By 1974 crude oil exports stood at 90.0 per cent of total exports; and further increased to 96.0 per cent in 1980 -1986. Conversely, the share of non-oil exports in total export declined from an average of 7.0 per cent from 1970 -1985 to 4.0 per cent between 1970 and 1986, but dropped further to 3.1 per cent from 2007-2011 (CBN, 2011). The non-oil exports performance remained largely unimpressive, even though by category it expanded to include non-traditional commodities. Furthermore, the international demand for non-oil products remained low owing, largely, to the development of synthetic alternatives, discriminatory tariffs and the new entrants into the international commodity market. Manufactured exports have remained low implying that there had been no significant shift from the primary to the industrial sector.

Figure 3: Oil and Non-Oil Exports (US$ Million)
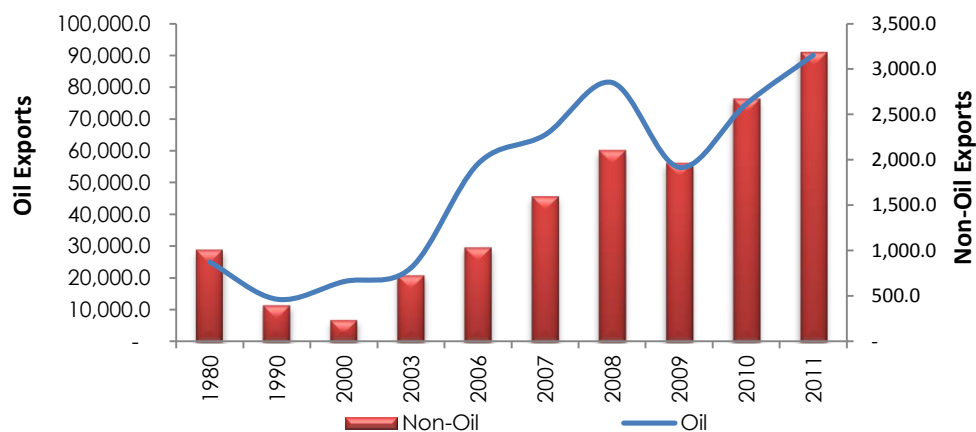
3.3   Capital and Financial Account
3.3.1   Foreign Direct and Portfolio Investments
The financial sub-account consist of: portfolio and direct investments, other long and short-term capital and; capital transfers. Long-term capital a prominent component of the financial account comprised of repayment and drawdown on loans. It had also been the main source of financing the deficit in the current account either through drawdown on loans or debt service deferment, especially since the early 1980s. Short-term capital, on the other hand, became prominent only in 1982 when Nigeria accumulated huge trade arrears used to finance balance of payments deficits. Inflow of direct investment rose in the late 1960s and the 1970s, but declined sharply thereafter, thus contributing to the mounting pressures on the capital account. The reduction in foreign direct investment inflow resulted from the decline in fresh equity participation in Nigerian

enterprises, thus the main source of inflow was from un-remitted profits. With the liberalization of the economy in the mid-1980s and the democratization in 1999, the flow of capital through equity participation in the oil and gas sector, telecommunications, and the privatization of public enterprises assumed an upward trend. The sustained rise in FDI inflows into the country resulted from macroeconomic stability, robust external reserves, favorable rating by the international rating agencies, delisting of the country by the Financial Action Task Force (FATF) as well as fiscal prudence and transparency in the allocation of new oil blocks by the Department of Petroleum Resources (DPR). Portfolio investment inflows which hitherto had remained low witnessed substantial increase in demand from 2004 to 2006 owing to investment opportunities presented by the privatization of public utilities and the consolidation of the financial sector under the NEEDS programme. With further liberalization of the capital accounts, foreign portfolio investors are attracted to high returns on investments in the money market (National Planning Commission, 2005).

3.3.2   External Debt Stock

The origin of Nigeria's external debt could be traced back to 1958 when the country first contracted the sum of US$28.0 million for railway construction and the accumulation of short-term trade arrears in 1982 and 1983. These instruments were reconciled and accepted as public debt some years later, and contributed substantially to the external debt stock. Since then a number of external debts have been contracted. The country experienced considerable difficulties in meeting its scheduled external debt service obligations during most of the period preceding the Paris Club "Debt Relief Deal" in 2005. Prior to the Paris and the London Club of Creditors debt exit, external debt stock which stood at US$35.9 billion in 2004 declined to US$3.5 billion in 2006, resulting to debt and the debt service to GDP ratios of 2.4 per cent and 1.5 per cent, respectively. These ratios declined further to 1.9 per cent and 0.5 per cent, respectively, in 2007. The sharp decline resulted from the significant Paris Club debt cancellation and repayments. Owing to Federal Government drawn down on multilateral loans Nigeria external debt grew from US$3.9billion in 2009 to US$4.6 billion and US$5.7 billion in 2010 and 2011, respectively.

3.4   Exchange Rate Management

Exchange rate management in Nigeria has evolved over the years spanning various regimes. In its nearly five decades of existence, the CBN has adopted several foreign exchange management options in an attempt to achieve these objectives. Between 1960 and 1986, the country operated the fixed exchange rate regime backed by control measures under different regimes (Akinlo and Yinussa, 2007).

Throughout the period, the foreign exchange market was made up of two principal segments, the official and the parallel market while authorization of foreign exchange disbursement was a shared responsibility between the Federal Ministry of Finance and the CBN. For example, between 1960 and 1967, the country's currency (The Nigeria pound) was fixed at par with the British pound. But from 1967 to 1974, the Nigerian naira (the new name for the country's currency) was pegged to the US dollar. In 1974, the authorities started a policy of progressive valuation of the naira to reflect the improved strength of the naira as a result of enhanced foreign exchange receipts owing to the oil boom and improved BOP position. There was, however, a policy reversal in 1981 to arrest the deteriorating external sector position. The overvaluation of the naira was recognized and the naira was gradually devaluation to stem the outflow of foreign exchange and curtail the huge import demand (Obaseki, 1991).

Figure 4: Trends in Average Exchange Rate
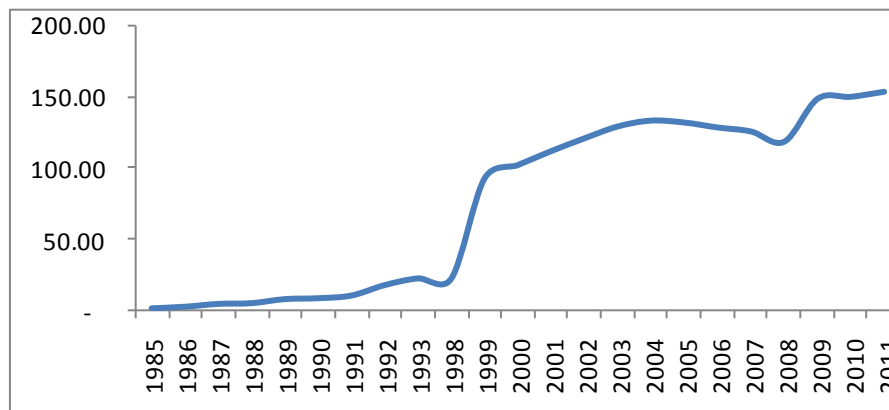
By 1984, a major foreign exchange reform was carried out when the Federal Government, through the CBN decentralized foreign exchange allocation with licensed banks allowed to approve applications and allocate foreign exchange to customers subject to the maximum approved by the CBN (CBN, 2000). However, the practice was discontinued in 1985 because of abuses by the operators, thus, the CBN took over the direct allocation of the foreign exchange to the market. Under the exchange control system, economic objectives played a major role, although ad-hoc measures were used to determine the naira exchange rate. The Second-Tier Foreign Exchange Market (SFEM) came into being on September 26, 1986, when the determination of the naira exchange rate was made to reflect market forces.

At the commencement of the SFEM, a dual exchange rate system for the allocation of foreign exchange was adopted. In order to introduce professionalism into the bidding system, the Dutch Auction System (DAS) was adopted in April 1987. The system later created the problem of multiplicity of rates, while the naira depreciated further. The first tier and second-tier foreign exchange markets were merged into an enlarged Foreign Exchange Market (FEM) in July 1987 and all transactions were subjected to market forces.

In 1988, the inter-bank market was separated from the official market and an autonomous market for privately sourced foreign exchange merged with the FEM to form the Inter-bank Foreign Exchange Market (IFEM) in January 1989. In the same year, the Bureau-de-Change segment of the foreign exchange market was established to cater for small end-users of foreign exchange.

To further reduce exchange rate instability, the CBN modified the IFEM procedures in December 1990 with the re-introduction of DAS. In spite of the modification in foreign exchange arrangement, the instability in the foreign exchange market persisted as the premium in the parallel market went up from 19.6 per cent in 1990 to 64.3 per cent in February 1993 as against the universally recommended limit of 5.0 per cent. As a result, the CBN adopted a completely deregulated system of foreign exchange trading on March 5, 1992 to narrow the parallel market premium and enhance the operational and allocative efficiency of the foreign exchange market. The naira was exchanged for ₦17.30/1.0 US$ and by 1993 it depreciated to ₦22.1/ 1.0 US$.

The return to fixed exchange rate system in 1994 left the economy worse off with the naira exchanging for ₦22.0 for US$1.0 with the depreciation of the naira in the parallel market segment and the widened parallel market premium. These outcomes exacerbated balance of payments deficits, particularly, the declining non-oil exports receipts. The "guided deregulation" of the foreign exchange market was established in 1995 and authorized dealers were allowed to buy and sell foreign exchange at a second window. A major element of the deregulation was the introduction of the Autonomous Foreign Exchange Market (AFEM) for the allocation of privately sourced foreign exchange to end-users, while a fixed exchange rate at the official market remained but was reserved for public sector use only. As at the end of 1998, the market comprised of the Official, Bureaux de Change, Autonomous Foreign Exchange Market (AFEM) and the parallel market segments. On October 25, 1999, the Inter-bank Foreign Exchange Market (IFEM) was re-introduced. The foreign exchange market became deeper in sophistication and the exchange rate moved from a fixed to a more liberalised

regime. These developments seemed to have enhanced market efficiency through a more rational use and allocation of foreign exchange.

Following the significant improvement in the foreign exchange market brought about by the re-introduction of Retail DAS in 2002, the CBN further liberalized the foreign exchange market in 2006 with the introduction of Wholesale DAS (WDAS) to deepen the market and close the wide premium. Consequently, many parallel market operators were brought into the BDC segment. The naira exchange rate stabilized and for the first time in two decades of foreign exchange management, the official and parallel market rates converged in July 2006 and at end-December, 2006 the premium marginally fell short of the internationally acceptable limit of 5.0 per cent by 0.08 per cent. With the moderation in demand pressure at the foreign exchange market, in July 2009, Wholesale DAS (WDAS) was re-introduced and companies and government agencies were again permitted to sell foreign exchange directly to authorized dealers of their choice. Also, the CBN resumed the sale of foreign exchange to class 'A' and 'B' BDCs in April and August, 2009, respectively, (CBN, 2009).

