

Domestic Macroeconomic Policies and Capital Flight from Nigeria: Evidence from a Macro-econometric Model

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There is no scarcity of empirical studies into the causes of capital flight or the associated attempt to relate the phenomenon to economic growth and other macroeconomic stability indicators. Studies that undertook that include Onwuoduokit, (2002), Ajayi (1992, 2002) Pastor (1990), among others. The emerging list of causal variables is equally diverse - ranging from balance of payments disequilibrium and real exchange rate distortions to political risks and other social imbalances. Expectedly too, different works place different premia and weights on different causal variables. Indeed, distilling from the menu of variables that influence capital flight will continue to be a major challenge to macroeconomic researchers. However, there is still intense debate on how effective or otherwise domestic fiscal and monetary policies can be in reducing capital flight, either through impacting on its causes or by directly influencing capital flows. This work aims to contribute to this debate for a typical developing country. It proposes a macroeconomic model with the intent first of empirically evaluating the place of risk in capital movements and, thereafter, to evaluate the effectiveness of domestic fiscal and monetary policies in combating capital flight. It found evidence in support of risk and volatility influencing the outflow of capital and of capital flight responding directly to capital controls, but could not find evidence to support indirect control of capital flight using fiscal and monetary policies to control uncertainty.

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I. Introduction

Over the years, Africa and, indeed, the rest of the developing world has witnessed massive outflow of investible resources. This is both counter-intuitive and atheoretical given the high returns to investment in many of the countries concerned. Boyce and Ndinkumana (2001) estimate that compared to the size of the region's debt, capital flight from SSA put at about \$193 billion in 1996 dollars between 1970 and 1996 makes the region a net creditor to the world. The figures are even more intriguing when imputed interest earnings are added to the accumulated stock of capital abroad bringing the total to \$285 billion against a total debt stock of \$178 billion. Ndinkumana and Boyce (2002) note that for every dollar of external borrowing in SSA; roughly 80

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cents flowed back as capital flight in the same year. Pastor (1990) estimates that capital flight bled Latin America of \$151 billion between 1973 and 1987. His estimates are that approximately 43% of total debt build-up in the region within the same period was used to finance capital flight and a high percentage of new debt in most cases "slips out" again as flight capital.

More importantly, such outflows constrain economic policy as they reduce investible resources. If reversed, these outflows have the potential for largely easing the capital constraints facing developing countries and providing the quantum leap developing countries need to reverse their perennial dependence on aid and conditional transfers from the rest of the world. This is all the more needed given the dwindling foreign aid and credit to developing countries in the last decade. Capital flight perpetuates the debt crises not only through diversion of savings but also because retention of assets and earnings abroad erodes the domestic tax base and lead to more budget deficits that require contracting further debts to finance. Besides, the non-repatriation of earnings on foreign assets retards growth as it exacerbates the foreign exchange shortage that constrains the import of capital goods necessary for development. Furthermore, it accentuates instability in the polity, and sends (possibly wrong) signals of the potentials of the economy thereby putting monetary and fiscal policies on the defensive. Resource constraints generally entail reductions in the options for macroeconomic intervention open to governments, but also, it increases the risk perception of the countries in question and tends to lead to even more outflows of capital.

While this last point seems intuitive enough, it is a point of contention in the literature. In particular, Cline (1985) claims that it is largely within the power of debtor countries to limit capital outflows by adopting appropriate domestic policies on interest rates, exchange rates, capital account convertibility, and fiscal balance (see also Ajayi, 2002). But this stance is very debatable. For most SSA countries, the movement of capital out of the region is persistent despite long years of attempts at forcing the macroeconomic policy numbers to add up. And so far, it is difficult to assert with certainty that capital flight persists because macroeconomic policy numbers did not add up and even more difficult to assert that it persists despite the policy numbers having added up. This is because empirical works on capital flight have generally been concerned with definitional and measurement issues. Not much has been done on the impact of macroeconomic policies on capital flight for a typical highly-indebted poor country.