3.5   External Reserves

Nigeria's external reserves at end 1960 stood at US$217.3 million and by 1980 was US$5.5 billion. Due to the poor economic performance and surging debt burden, the external reserves depleted significantly during the early 1980's. However, at US$2.8 billion in 1986, it rose marginally to US$3.1 billion in 1989. By 1990 it was US$4.5 billion. Although the reserves dropped from 1992-1993 level, it rose gradually to US$9.1 billion by end 1994 due to favorable external position before dropping to US$5.4 billion in 1999. During this period using the traditional benchmark of three months of import cover to estimate the adequacy of external reserves, in 1986, reserves could cover 11.5 months of imports while in 1989 and 1990 it could cover 8.8 and 9.6 months, respectively. By 1998, it had fallen to 2.2 months of import cover which is below the traditional benchmark. The external reserves dwindled to US$5.4 billion in 1999, but later rose to US$10.4 billion in 2001. Following the severe pressure witnessed in the external sector, the external reserves fell to US$7.5 billion in 2003, however it rose to US$28.3 billion and US$42.3 billion in 2005 and 2006, respectively, which was attributed to the improved performance of the oil sector. The months of import cover by the external reserves ranged between 7.6 months in 1999 to 25.6 months in 2006. By 2007, the external reserves stood at US$51.3 billion. From 2001-2011, the import cover has consistently exceeded the 6.0 months requirement under the West Monetary Zone (WAMZ) convergence criteria, except in 2011 when it stood at 5.3.

Figure 5: Reserves/Months of Import Cover
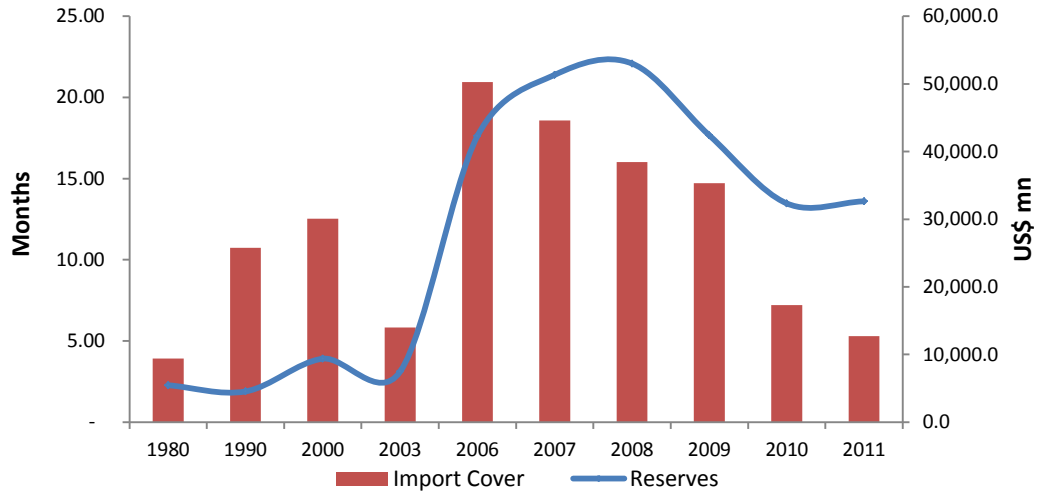
Chapter Four

4.0   Methodology
4.1   Data Requirements

The data used in this study were obtained from two main sources, namely: the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN). These were complemented with data from other sources which include the Organization of Petroleum Exporting Countries (OPEC) and International Financial Statistics (IFS). The estimation was based on quarterly data for the period 1990 – 2011.

The use of quarterly series was based on the need for sufficient degrees of freedom relating to the number of observations, especially when estimating the over-parameterized models. In the study, nominal data sets are used for estimation and in-sample simulations, except for the real exchange rate.

4.2   Models Specification
4.2.1   Exports

Considering the peculiarities of the Nigerian economy as an oil dependent economy, modelling of exports is decomposed into oil and non-oil.

4.2.1.1 Oil exports

Oil export is mainly determined by global demand, OPEC production quota and international prices of crude oil. In view of this, oil exports (X_o) is specified as a function of three variables namely, income of the Organisation of Economic Cooperation and Development (OECD), (Y_f), OPEC quota (OPEC) and oil price (P_o).

$$X_o = \nu_{0,1} + \nu_{1,1} P_o + \nu_{2,1} \text{OPEC} + \nu_{3,1} Yf + \mu_1 \qquad (18)$$

4.2.1.2 Non-oil exports

Although, non-oil output contributes over 90 per cent to domestic output, non-oil exports as a proportion of total export has remained very small. One of the inhibiting factors is the slow response of domestic supply due to domestic conditions, especially, infrastructural bottlenecks. Non-oil exports can also be influenced by fluctuations in the domestic currency and commodity prices in the world market. In addition, improved world economy can lead to increased demand which eventually influences the demand for non-exports. Consequently, we specify non-oil exports (X_n) to depend on nominal exchange rate (NER), foreign output proxied by OECD output (Y_f) and non-oil GDP (Y_n).

$$X_n = v_{0,2} + v_{1,2}\text{NER} + v_{2,2}Yf + v_{3,2}Y_n + \mu_2$$

(19)

4.2.2 Imports

In Nigeria, imports constitute a significant share of inputs for both domestic production and final consumption. Import demand is traditionally a function of output and price. For intermediate imports, the key driver is domestic production activity. However, given that a number of importers rely on DMB loans and guarantees for their operating capital, the domestic lending rates become an important factor. Trade policy effects are captured using implicit tariff[1] while domestic prices for imports are reflected using import price deflator. Considering that the bulk of items under "other imports" consist of consumption items, personal disposable income is used instead of GDP as an explanatory variable. Real exchange rate captures relative prices for both components of imports.

$$M = v_{0,3} + v_{1,3}Y - v_{2,3}\text{RER} - v_{3,3}MLR + v_{4,3}\text{TAR} + \mu_3$$

(20)

4.2.3 External Reserves

Countries, particularly developing ones, use reserves as an insurance mechanism to hedge against adverse external shocks. Reserves also serve as a measure of a country's financial strength. Given its monocultural export structure, reserves in Nigeria critically depend on the revenue from the exports of crude oil. Exchange rate policy in the country aims at strengthening the value of the domestic currency and involves occasional intervention by the Central Bank of Nigeria in the foreign exchange market. The underlying motivation is to strengthen domestic prices relative to those of the country's trading partners and ensure stability in the macroeconomy. As a result, the nominal exchange rate impacts on reserves through stabilization programmes for both the exchange rate and domestic prices. Prior to this time, Nigeria had high debt overhang that led to substantial resource outflows which impinged on the size of external reserves. External reserves (RES) is therefore specified as a function of real exchange rate (RER), oil exports (X_o) and external debt services (EDS).

$$\text{RES} = v_{0,4} + v_{1,4}\text{RER} + v_{2,4}P_o - v_{3,4}\text{EDS} + v_{4,4}X_o + \mu_4$$

(21)

4.2.4 Foreign Direct Investment (FDI)

FDI in Nigeria can be broadly categorized into oil and non-oil. FDI into the oil sector historically dominates, but recent reforms in the telecommunications and

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[1] For time series purposes, the ratio of revenue from customs duties to total imports is used as a proxy for tariff rate.

financial sectors have led to increases in FDI into the non-oil sector. As in standard theory, FDI is treated in the same way as other components of aggregate demand. FDI in the oil sector reflects demand by the rest of the world for Nigeria's oil as well as the constraints and incentives provided by domestic production risks and product price, respectively. Therefore, FDI is specified as a function of market size proxied by per capita income, oil price, non-oil export and previous value of FDI.

$$\text{FDI} = v_{0,6} + v_{1,6}FDI_{t-1} + v_{2,6}PCGDP + v_{3,6}X_n + \mu_6 \tag{22}$$

4.2.5 Exchange Rate

Fluctuations in exchange rate (depreciation/appreciation) reflect changes in domestic and foreign economic fundamentals. Over the years, descriptive evidence suggests a strong correlation among exchange rate, reserves, government expenditure and the price of oil. These developments pose either negative or positive impact on domestic prices and invariably affect international competitiveness of Nigeria's exports. It is therefore intuitive to understand the strategic role of the exchange rate in macroeconomic stability. Thus, we consider the exchange rate to be influenced by foreign reserves (RES), remittances (RMT), interest rate differential (IRD), terms of trade (X/IMP), consumer prices (CPI), total government expenditure (TGE) and price of oil (Po). This specification underscores the obvious tri-lemma problem of maintaining exchange rate stability as well as achieving low inflation and interest rate.

$$\text{NER} = v_{0,7} - v_{1,7}RES - v_{2,7}RMT + v_{3,7}IRD + v_{4,7}\text{X/M} + v_{5,7}\text{CPI } v_{6,7}TGE + v_{7,7}\text{P}_o + \mu_7 \tag{23}$$

4.2.6 Identities

$$\text{RER} = \text{NER}*(\text{FCPI/CPI}) \tag{24}$$

$$\text{X} = \text{XO} + \text{XN} \tag{25}$$

$$\text{CF} = \text{FDI} + \text{PI} + \text{OSC} \tag{26}$$

4.2.7 Model Flowchart and Linkages

The external sector affects the real sector, the financial sector and the fiscal sector through the linkages of the various current account components with output and expenditures and deficit financing, as well as its contributions to net foreign assets through the BOP accounts. These inter-linkages are as depicted in the flowchart below.

Figure 6: Model Flowchart and Linkages
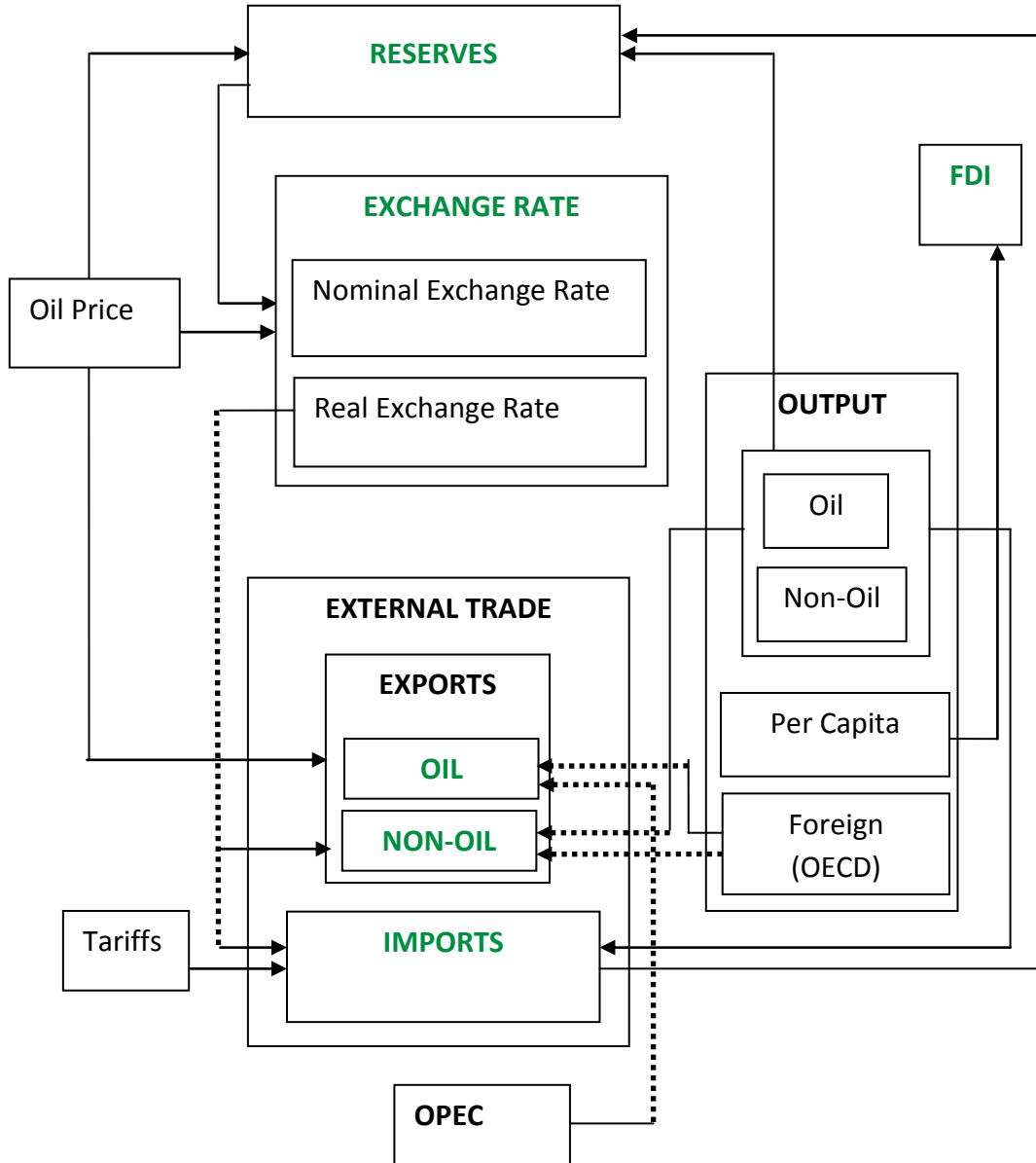
4.3   Estimation Techniques

Model building requires, not only applying appropriate techniques, but more, importantly, the integration of the specific peculiarities of the economy being investigated. Haque et al. (1990) note that the application of techniques in the process of model building is determined by the nature of data challenges.

This section presents the model estimation technique adopted for this study, among the existing techniques in the literature. The most popular techniques include among others the Ordinary Least Squares techniques (OLS), Two Stage Least Squares (2SLS), Instrumental Least Square (ILS), Maximum Likelihood (ML) and Autoregressive Distributed Lag (ARDL) techniques. The choice of an estimation technique depends on the data availability, size of the model and recursive nature of the variables. In estimating this model, therefore, ordinary least squares technique is adopted. The choice of OLS is premised on the robustness of the technique and the size of the model.

Chapter Five

5.0   Model Estimation, Interpretations and Appraisal
5.1   Model Estimation and Interpretations

The external sector model consists of six behavioural equations including oil export, non-oil export, imports, reserves, remittances, exchange rate and foreign direct investment, and three identities.

5.1.1   Oil Export

The result of the model estimation showed that, the probability functions of all the variables are highly significant; thus justifying the robustness of the estimates. The R-squared, which measures the coefficient of determination, indicates that 97.2 per cent variation in oil exports are jointly determined by oil price (Po), OPEC quota (OPEC), global oil demand (FNGDP) and Foreign Direct Investment (FDI). The coefficients of all the explanatory variables were statistically significant at 5 per cent level. Global oil demand, OPEC quota, Foreign Direct Investment and international price of crude oil all worked together to determine oil export in Nigeria.

Given the structure of the oil sector in terms of FDI in the sector combined with world demand for oil, OPEC quota and oil price, the results were in line with the *a priori* expectations. The presence of foreign investors in the sector, increase in oil prices and OPEC quota would stimulate higher oil production and export provided the existence of stability in the oil producing area of the Niger Delta region.

Table 1: Oil Exports Equation

Dependent Variable: LOG(XO)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(PO)	0.356153	0.067051	5.311708	0.0000
OPEC	0.411121	0.206549	1.990429	0.0498
LOG(FNGDP)	0.163631	0.020610	7.939417	0.0000
LOG(FDI)	0.773322	0.031965	24.19245	0.0000
Adjusted R-squared	0.971001	Durbin-Watson stat		0.330360

5.1.2   Non-Oil Exports

The long-run estimation result showed that all the explanatory variables (previous value of non-oil export, real exchange rate and non-oil output) were statistically

significant. Therefore, keeping other variables constant, 1.0 per cent increase in the value of non-oil output would induce a 0.14 per cent increase in non-oil exports. This finding conformed with theory. It is indeed obvious that volume of non- oil export can expand as aggregate supply increases. The increase in output fed into non-oil export through increased availability of funds for investment in the sector.

The result also explained that a 1.0 percent increase (depreciation) in real exchange rate leads to aproximately 0.09 percent decrease in non-oil export and vice versa. This phenomenon conformed with economic theory and was explained through the impact such depreciation would have on the competitiveness of non-oil exports in the international commodity market. Policymakers should, therefore, take this fact into consideration in the non-oil export promotion issues and consequently factor it into their strategic economic policies.

Table 2: Non-Oil Exports Equation

Dependent Variable: LOG(XN)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(XN(-1))	0.845397	0.049036	17.24019	0.0000
LOG(YN)	0.142846	0.046080	3.099968	0.0026
LOG(RER)	-0.087607	0.041894	-2.091137	0.0395
Adjusted R-squared	0.983811	Durbin-Watson stat		1.450254

5.1.3 Imports

Following economic theory, import was modelled to be determined by its own lag, domestic income, price variable (real exchange rate), and tariffs. There was evidence of import inertia, with 1 per cent increase in previous quarter imports leading to 0.57 per cent rise in the current imports. The response of imports to domestic income was strong. Domestic income was identified as a positive and significant determinant of imports. A 1.0 per cent increase domestic income would raise total imports by 0.34 per cent. The reason for the significance of this variable is not far-fetched. Since Nigeria is import-dependent economy, marginal propensity to import increases as the level of income increases. This result is consistent with the Keynesian view that consumption would increase as income increases. Intuitively, a higher marginal propensity to consume raises the demand for imports, given Nigeria's high import propensity.

Different test statistics for the model confirmed the robustness of the estimates. The model explained about 99 per cent of the variations in total imports and

there was evidence of autocorrelation as indicated by the Durbin-Watson autocorrelation coefficient of 1.147. Probability function statistics among the different explanatory variables are also low enough to make for consistent and reliable estimates.

Table 3: Estimation of Import Demand Equation

Dependent Variable: LOG(M)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(M(-1))	0.565245	0.064012	8.830273	0.0000
LOG(Y)	0.337183	0.060492	5.574041	0.0000
LOG(RER)	0.058622	0.039269	1.492851	0.1393
TAR	-0.060813	0.010253	-5.931383	0.0000
C	0.848696	0.245774	3.453157	0.0009
Adjusted R-squared	0.990506	Durbin-Watson stat		1.147254

5.1.4   External Reserves

One of the core mandates of the CBN is to preserve the value of naira and this is inextricably linked to the level of external reserves. External reserves give an indication of country's credit worthiness and sustenance of external viability. An estimate of the reserve equation showed that the huge level of Nigeria's imports iwas inversely related to reserves, reflecting imports as a significant source of vulnerability in the country's external reserve assets. Hence, a 1.0 per cent increase in previous quarter imports would concomitantly reduce reserves by 0.36 per cent. Enhanced domestic output growth, especially in the tradable sectors of the economy, could result in a proportionate increase in reserve accumulation. Given the strong correlation between reserve accumulation and oil exports, the price of oil is a robust determinant of reserves. A 1.0 per cent rise in price of crude oil would result into a 0.42 per cent increase in reserves.

The above findings were consistent with the data properties associated with the model and reflect the need to overhaul and correct domestic conditions to kick-start the miniature industrial base in Nigeria. The development of core value chains in manufacturing and agricultural sectors and, improvements on the deplorable state of infrastructure would be the key turning point for growth in non-oil exports and hence, foreign exchange earnings.

Table 4: External Reserve Equation

Dependent Variable: LOG(RES)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RES(-1))	0.382441	0.097395	3.926683	0.0002
LOG(M(-1))	-0.367028	0.218497	-1.679789	0.0968
LOG(PO)	0.424830	0.151357	2.806802	0.0062
LOG(FNGDP)	0.045685	0.043931	1.039919	0.3014
LOG(Y)	0.573028	0.252696	2.267659	0.0259
Adjusted R-squared	0.812782	Durbin-Watson stat		2.353855

5.1.5 Remittances

Given the growing importance of remittances to Nigeria's economy, the microscopic role of key macroeconomic fundamentals in explaining remittances is closely examined. Thus, remittance was modeled as a function of its own inertia, nominal exchange rate, stock market activities, the interest rate differential and foreign output. The regression result indicated that remittances had high inertia (0.84 per cent). In addition, as an investment channel for Nigerians in diaspora, stock market activities have been a significant driver of remittances over the estimation period. A 1.0 per cent increase in the stock market index would raise remittances by 0.14 per cent.

Table 5: Remittances Equation

Dependent Variable: LOG(RMT)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RMT(-1))	0.838163	0.062529	13.40439	0.0000
LOG(NER)	0.026028	0.053713	0.484570	0.6293
LOG(SMK)	0.144422	0.068753	2.100585	0.0387
IRD2	-0.010410	0.004455	-2.336787	0.0219
LOG(FNGDP)	-0.001553	0.022017	-0.070522	0.9439
Adjusted R-squared	0.982039	Durbin-Watson stat		1.726793

5.1.6   Exchange Rate

Exchange rate is a key variable in external sector because it linked external variables to domestic variables. Fluctuations in exchange rate is a reflection of changes in both foreign and domestic fundamentals such as foreign reserves, terms of trade, oil price, domestic price, government expenditure and interest rate differential. Studies have also shown that past values of exchange rate could explain its variations. The argument is anchored on the fact that exchange rate follows random walk and it past values could better mirror the present and future values rather than other economic fundamentals.

Contrary to expectations, the result showed that interest rate differential, domestic price level and terms of trade do not significantly influence fluctuations (depreciation or appreciation) in exchange rate. Finding from the study indicated that past values of exchange rate, reserves level and oil prices were the principal variables driving fluctuations in the nominal exchange rate in Nigeria. For instance, 1.0 per cent depreciation in the lagged value of exchange rate triggered 0.98 per cent depreciation in the current exchange rate. This implies that past depreciation in exchange rate would trigger further depreciation in the current exchange rate due to the influence of speculators in the foreign exchange market. The result also showed that 1.0 per cent decrease in oil price at the international market could cause exchange rate to depreciate to the tune of 0.08 per cent. The influence of foreign reserves level though significant, the sign was contrary to expectation. This result showed that nominal exchange rate in Nigeria is highly sensitive to speculative activities and development in the international market, especially, movement in oil prices.