This work is an attempt to present evidence on the nature of the relationship between capital flight and domestic macroeconomic environment and policies. It proposes a medium-sized macroeconomic model of Nigeria which shall be used to evaluate the relationship between capital flight and domestic risk variables as well as the relative impact of alternative monetary and fiscal policy measures in ameliorating or accentuating capital flight. The broad objective is to contribute to the debate on and understanding of the mechanism of capital flight from developing countries and its relationship with domestic risk factors as well as fiscal and monetary policies. The remainder of this paper is organized as follows: Section II reviews the literature on capital flight and political risk; the empirical model for analysis is presented in Section III and the findings discussed in Section IV while Section V concludes.

II. Issues in the Literature

II.1 Capital Flight

A knotty issue in the capital flight literature is the underpinning argument for the 'arbitrary' classification and nomenclature of 'flight' for some capital and 'FDI' for others. The use of 'flight' for capital movement across borders in certain circumstances is considered pejorative by some in the literature. The argument is that there is inconsistency when capital from other quarters are termed FDI and encouraged while those considered flight capital are discouraged (Onwioduokit, 2002; Schneider, 2003). Specifically, optimal portfolio choice for individuals in any country, especially in a globalizing world necessarily implies the diffusion of investment among different countries, based on their risk-return perception of assets in those places. Therefore, such discriminatory classification is considered by some as unwarranted.

Nor is the problem with capital flight only in terms of the variations in theoretical conception. The empirical estimation of what constitutes flight as a subset of broad private capital flows is often as problematic leading to varying estimates and definitions of what constitutes capital flight. Like the real exchange rate, while conceptually admitted as being a problem, capital flight is difficult to track. The disagreement in concept also shows up in the ambiguity arising from an attempt to distinguish capital outflows responding to positive incentives and returns across the border from those responding to negative incentives and risks within a country. Particularly, the line of distinction is often very thin and defined by the even less tangible and measurable motives of private agents. It, therefore, comes as no surprise that several different capital flight measures are available in the existing literature (Kant, 1996, Lensink, et al 1998, Hermes and Lensink, 2001).

Three methods of measuring capital flight have emerged over time. The **Residual Method** measures capital flight indirectly from the balance of payments statistics by comparing the sources of capital inflows (*i.e.* net increases in external debt and the net inflow of foreign investment) with the uses of these inflows (*i.e.* the current account deficit and additions to foreign reserves). If the sources exceed the uses of capital inflows, the difference is termed as capital flight. It is so far the most widely used and currently has a number of variants among them World Bank (1985), Morgan Guaranty (1986) and Cline (1987). The second method referred to as the **Hot Money Method** measures capital flight by adding up net errors and omissions and non-bank private short-term capital outflows (Cuddington, 1986; Gibson and Tsakalotos, 1993). This measure reflects the idea that capital flight goes unrecorded, due to the illegal nature of these capital movements. It is argued that the unrecorded capital movements appear in the net errors and omissions. Moreover, by concentrating on short-term flows, medium- and long-term outflows are excluded, which are considered more *normal* in character. The third is the **Dooley Method** (proposed by Dooley, 1986). It defines capital flight as all capital outflows based on the desire to place assets beyond the control of domestic authorities, excluding normal outflows. Consequently, this measure includes all capital outflows that do not receive and/or register interest payments. However, Claessens and Naudé (1993, pp.5-7) show that the calculation of capital flight as proposed by Dooley (1986) is in fact partly based on and gives rather identical magnitudes as the Residual Method, although it uses a different concept of capital flight.