Table 6: Nominal Exchange Rate

Dependent Variable: LOG(NER)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(NER(-1))	0.977016	0.024478	39.91415	0.0000
LOG(RES)	0.047149	0.016471	2.862537	0.0053
X/M	-0.018570	0.038254	-0.485434	0.6286
LOG(PO)	-0.079708	0.047945	-1.662473	0.1001
Adjusted R-squared	0.976375	Durbin-Watson stat		2.000089

5.1.7   Foreign Direct Investment (FDI)

Being a component of the capital and financial accounts, inflows of FDI in Nigeria, which witnessed high peaks in the 1960s and 1970s declined significantly,

exacerbating pressures on capital accounts. However, economy-wide reforms that brought about the liberalization and the subsequent enthronement of democratic governance spurred FDI flows through huge equity participation in the oil and gas sector, telecommunications and building and construction. According to the CBN (2010, p544) "the sustained rise in FDI inflows into the country resulted from macroeconomic stability, robust external reserves, favourable rating by the international rating agencies, delisting the country by the Financial Action Task Force (FATF)as well as fiscal prudence and transparency in the allocation of new oil blocks by the Department of Petroleum Resources (DPR)".

Thus, in the model, foreign direct investment was specified as a function of its own lag and the general standard of living represented by the per capita income. Consistent with economic theory, the *a-priori* expectations of the explanatory variables were expected to be positively related with the movement in foreign direct investment.

The estimated coefficients of the explanatory variables were highly statistically significant and correctly signed as evidenced by the t-statistic. The results showed that the contemporaneous component impacted more positively on foreign direct investment, suggesting a strong adaptive movement in the dependent variable and that higher level of foreign direct investment in the past period would, on the average, lead to about 72.9 per cent increase in current FDI inflows. Similarly, a one per cent increase in per capita income could induce foreign direct investment flows by as much as 38.1 per cent, given the positive relationship.

Table 7: Foreign Direct Investment

Dependent Variable: LOG(FDI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FDI(-1))	0.729284	0.065774	11.08776	0.0000
LOG(PCGDP)	0.380871	0.076116	5.003840	0.0000
LOG(PO(-3))	0.041540	0.043752	0.949444	0.3452
LOG(XN(-4))	-0.081490	0.036461	-2.234982	0.0282
Adjusted R-squared	0.988870	Durbin-Watson stat		1.496448

Chapter Six

6.0   Model Simulation and Scenarios Analysis

In order to evaluate the performance of the model, both in-sample (ex-post) and out-of sample (ex-ante) simulations were carried out.

6.1   In-sample Simulation

Within-sample (ex-post) simulation, in which the endogenous and exogenous variables are known with certainty during the forecasting period, was conducted to test the reliability of the model in predicting the movement of the endogenous variables. It is pertinent to emphasize that good forecast performance of the model depends greatly on the quality of data, how well the behavioral equations are linked (block structure of the model) and how economically meaningful the coefficient estimates are.

A cursory examination of the graphs in Figure 8 indicated that the model tracked the time paths and turning points of the endogenous variables reasonably well, indicating that the model is a good reflection of the behaviour of the variables of interest. This suggested its suitability and reliability for policy simulation and forecasting.

Figure 7: Actual and Simulated Values of Endogenous Variables
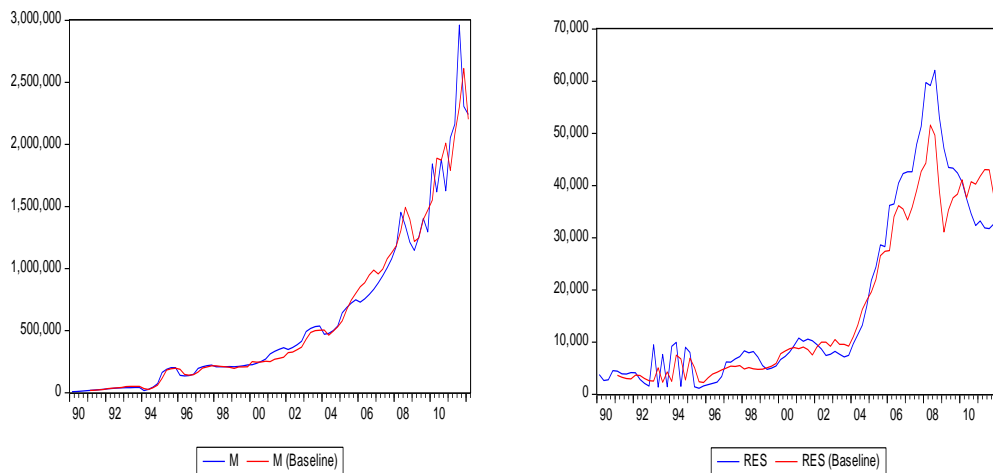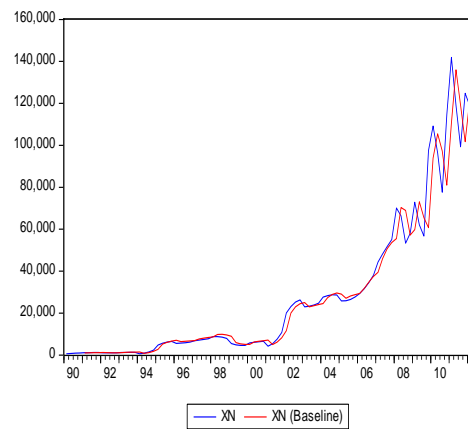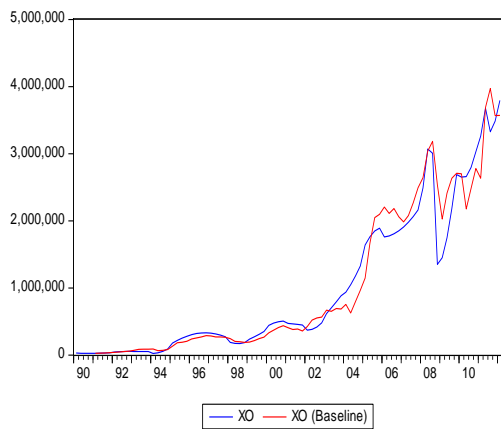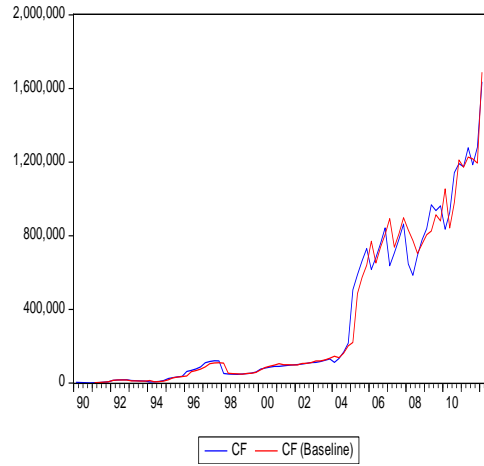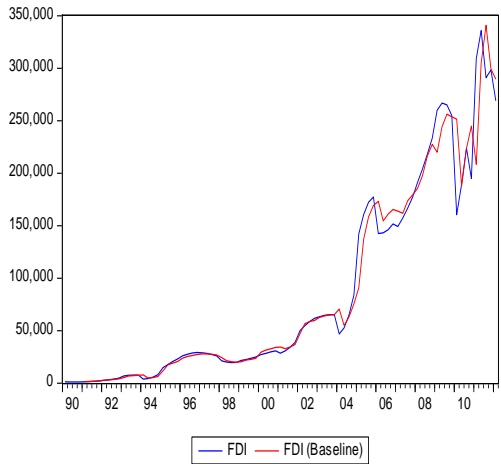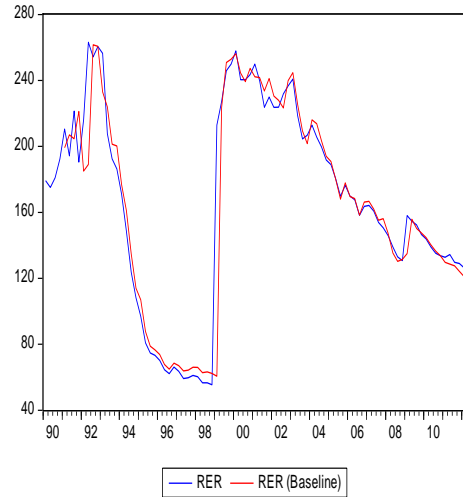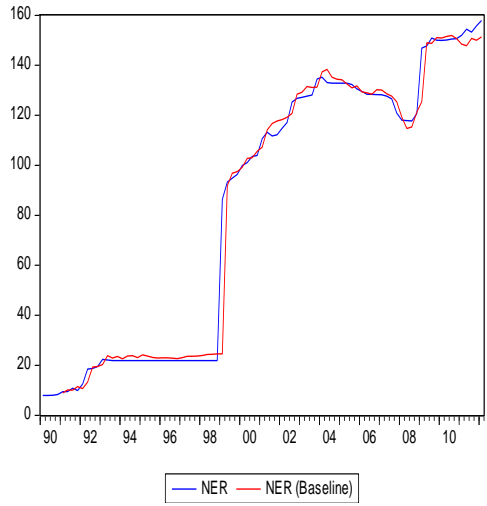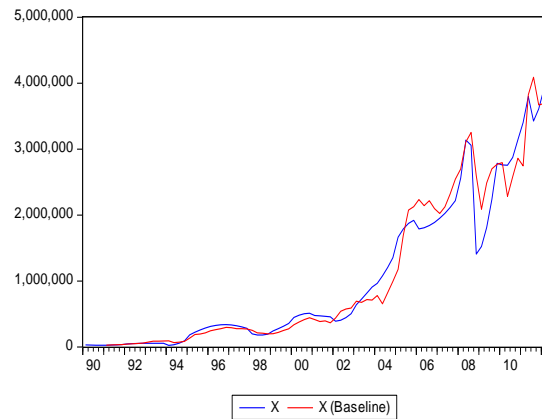
6.2   Out-of-Sample Simulation and Scenarios Analysis

With the good tracking of the endogenous equations observed from the in-sample simulation, out-of-sample simulation of possible outcomes of changes in some identified variables was carried out. Selected variables were shocked and their impact traced given the interrelationship and inter-linkages.

The baseline simulation assumed that the present condition would continue, while the alternative scenarios were premised on the assumptions that the present situation would change based on the changes in the economy. Some of the issues for which some alternative scenarios were considered included:

- The response of selected external sector variables to negative oil price shocks.

- The response of selected external sector variables to changes in OECD output (increase and decrease).

6.2.1   Baseline Scenarios

In the baseline scenarios, we assumed that:
- Price of crude oil (bonny light) would remain at the level attained in 2012: ($121 per barrel)
- Crude Oil Production (budget benchmark) 2.48 mbd

6.2.2   Alternative Scenarios

Scenario 1: Oil price rule - $75
Scenario 2: Oil price declines to $70
Scenario 3: Increase in Current oil production by 0.6 million barrels per day (mbd)
Scenario 4: Current oil production falls to 1.5 mbd

Scenario 5: Budget benchmark Scenario (Oil price at $75 and Oil Production at 2.48 mbd)

Scenario 6: Decrease in Oil Price and Oil Production to $70 and 1.5 mbd, respectively.

6.2.3 Simulation Results
There were three shock variables used for the simulation: crude oil price and oil production. The results of the scenarios are reported in Tables 8 to 13.

Scenarios 01 – A decline in the Price of Crude Oil to US$75
Scenario 1 assumes a sharp drop in the baseline price of crude oil from $121.23 per barrel to $75.0 per barrel. The outcome of the simulation reflected an expected substantial negative impact on selected macroeconomic variables in the model due to the price shock. Capital flows, foreign direct investment, nominal exchange rate, reserves and exports (both oil and non-oil), declined significantly, following a decline in the price of crude oil. The impact on other variables was almost instantaneous, while capital flows and foreign direct investments responded to the oil price shock with a considerable lag of three quarters.

A cursory examination of the results showed the negative impact on total export to be marginal in the first three quarters of the shock as the percentage change hovered at 15.0 per cent, while non-oil export and oil exports declined from 1.45 and 15.7 in the fourth quarter of 2012 to 9.5 and 19.5 per cent in the fourth quarter of 2014, respectively.

The dominant valuation effects persisted as imports rise irrespective of the fall in oil prices. The results showed that imports would rise to as much as 3.64 per cent at the end of 2014. The impact on Reserves was significant throughout the period and was as high as 2.9 per cent from the baseline. In line with a priori expectation, nominal exchange rate depreciated steadily, showing a significant impact from the fifth quarter after the shock.

Table 8: Crude Oil decline to US$75.0 per Barrel

		Capital Flows		Foreign Direct Investment		Imports		Nominal Exchange Rate		External Reserves		Remittances		Exports		Non-oil Exports		Oil Exports	
		Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ
2012	Q1	1,635,796	0.00	268,802	0.00	2,241,004	0.00	157.95	0.00	35,197	0.00	769,243	0.00	3,912,345	0.00	118,933	0.00	3,793,412	0.00
	Q2	1,644,352	0.04	273,506	0.00	2,158,144	0.20	153.91	-3.28	43,236	-18.45	746,882	0.09	3,538,166	-15.20	119,107	-0.29	3,419,059	-15.72
	Q3	1,672,100	0.10	281,477	0.00	2,089,035	0.48	150.47	-6.06	47,575	-24.63	728,583	0.24	3,621,002	-15.22	121,812	-0.79	3,499,191	-15.72
	Q4	1,743,559	0.18	284,304	0.00	2,033,435	0.80	147.41	-8.60	50,311	-26.94	713,570	0.43	3,653,698	-15.24	124,028	-1.45	3,529,671	-15.72
2013	Q1	1,800,673	-0.06	289,389	-1.97	1,988,682	1.14	144.58	-11.02	52,428	-27.89	701,226	0.67	3,705,455	-16.52	123,693	-2.23	3,581,762	-17.01
	Q2	1,832,905	-0.19	293,717	-3.37	1,942,324	1.49	141.86	-13.35	53,861	-28.34	691,053	0.93	3,752,970	-17.42	126,463	-3.11	3,626,507	-17.92
	Q3	1,912,154	-0.24	297,719	-4.33	1,900,346	1.85	139.25	-15.60	55,287	-28.60	682,656	1.23	3,799,577	-18.06	131,510	-4.07	3,668,067	-18.56
	Q4	1,974,002	-0.23	302,131	-4.98	1,863,867	2.21	136.76	-17.78	56,835	-28.79	675,720	1.55	3,849,175	-18.49	135,711	-5.10	3,713,464	-18.98
2014	Q1	2,010,273	-0.19	306,059	-5.38	1,823,529	2.57	134.33	-19.88	58,018	-28.96	669,986	1.88	3,891,000	-18.79	136,813	-6.17	3,754,188	-19.25
	Q2	2,092,873	-0.12	309,754	-5.61	1,785,826	2.92	131.97	-21.91	59,360	-29.11	665,246	2.23	3,933,741	-18.96	141,085	-7.27	3,792,657	-19.40
	Q3	2,156,968	-0.03	313,390	-5.70	1,752,378	3.28	129.70	-23.87	60,905	-29.26	661,334	2.59	3,978,227	-19.05	147,711	-8.40	3,830,517	-19.46
	Q4	2,194,289	0.07	315,860	-5.68	1,715,009	3.64	127.48	-25.76	62,112	-29.41	658,107	2.96	4,010,567	-19.07	153,237	-9.54	3,857,330	-19.45
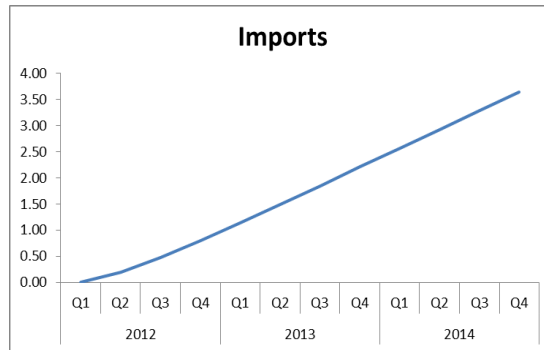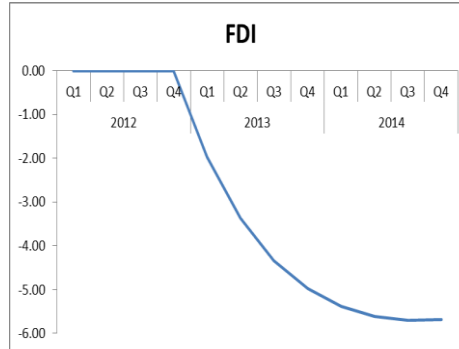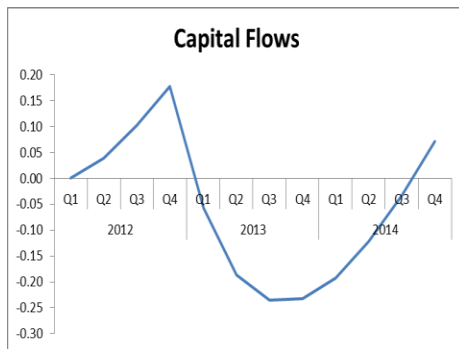
Scenarios 02 – A decline in the Price of Crude Oil to US$70

The dynamics of crude oil prices in the international market is crucial when modeling the external sector of net-oil exporting countries like Nigeria. This is so owing to the fact that it determines to a great extent, Nigeria's foreign exchange earnings. This scenario adopted a pessimistic view by assuming a drastic fall in the price of oil from $121 to $70 per barrel. The result consequently, indicated a gradual deterioration of the exchange rate and drastic depletion of the external reserves. It also showed that a decrease in oil price by $51 could cause an

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average reduction of 0.08 and 3.52 per cent in capital flows and foreign direct investment, respectively, over the period of projection.

The simulation result also pointed out that a decline in the price of oil has a deleterious impact on total exports. Specifically, while non-oil exports decreased marginally and peaked at 10.8 per cent over the forecast horizon, oil exports reduce drastically, recording 21.9 per cent at the end of the forecast horizon. Imports and remittances, on the other hand, rose by as much as 4.15 and 3.38 per cent, respectively, at the end of 2014. This signaled the import-dependent nature of the economy as well as the exchange rate depreciation advantage with respect to the inflow of remittances.

From the above analysis, it could therefore, be observed that an undesirable change in oil price further exacerbates the exchange rate depreciation, lull in reserves, FDI and exports movements, similar to when crude price declined to US$75 per barrel.

Table 9: Crude Oil Price decline to US$70.0 per Barrel

obs		CF		FDI		Imports		NER		RER		Reserves		Remmittances		Exports		Non-oil Exports		Oil Exports	
		Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ
2012	Q1	1635796	0.00	268802	0.00	2241004	0.00	157.95	0.00	126.31	0.00	35197.44	0.00	769243	0.00	3912345	0.00	118933	0.00	3793412	0.0
	Q2	1644352	0.05	273506	0.00	2158144	0.22	153.91	-3.73	121.13	-3.73	43235.99	-20.81	746882	0.10	3538166	-17.18	119107	-0.33	3419059	-17.8
	Q3	1672100	0.12	281477	0.00	2089035	0.55	150.47	-6.89	116.19	-6.89	47574.52	-27.63	728583	0.27	3621002	-17.20	121812	-0.90	3499191	-17.8
	Q4	1743559	0.20	284304	0.00	2033435	0.91	147.41	-9.75	111.74	-9.75	50311.28	-30.16	713570	0.49	3653698	-17.22	124028	-1.65	3529671	-17.8
2013	Q1	1800673	-0.07	289389	-2.26	1988682	1.30	144.58	-12.47	107.64	-12.47	52428.03	-31.20	701226	0.76	3705455	-18.65	123693	-2.54	3581762	-19.2
	Q2	1832905	-0.21	293717	-3.84	1942324	1.70	141.86	-15.08	103.79	-15.08	53860.5	-31.69	691053	1.07	3752970	-19.66	126463	-3.54	3626507	-20.2
	Q3	1912154	-0.27	297719	-4.94	1900346	2.11	139.25	-17.59	100.16	-17.59	55286.93	-31.97	682656	1.40	3799577	-20.36	131510	-4.64	3668067	-20.9
	Q4	1974002	-0.26	302131	-5.67	1863867	2.52	136.76	-20.01	96.75	-20.01	56834.88	-32.18	675720	1.76	3849175	-20.85	135711	-5.79	3713464	-21.4
2014	Q1	2010273	-0.22	306059	-6.13	1823529	2.93	134.33	-22.33	93.50	-22.33	58018.25	-32.36	669986	2.15	3891000	-21.18	136813	-7.00	3754188	-21.7
	Q2	2092873	-0.14	309754	-6.39	1785826	3.34	131.97	-24.57	90.42	-24.57	59359.61	-32.53	665246	2.55	3933741	-21.37	141085	-8.25	3792657	-21.9
	Q3	2156968	-0.04	313390	-6.49	1752378	3.75	129.70	-26.72	87.51	-26.72	60905.27	-32.69	661334	2.96	3978227	-21.46	147711	-9.52	3830517	-21.9
	Q4	2194289	0.08	315860	-6.47	1715009	4.15	127.48	-28.78	84.72	-28.78	62111.67	-32.85	658107	3.38	4010567	-21.49	153237	-10.80	3857330	-21.9
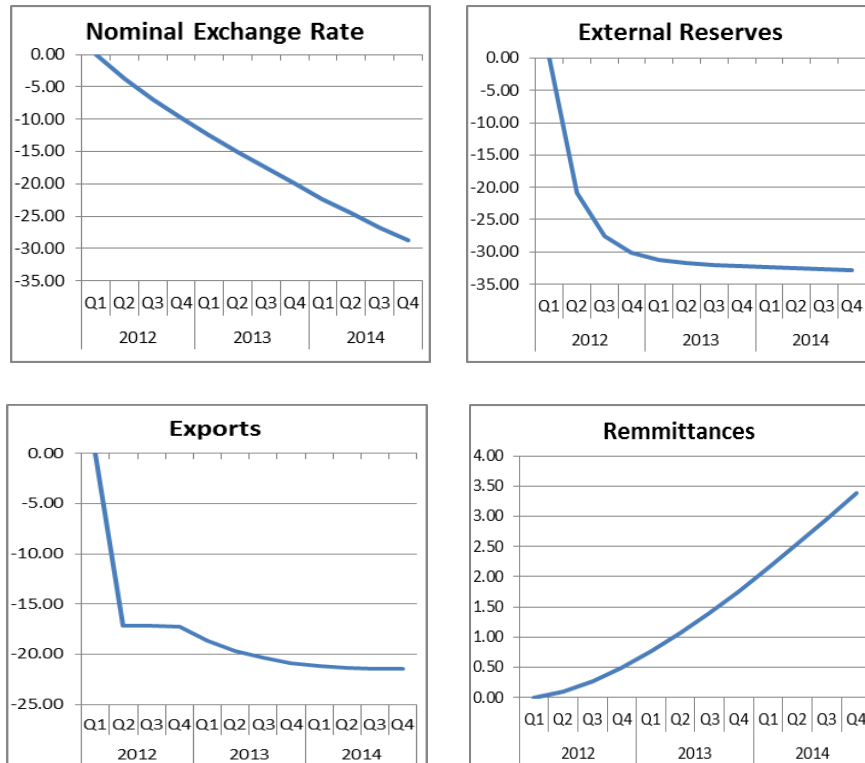
Scenarios 03 – An increase in the Current Oil Production from 1.88 mpbd to 2.25 mpbd

An increase in the baseline crude oil production from 1.88 mpbd to 2.25 mpbd would initially have no impact on reserves accumulation, until the 3rd quarter where a minimal accretion of 2% was observed. Subsequently, the reserves consistently increased at an average of 30% throughout the remaining period of the forecast. The persistent increase in reserves consequently led to nominal exchange rate appreciation; it appreciated by 0.8, 4.4 and 8.5 in the 2nd quarters of 2012, 2013 and 2014, respectively. The continuous appreciation of nominal exchange rate would have negative effect on both short and long term flows such as capital flow, foreign direct investment (FDI) and remittances. The effects on capital flow and remittances were immediate as they fall by 0.01% and 0.02% in the 2nd quarter 2012 and the trended persist throughout the forecast period. However, a cursory examination of the results indicated that FDI responded with a lag of six quarters, precisely it manifest in the 1st quarter of 2013.