The causes of capital flight have been a subject of much debate. Lensink, et al (1998), Hermes and Lensink (2001) among others identify governance and political risks as the key factors responsible for 'counter-intuitive' capital flows. Cuddington (1986), Ajayi (1992) and Onwioduokit (2002) identify macroeconomic mismanagement in the form of expansive fiscal and monetary policies and exchange rate overvaluation and misalignment as creating uncertainty and making the domestic environment unattractive for investment. McKinnon (1999) identified the whole gamut of exchange rate and regime-related disturbances as risk-boding even for a net absorber of private capital. Other factors identified in the literature include declining terms-of-trade, changes in tax regimes, budget deficits, financial repression and debt (Pastor, 1990; Ul Haque and Khan, 1985; Khan and Ul Haque, 1987). Duwendag (1989) particularly notes that the relationship between poor countries' indebtedness and capital flight is a bit complicated. Much of the funds contracted in debts aimed at financing short-term balance of payments crises usually found their way back into foreign accounts of private residents without being put to use in the countries where they

were originally designated. This was accentuated by Pastor (1990:4) in discussing the Brady Plan of the Bush (Snr) administration who insists that capital flight impedes the resolution of the overall debt problem of the Latin American (and by extension developing countries') debt problem because the continued extension of new credit or debt relief is counter-productive when a high percentage of the new resources 'slips out' of the region again as flight capital. He estimates that approximately 4.3 percent of the debt build-up in the region was used to finance capital flight

While there is some agreement in the risk-content of the factors determining capital flight, there is very little on what constitutes optimal policy response to the problem. A number of the identified factors are external and probably cannot be directly influenced by domestic macroeconomic policies. The variables lumped under 'relative country risk' in Ajayi, 1992, 2002 and Onwiodiokit, 2002, among others are wide and require varying (and sometimes conflicting) measures to contain. For many poor countries, therefore, with segmented product and factor markets and subject to a range of external shocks, there are genuine questions as to the practicality and feasibility of policy combinations that can stop or reverse capital flight. McKinnon (1999) and a number of other researchers have extensively pursued the efficacy of policies in this direction and a number of (at least theoretically plausible) policy recommendations have been proffered. But to what extent these are practicable for a typical developing country especially given the pressure for further liberalization of the capital market is not known. If as Pastor (1990) noted and confirmed by a number of other works (Ajayi 1992, 2002, among others), there is a high correlation between debt accumulation/overhang and capital flight, what are the policy options open to an average developing country and what are the rooms available for effective combination of monetary and fiscal policies in engaging the movement of capital away from the shores of the country? This is part of the questions that this work sets out to answer.

II.2 Political Risk

As in the capital flight literature, despite the widespread coverage of political risk, modern authors continue to grapple with the definition and classification of political risk. Most definitions agree that risk exists when there are discontinuities in the business environment arising from political change and such discontinuities are difficult to anticipate (Robock and Simmonds, 1973). In some of the literature, distinctions are made between transfer risks (potential restrictions on transfer of funds, products, technology and people), operational risks (uncertainty about policies, regulations, governmental administrative procedures which would hinder results and management of operations), and risks on control of capital

(discrimination against foreign firms, expropriation, forced local shareholding, etc) as in Root (1973). Clark (1991) concentrates on the non-diversifiable variations in a country's internal rate of return and the financial risk premium associated with a country's ability to generate the net foreign exchange necessary to meet interest and principal payments on outstanding foreign debt. There are other lines of not-too-fine distinction in the definitions as in that between global and specific political risks, macro and micro risks as well as soft and hard risks. There is the idea that the distinctions and the diversities in the forms of risk confirm the fact of the presence of political risk in almost all forms of business endeavours with a wide range of sources.

As the scope of political risk increased, so also did the literature attempt to quantify and clarify the mechanism for objective evaluation of investment climates. Rummel and Heenan (1978) is among studies in this group and proposes a method of converting polemical instability into probabilistic terms thus providing a scientific definition of political risk. This is closely followed by the Business Environment Risk Information Index (BERI), developed as a quantitative guide to political risk ratings. BERI reviews more than forty-five countries three times a year and is based mainly on the judgments and appreciations of a panel of outside experts which try to rank countries according to fifteen factors affecting business climate. Thereafter in 1979, the Political-Risk Services (PRS) evaluation system was developed and this has been extensively used by many multinationals. Subsequently, a new offshoot of the literature tried to evaluate political risk and integrate it into the decision-making process of an enterprise. Generally, the 1990s saw the scientific refinement of the political risk concept through the contributions of other fields of research such as political science, sociology, decision theory and psychology.