Oil exports is according to expectation, in response to rise in oil production, oil exports increased at a decreasing rate, reflecting that movement in oil price mattered in driving oil exports in medium and long terms rather than oil production. The impact of oil export hovered at 28.0 per cent in the 2nd quarter of

2012 and averaged 27.9 per for the remaining ten quarters. The trend in total exports mimic trend in oil import being a major component in the total exports.

Table 10: Increase in Current Crude Oil Production from 1.88 mbd to 2.25 mbd

		Capital Flows		FDI		Imports		NER		Reserves		Remittances		Exports		Non-Oil Exports		Oil Exports	
		Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change
2012	Q1	1635796.14	0	268802.06	0	2241004	0	157.95	0.00	35197.44	0	769243.22	0	3912344.74	0	118933.18	0	3793411.6	0
	Q2	1644352	-0.01	273506.1	0	2158144	-0.05	153.9078	0.83	43235.99	0	746882	-0.02	3538166	27.04	119106.8	0.07	3419059	27.98
	Q3	1672100	-0.03	281477.1	0	2089035	-0.13	150.474	1.69	47574.52	0.02	728582.7	-0.06	3621002	27.04	121811.5	0.21	3499191	27.98
	Q4	1743559	-0.05	284303.8	0	2033435	-0.22	147.4079	2.58	50311.28	0.05	713570	-0.12	3653698	27.04	124027.5	0.40	3529671	27.98
2013	Q1	1800673	-0.07	289389.1	0	1988682	-0.33	144.5751	3.50	52428.03	0.10	701226.2	-0.19	3705455	27.06	123692.9	0.64	3581762	27.98
	Q2	1832905	-0.10	293717.2	-0.01	1942324	-0.44	141.8586	4.44	53860.5	0.16	691053	-0.27	3752970	27.06	126463.4	0.93	3626507	27.97
	Q3	1912154	-0.13	297719.2	-0.02	1900346	-0.56	139.2518	5.40	55286.93	0.22	682655.5	-0.36	3799577	27.03	131509.5	1.25	3668067	27.95
	Q4	1974002	-0.17	302131.2	-0.05	1863867	-0.68	136.7622	6.39	56834.88	0.29	675719.6	-0.47	3849175	27.00	135711	1.60	3713464	27.93
2014	Q1	2010273	-0.21	306058.7	-0.09	1823529	-0.80	134.3322	7.41	58018.25	0.36	669985.8	-0.58	3891000	26.98	136812.6	1.99	3754188	27.89
	Q2	2092873	-0.24	309754	-0.14	1785826	-0.92	131.9729	8.45	59359.61	0.43	665246.1	-0.69	3933741	26.93	141084.8	2.41	3792657	27.84
	Q3	2156968	-0.28	313389.8	-0.20	1752378	-1.05	129.7027	9.52	60905.27	0.51	661333.6	-0.82	3978227	26.85	147710.6	2.85	3830517	27.78
	Q4	2194289	-0.32	315860.1	-0.28	1715009	-1.18	127.4785	10.61	62111.67	0.58	658106.9	-0.94	4010567	26.77	153236.6	3.31	3857330	27.70
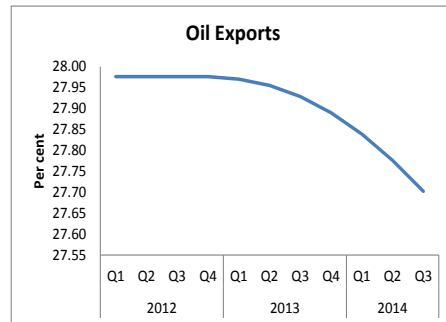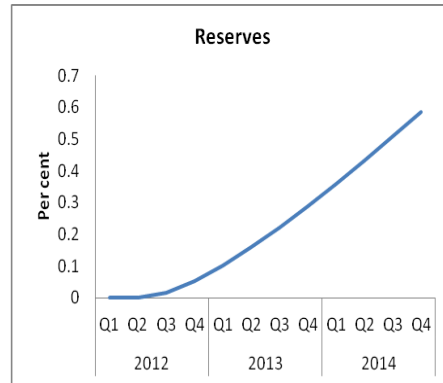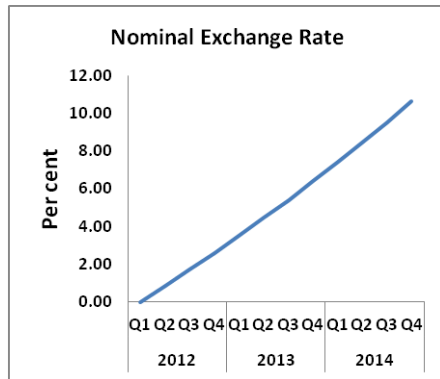
Scenarios 04 – A decline in the Current Oil Production from 1.88 to 1.50mbd

A decline in the baseline oil production from 1.88 mbpd to 1.50 mbpd showed mixed reactions on most of the variables in the model. There was an initial drop in

FDI and imports, but started to peak in the second quarter of 2013, following a decline in oil production. As widely maintained, FDI in Nigeria could be broadly categorized into oil and non-oil. Though FDI into the oil sector historically outweighed, but recent reforms in the telecommunications and financial sectors have led to increases in FDI into the non-oil sector. This could explain the increase despite the reduction in oil production.

Though both nominal and real exchange rate depreciated, remittances continued to increase. The increase in remittance could be attributable to the depreciation of the exchange rate as Nigerians in diaspora continued to take full advantage of the development in the exchange rate. Studies have shown that, the major determinants of remittances include migration trends, wage rates, exchange rates, interest rate differential, political risk, and income.

 A cursory look at the results indicated that, external reserves continued to deplete, which was in line with expectation given Nigeria's mono-cultural export structure with reserves critically depending on the oil sector. This calls for macroeconomic reforms that would effectively stabilize the Nigerian economy and provide a platform for sustained economic diversification and non-oil growth.

While the impact on total export was marginal in 2012 and 2013, there was a general decline as the percentage change hovers around 14.0 per cent with non-oil export and oil exports declined from 0.04 and 14.4 in the second quarter of 2012 to 1.7 and 14.4 per cent in the fourth quarter of 2014, respectively.

Table 11: Decline in Oil Production from 1.88 mbd to 1.50 mbd

		Cpital Flows		FDI		Imports		NER		RER		Reserves		Remittance		Exports		Non-Oil Exports		Oil Exports	
		Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change	Baseline	% Change
2012	Q1	1635796	-	268802.1	0.00	2241004	0.00	157.95	0.00	126.31	0.00	35197.44	0.00	769243.22	0.00	3912345	0.00	118933.2	0.00	3793412	0.00
	Q2	1644352	0.01	273506.1	0.00	2158144	0.02	153.9078	-0.43	121.1266	-0.43	43235.99	0.00	746882	0.01	3538166	-13.98	119106.8	-0.04	3419059	-14.46
	Q3	1672100	0.01	281477.1	0.00	2089035	0.07	150.474	-0.86	116.1948	-0.86	47574.52	-0.01	728582.7	0.03	3621002	-13.98	121811.5	-0.11	3499191	-14.46
	Q4	1743559	0.02	284303.8	0.00	2033435	0.11	147.4079	-1.31	111.7431	-1.31	50311.28	-0.03	713570	0.06	3653698	-13.98	124027.5	-0.21	3529671	-14.46
2013	Q1	1800673	0.04	289389.1	0.00	1988682	0.17	144.5751	-1.76	107.6429	-1.76	52428.03	-0.05	701226.2	0.10	3705455	-13.99	123692.9	-0.33	3581762	-14.46
	Q2	1832905	0.05	293717.2	0.00	1942324	0.23	141.8586	-2.21	103.788	-2.21	53860.5	-0.08	691053	0.14	3752970	-13.99	126463.4	-0.47	3626507	-14.46
	Q3	1912154	0.07	297719.2	0.01	1900346	0.29	139.2518	-2.67	100.1589	-2.67	55286.93	-0.11	682655.5	0.19	3799577	-13.98	131509.5	-0.64	3668067	-14.46
	Q4	1974002	0.09	302131.2	0.02	1863867	0.35	136.7622	-3.14	96.74793	-3.14	56834.88	-0.15	675719.6	0.24	3849175	-13.97	135711	-0.82	3713464	-14.45
2014	Q1	2010273	0.11	306058.7	0.04	1823529	0.41	134.3322	-3.60	93.50262	-3.60	58018.25	-0.18	669985.8	0.30	3891000	-13.96	136812.6	-1.01	3754188	-14.43
	Q2	2092873	0.12	309754	0.07	1785826	0.48	131.9729	-4.08	90.42118	-4.08	59359.61	-0.22	665246.1	0.36	3933741	-13.94	141084.8	-1.21	3792657	-14.42
	Q3	2156968	0.14	313389.8	0.10	1752378	0.54	129.7027	-4.55	87.50693	-4.55	60905.27	-0.26	661333.6	0.42	3978227	-13.91	147710.6	-1.43	3830517	-14.39
	Q4	2194289	0.17	315860.1	0.14	1715009	0.61	127.4785	-5.03	84.72241	-5.04	62111.67	-0.30	658106.9	0.49	4010567	-13.88	153236.6	-1.66	3857330	-14.37
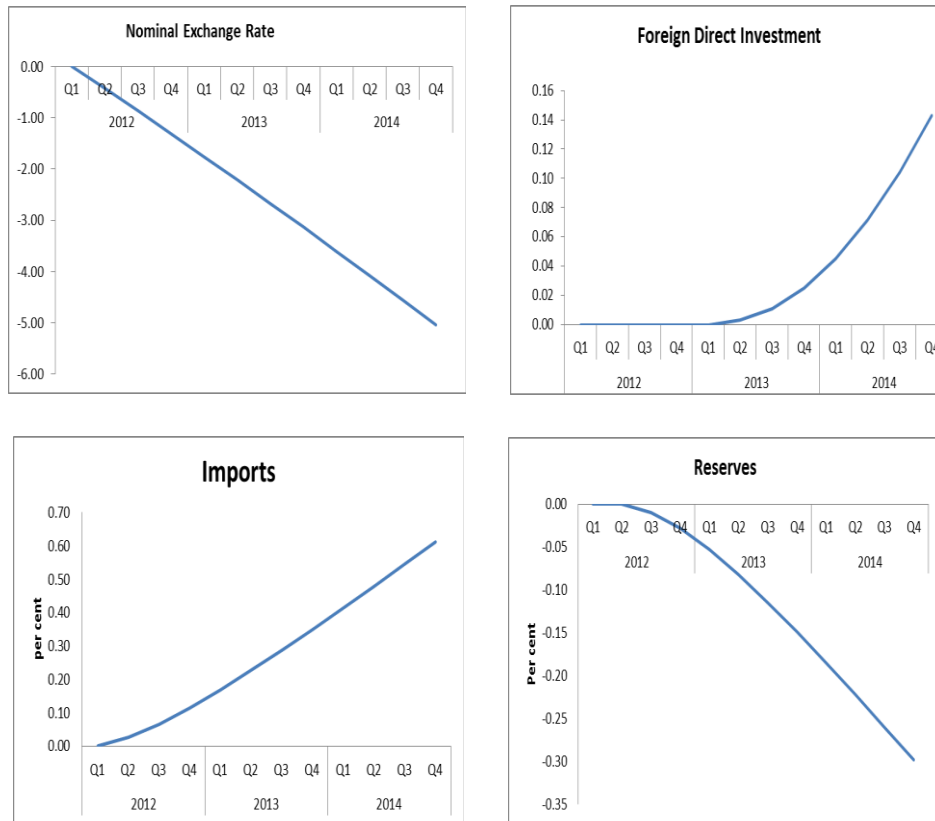
Scenario 5: Budget Benchmark Crude Oil Price of US$75.0 and Oil Production of 2.48 mbd