The magnitude, nature and direction of non-financial risks affecting businesses are uniquely dependent on the features of the businesses themselves. The latter vary widely and so do the interpretations of the potency and magnitude of the risks associated with them (Jensen, 2005). In a restrictive sense, the definition of political risk encompasses only political instability (activities originating from the activities of the state) and restricted to only unpredictable political events. A more inclusive definition, however, takes in all kinds of politically-motivated acts no matter where these are rooted – political or societal instability. Under this set of definitions there are fewer restrictions to what constitutes political risk and even economic variables, in so far as they are related to monetary and fiscal policy enter in the definition of political risk. In this latter group is the definition by Agmon (1985), who defines political risk as the unanticipated changes in political factors

that affect the relative prices of traded factors of production, goods and services caused by the actions and reactions of governments and other political groups within and between countries. As a financial phenomenon, political risk includes unpredictable demands raised by the state or society on the assets, returns or cash available for shareholders from corporate investment. For Haendel (1979), it is the risk or probability of occurrence of some political events that will change the prospects for the profitability of a given investment. These definitions generally assume the 'essential state'¹ and view the activities of rent-seeking groups as contributing to a higher level of uncertainty in an economy and, therefore, a major source of political risk especially in developing countries.

A major challenge of the empirical literature over time has been the measurement of political risk. Several of the available definitions do not yield to easy and immediate quantification. Several techniques, especially since 1990 have been developed to overcome this problem and scientifically assess political risk. A number of risk rating agencies have consequently emerged and the different data generated by their activities have fed into the massive research that has gone into the area lately. However, it must be noted that no matter the means adopted, measuring political risk will always involve some measure of subjective judgment. Particularly, the sources of risk are not very easy to measure and so would always task the ingenuity of the researcher in transforming them into measurable terms. In addition, the limit of the 'essential state' is a question for debate. Even for the neoclassical, this is not clearly and unambiguously spelt out. In effect, while government actions could lead to instability, government inactions could also be very destabilizing. How these are to be equally treated remains a matter for empirical question.

Empirically, there have been attempts at measuring how important an understanding of country risk is for investors. Erb, et al (1996) measure the economic content of five different measures of country risk: The International Country Risk Guide's political risk, the financial risk, economic risk and composite risk indices and Institutional Investor's country credit ratings. Through conducting trading simulations, they explore whether any of these measures contain information about future expected stock returns and, thereafter, linked these measures to future expected returns using time-series-cross-sectional analysis. They also analyze the linkages between fundamental attributes within each economy and the risk measures. The results show that the country risk measures are correlated with future equity returns and that the country risk measures are

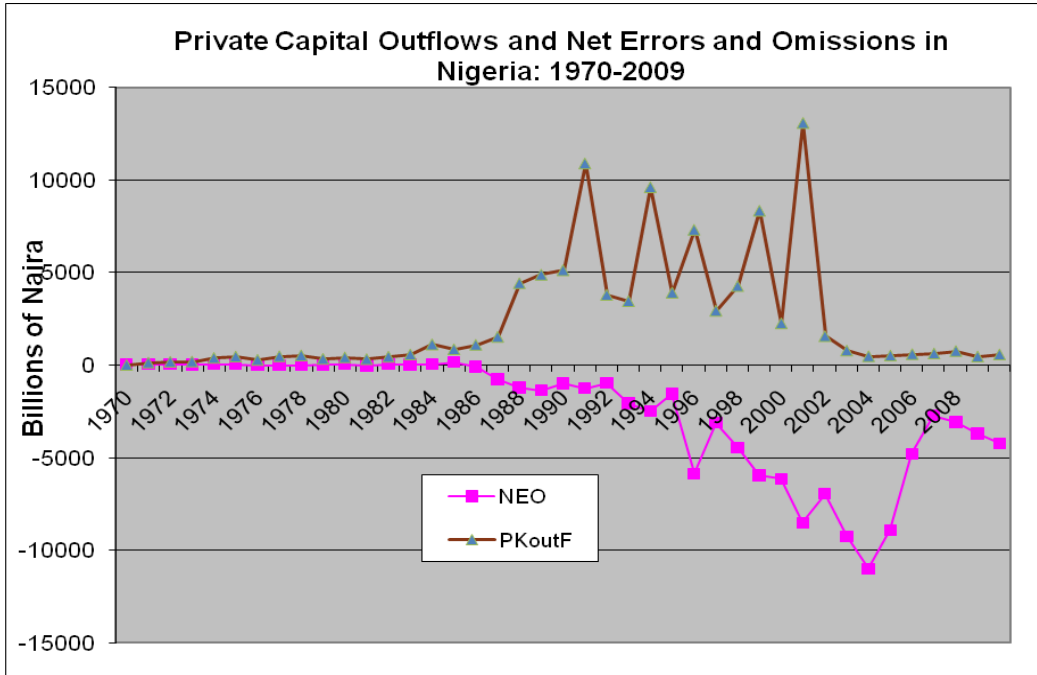
¹ The essential state is viewed in terms of the strict responsibilities of the state within a neo-classical definition