The economic contribution of the oil sector cannot be over-emphasized. Once there is a disturbance to the price and quantity of crude oil, the external sector fundamentals react almost instantaneously producing significant ripples effect to the entire economy. This, especially is against the strong positive correlation between oil price and oil exports, external reserves and domestic revenue among others.

This overarching feature of the external sector was apparent in scenario 5 where we considered a mix of a budget benchmark oil price rule of US$75.00 and oil production of 2.48 mbd against the baseline of US$121 and 1.88mbd. This assumption of an almost 40 per cent fall in oil price and a 0.60mbd crude production increased the value of exports by approximately 8 per cent in 2012 from baseline. The impact had a long memory, extending to Q4 in 2014. Non-oil exports, however, weakened, declining precipitously over the forecast horizon.

Imports, somewhat, increased putting pressure on external reserves as it fell by about a third. The nominal exchange rate depreciated in tandem and concomitantly, with the declining crude oil price. The depreciation of the nominal exchange rate perhaps is an important incentive to remittance inflow as it responded positively. Foreign direct investment also nosedives, resulting in an overall decline in total capital flows.

Table 12: Budget Benchmark Crude Oil Price of US$75.0 and Oil Output of 2.48 mbd

obs	Capital Flows		Foreign Direct Investment		Imports		Nominal Exchange Rate		External Reserves		Remittances		Exports		Non-oil		Oil Exports	
	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ	Baseline	%Δ
2012Q2	1644352	0.031	273506.1	0.00	2158144	0.15	153.91	-2.61	43235.99	-18.45	746882	0.07	3538166	7.59	119106.8	-0.23	3419059	7.86
2012Q3	1672100	0.080	281477.1	0.00	2089035	0.37	150.47	-4.73	47574.52	-24.62	728582.7	0.18	3621002	7.57	121811.5	-0.62	3499191	7.86
2012Q4	1743559	0.136	284303.8	0.00	2033435	0.61	147.41	-6.62	50311.28	-26.91	713570	0.33	3653698	7.55	124027.5	-1.12	3529671	7.86
2013Q1	1800673	-0.119	289389.1	-1.97	1988682	0.87	144.58	-8.43	52428.03	-27.83	701226.2	0.51	3705455	5.94	123692.9	-1.71	3581762	6.21
2013Q2	1832905	-0.274	293717.2	-3.37	1942324	1.12	141.86	-10.18	53860.5	-28.24	691053	0.71	3752970	4.78	126463.4	-2.37	3626507	5.03
2013Q3	1912154	-0.347	297719.2	-4.35	1900346	1.38	139.25	-11.88	55286.93	-28.47	682655.5	0.92	3799577	3.96	131509.5	-3.09	3668067	4.21
2013Q4	1974002	-0.372	302131.2	-5.02	1863867	1.64	136.76	-13.52	56834.88	-28.62	675719.6	1.16	3849175	3.39	135711	-3.85	3713464	3.65
2014Q1	2010273	-0.364	306058.7	-5.45	1823529	1.90	134.33	-15.11	58018.25	-28.75	669985.8	1.40	3891000	3.00	136812.6	-4.64	3754188	3.28
2014Q2	2092873	-0.321	309754	-5.72	1785826	2.15	131.97	-16.64	59359.61	-28.86	665246.1	1.65	3933741	2.75	141084.8	-5.46	3792657	3.06
2014Q3	2156968	-0.265	313389.8	-5.86	1752378	2.40	129.70	-18.12	60905.27	-28.97	661333.6	1.91	3978227	2.60	147710.6	-6.29	3830517	2.94
2014Q4	2194289	-0.196	315860.1	-5.89	1715009	2.65	127.48	-19.54	62111.67	-29.07	658106.9	2.18	4010567	2.52	153236.6	-7.13	3857330	2.91
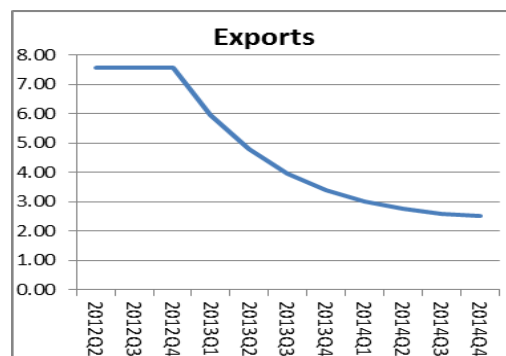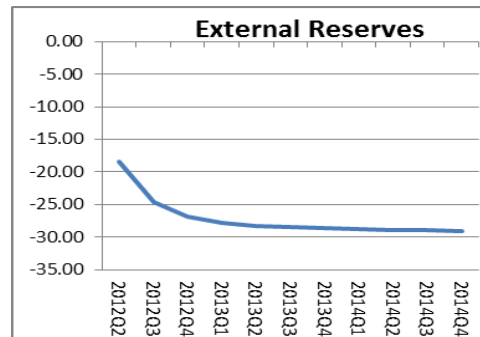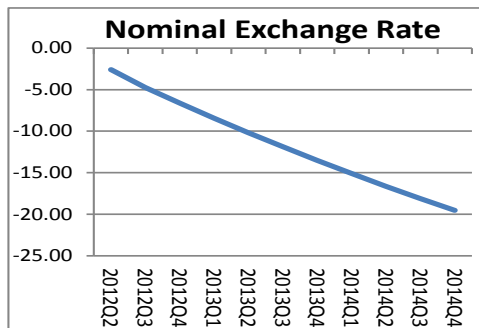
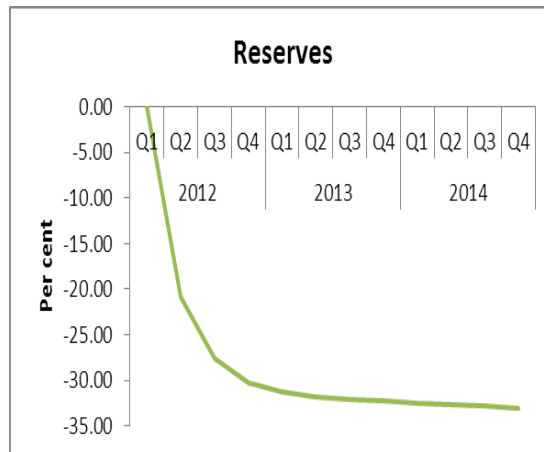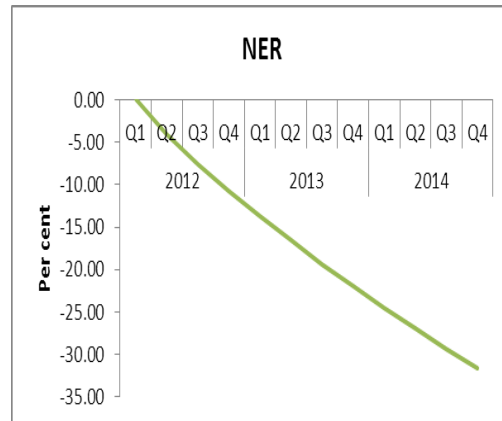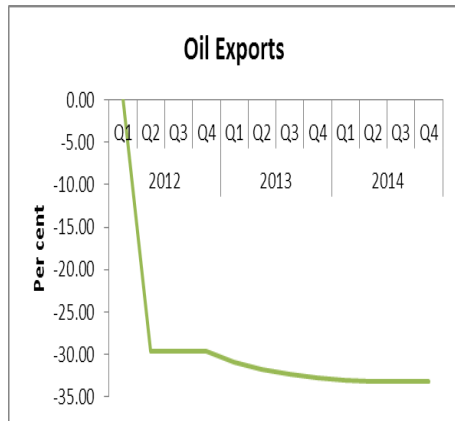***Scenarios 06 – A decline in the Price of Crude Oil to US$70 and crude oil output to 1.5 mbpd***

A decline in the baseline crude oil price and production from $121.0 per barrel to $70.0 per barrel and 2.48 to 1.5 mbpd, respectively, has dampening effect on most of the variables in the model. Nominal exchange rate, reserves, capital flows, foreign direct investment and exports (both oil and non-oil), declined significantly following a decline in the crude oil price and output. A cursory examination of the results indicated that oil exports declined significantly by as much as 30.0 per cent in the first two quarters and moderated for the rest of the period standing at an average change of 33.0 per cent from its baseline.

Mimicking the peculiarities of the Nigerian economy, the decline in oil exports, which constituted the largest proportion of exports, concomitantly resulted in decrease in foreign reserves and nominal exchange rate. Foreign reserves declined almost mirrors the movement in oil exports, confirming the strong relationship between the two indicators. The percentage change of exports and reserves, which hovered at 28.7 and 20.8 per cent in the second quarter of 2012 decelerated to 32.3 and 33.0 per cent in the fourth quarter of 2014, respectively.

Contrary to economic literature and expectations, imports volume increased following decline in crude oil price reflecting dominant valuation effects. The results showed that imports would rise from 0.24 per cent in the second quarter of 2012 to as much as 4.7 per cent at the end of 2014.

Table 13: Decline in Price of Crude Oil to US$70 and Oil Production to 1.5mbpd

		Capital Flows		FDI		Imports		NER		Reserves		RMT		Exports		Non-Oil Exports		Oil Exports	
		Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change
2012	Q1	1635796	0.000	268802.1	0.00	2241004	0.00	157.95	0.00	35197.44	0.00	769243.2	0.00	3912345	0.00	118933.2	0.00	3793412	0.00
	Q2	1644352	0.049	273506.1	0.00	2158144	0.24	153.9078	-4.07	43235.99	-20.81	746882	0.11	3538166	-28.67	119106.8	-0.36	3419059	-29.66
	Q3	1672100	0.129	281477.1	0.00	2089035	0.60	150.474	-7.55	47574.52	-27.63	728582.7	0.30	3621002	-28.70	121811.5	-0.99	3499191	-29.66
	Q4	1743559	0.223	284303.8	0.00	2033435	1.01	147.4079	-10.72	50311.28	-30.18	713570	0.54	3653698	-28.71	124027.5	-1.82	3529671	-29.66
2013	Q1	1800673	-0.035	289389.1	-2.26	1988682	1.44	144.5751	-13.72	52428.03	-31.23	701226.2	0.84	3705455	-29.95	123692.9	-2.80	3581762	-30.89
	Q2	1832905	-0.170	293717.2	-3.84	1942324	1.89	141.8586	-16.60	53860.5	-31.73	691053	1.18	3752970	-30.82	126463.4	-3.92	3626507	-31.76
	Q3	1912154	-0.212	297719.2	-4.93	1900346	2.35	139.2518	-19.36	55286.93	-32.04	682655.5	1.56	3799577	-31.41	131509.5	-5.13	3668067	-32.36
	Q4	1974002	-0.194	302131.2	-5.65	1863867	2.81	136.7622	-22.00	56834.88	-32.26	675719.6	1.96	3849175	-31.83	135711	-6.41	3713464	-32.75
2014	Q1	2010273	-0.133	306058.7	-6.10	1823529	3.27	134.3322	-24.55	58018.25	-32.46	669985.8	2.39	3891000	-32.11	136812.6	-7.75	3754188	-33.00
	Q2	2092873	-0.036	309754	-6.34	1785826	3.73	131.9729	-26.99	59359.61	-32.65	665246.1	2.84	3933741	-32.27	141084.8	-9.13	3792657	-33.13
	Q3	2156968	0.081	313389.8	-6.41	1752378	4.19	129.7027	-29.32	60905.27	-32.83	661333.6	3.30	3978227	-32.33	147710.6	-10.54	3830517	-33.17
	Q4	2194289	0.218	315860.1	-6.36	1715009	4.65	127.4785	-31.57	62111.67	-33.00	658106.9	3.78	4010567	-32.34	153236.6	-11.96	3857330	-33.15

6.2.4   Policy Implications

- The simulation result showed that a decline in the price of oil significantly affects most of the variables in the model negatively. From a marginal influence on total exports, the decline in the price of crude oil translated to a decrease in the external reserves, capital flows and foreign direct investment. Imports also moved contrary to economic expectations signaling the import-dependence of the economy. This is a reflection of the over reliance on oil exports and points to the need for diversification of the Nigerian economy with respect to her revenue base.

- From the empirical findings, it is evident that allowing the exchange rate to adjust to a negative shock to price of crude oil is a potent policy in building up external reserves for the country.

- Also, the findings justified the need to overhaul and correct domestic conditions to kick-start the miniature industrial class in Nigeria. The

development of core value chains in manufacturing and agricultural sectors and, improvements on the deplorable state of infrastructure will be key turning points for growth in non-oil exports and hence, foreign exchange earnings.

- Nigeria's demand for imports is generally inelastic culminating into greater demand for foreign exchange and subsequent volatility in the nominal and real exchange rate.

Chapter Seven

7.0   Summary, Conclusion and Direction for Further Study
7.1   Summary and Conclusion

The discovery and exploration of crude oil in the 1960s led to desertion of agricultural sector of the Nigerian economy, which had been the main source of foreign exchange for the country. Crude oil exports replaced agricultural exports and became a major source of foreign exchange. The performance of the external sector of the Nigerian economy over the years were influenced largely by external shocks, especially, shocks to crude oil prices at the international market. In view of these developments, a model of the external sector was estimated to better understand the inter-linkages between external developments and domestic economy. The model comprised seven equations and three identities. The study used quarterly data spanning from 1990Q1 to 2012Q1.

The seven behavioural equations were specified in line with literature and estimated using the ordinary least squares technique. Shocks to three variables were used, namely oil price, tariff and income of OECD to capture the impact of external shocks on the economy. To close the model, three identities were also specified.

The behavioural equations comprised oil export, non-oil export, import, foreign direct investment, nominal exchange rate, remittances and external reserves equations. The three identities defined the capital flow, total exports and real exchange rate. Both in-sample and out-of-sample forecasts were carried out.

7.2   Limitations and Directions for Future Study

Further studies in the following areas will give insight into the workings of the external sector:

- Incorporating recent developments in the service sector

- Explore opportunity for the application of monthly data to better capture dynamics in the external sector and enhance availability of up-to-date information for policy makers.

REFERENCES

Akanbi, O. A. and C.B. Dutoit (2010). "Macroeconometric Modeling for the Nigerian Economy: A growth poverty Gap Analysis". Economic Modeling. Doi:1016/j.eiowmod.2010.08.015

Akinlo, A.E. and D.O. Yinusa (2007). Exchange Rate versus Capital Account Liberation in Nigeria: Some Important Issues, *Central bank of Nigeria, Economic and Financial Review*, Vol.45, No. 4, PP. 69-89.

Aron, J., Elbadawi I. and B. Kahn (1997). "Determinants of Real Exchange Rate in South Africa", *CSAE Working Paper,*WPS/ 97 – 16, CSAE

Athukorala, P. (1993) Enhancing Development Impact of Migrant Remittances: A Review of Asian Experiences. New Delhi: Asian Regional Programme on *International Labour Migration* (ILO) UNDP Project

Basdevant, O. (2000). "An Econometric Model of the Russian Federation", *Economic Modeling,* Vol. 17, pp. 305 – 336

Beenstock, M. (1995). "An Econometric Model of Oil Importing Developing Countries". *Economic Modeling*, Vol. 12(1), pp. 3 – 14

BPM6, (2009): *Balance of Payments and International Investment Position Manual*. Washingt6on, D.C: IMF Multimedia Service Division.

CBN (2000): *The Changing Structure of the Nigerian Economy and Implications for Development*. Lagos: Realm Communications Ltd.

CBN (1970, 2009, 2011): Annual Report and Statement of Accounts. Abuja

CBN (2010) *The Changing Structure of the Nigerian Economy*. Edited by Mordi CNO, A. Englama and B.S. Adebusuyi

Devereux, M. B. (1997). "Real Exchange Rates and Macroeconomics: Evidence and Theory." *Canadian Journal of Economic, XXX* (4), pp. 773 – 808

Fleming J.M (1962) Domestic Financial Policies under fixed and under Floating Exchange Rate' international monetary fund staff papers.

Geda, A. Karingi S. N., Ndung'u S. N., Van Schaaijk M., Were M., Wasala W., and J. Obere (2001). "Estimation Procedure and Estimation Results of the KIPPRA – Treasury Macro Model" *Working Paper WP/05/2001,*KIPPRA, Kenya.

Ghartey, E. E. and U. L. G. Rao (1990). 'A Short – Run Forecasting Model of Ghana', *Economic Modeling*, Vol 7(3): 291 - 308

Haque, N. U., K. Lahiri and P. J. Montiel (1990). 'A Macroeconometric Model for Developing Countries', *IMF Staff Papers*, 37(3): 537 – 559

Jah, R. (2003): *Macroeconomics for Developing Countries*. London: Routledge.

Jhingan, M. L. (2003): *Macro-Economic Theory*. Delhi: Nisha Enterprises.

Karnik A. and C. Fernandes (2005) "Macroeconometric Modeling for an oil development Economy: An Instruments targets Approach for the UAE economy". Economic Research Forum Annual Conference Cairo.

Khan, M. S. (1974)."Import and Export Demand in Developing Countries". *IMF Staff Paper,* Vol. 21, pp. 678 – 693

Krueger, A. (1997). "Trade Policy and Economic Development: How Can We Learn."*The American Economic Review,* Vol. 87, pp. 1 – 21

Lord, M.J. and ADB (2002) Modeling the Macroeconomy of Bangladesh *MPRA Paper* No 41171

Matlanyane, A. R. (2005). "A Macroeconometric Model for the Economy of Lesotho. University of Pretoria, South Africa. Unpublished Ph.D Dissertation.

Mundell R.A. (1973) "Uncommon Arguments for Common Currencies" in the *Economics of Common Currencies* (Edited by H.G. Johnson and A.K. Swoboda).

National Planning Commission, (2005): *National Economic Empowerment and Development Strategy*. Lagos: b3 Communications Limited.

Obaseki, P.J (2001): Issues in Exchange Rate Policy Design and Management, *Central Bank of Nigeria, Economic and Financial Review*, Vol. 39, No.2, PP. 1-28.

Pandit, V. (2000): Macroeconometric Policy Modelling for India: A Review of Some Analytical Issues. *Centre for Development Economics Working Paper*, No. 74.

Pauly, P. (2000): A Framework for a Macroeconometric Model of an Emerging Small Open Economy. Revised Draft, Institute of Policy Analysis, Toronto.

Soludo, C. C., (1995). "Macroeconomic Adjustment, Trade and Growth: Policy Analysis using a Macroeconometric Model of Nigeria", *AERC Research Paper 32,* AERC, Nairobi

APPENDIX 1
Table 14: Variables Definitons, Types and Units

	Notation	Definition	Type	Unit
1	CF	Capital flows	Endogenous	Million naira
3	CPI	Consumer price index	Exogenous	Index
4	EDS	External Debt Service	Exogenous	US$' Million
5	FCPI	Foreign CPI	Exogenous	Index
6	FDI	Foreign Direct Investment	Endogenous	Million naira
7	FNGDP	Foreign Output	Exogenous	US$
8	IRD	Interest Rate Differential (MLR - USLR)	Exogenous	(%)
9	M	Imports	Endogenous	Million naira
10	MLR	Maximum Lending Rate	Exogenous	Per cent
11	NER	Nominal Exchange Rate	Endogenous	Index
12	NFA	Net Foreign Assets	Exogenous	Million naira
13	OPEC	OPEC	Exogenous	MBD
14	PCGDP	GDP Per Capita (NGDP/POP)	Exogenous	Naira
15	P_o	Oil Price	Exogenous	US$
16	PI	Portfolio Investment	Exogenous	Million naira
17	RER	Real Exchange Rate [(NER)*(CPI/CPIf)]	Identity	N/US$ 1.00
18	RES	External Reserves	Endogenous	US$
19	RMT	Remittances	Exogenous	Million naira
20	TAR	Tariff	Exogenous	Per cent
21	TGE	Total Government Expenditure	Exogenous	Million naira
22	TOT	Terms of trade (Exports/Imports)	Exogenous	Ratio
23	X	Exports	Identity	Million Naira
24	X_n	Non-oil Exports	Endogenous	Million Naira
25	X_o	Oil Exports	Endogenous	Million Naira
26	Y	Domestic Output	Exogenous	Million Naira
27	Y_f	OECD (foreign) output	Exogenous	US$
28	Y_n	Non-oil Output	Exogenous	Million Naira

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