inter-correlated with one another. However, they noted that financial risk measures contain the most information about future equity returns. On their part, Busse and Hefeker (2005) explore the linkages between political risk, institutions and foreign direct investment inflows. Using different econometric techniques for a data sample of 83 developing countries for the years 1984 to 2003, they tried to identify those indicators that matter most for the activities of multinational corporations. Of the 12 different indicators for political risk and institutions that they used, they found that government stability, the absence of internal conflict and ethnic tensions, basic democratic rights and ensuring law and order are highly significant determinants of foreign investment inflows – and we may add, ...and other forms of investment.

II.3 Capital Flight and Political Risk in Nigeria

Capital flight studies in Nigeria are not divorced from the already mentioned problems of measurement. First, different definitions of capital flight yield different measures and magnitudes of the phenomenon. Secondly, even when only 'run-away funds' are to be captured as flight capital, they are not (and, indeed, cannot be) reported to authorities. So it is generally difficult to deduct capital that flees abnormal risks at home from total capital outflows. So measurement of capital flight in Nigeria has traditionally incorporated total resident capital outflows (see Onwioduokit, 2002). The alternative that has also been widely adopted is to assume that since such funds are unrecorded, they could only appear in the net errors and omissions. The empirical section of this work shall evaluate trends in both so as to capture their relative strengths and weaknesses. The diagram below shows the trends in both aggregate capital outflow and net errors and omissions².

² Actually, trade misinvoicing should be explicitly incorporated, but again, the assumption is that such sharp practices would reflect in the records in the form of errors and omissions.



Within the sample period, given whatever measure of instability that one may choose to adopt, Nigeria has been highly unstable. There have been 10 regimes and 9 changes in regimes, six of which were through coups, some violent and others non-violent. Recorded disputes stand at a total of 5,742 with about 294.5 million man-days lost as a result. Even associated macroeconomic policy variables like monetary and fiscal instruments have also been unstable with even more unstable outcomes. Domestic inflation has remained in double digits for over two decades, while monetary policy targets were hardly ever met throughout the 1990s. Terms-of-trade shocks seem to have magnified the internal instability as oil price changes have literally been translated to domestic fluctuations as government spending gyrated with such changes. In fact, on many indicators of volatility and risk, Nigeria is considered to have performed even worse than developing countries' average (Addison, 2002). Whether such instability is in any way related to capital movements may be difficult to say at this point, that being one of the subject matters of interest in the present enquiry. However, anecdotal evidence through a correlation analysis seems to point to some relationship between net errors and omissions and disputes with a positive coefficient of 0.5.

III. The Empirical Model

The work presents a medium-sized, multi-sectoral general equilibrium model for Nigeria, a developing country. The model is situated within the reforms in the country, particularly the National Economic Empowerment and Development Strategy (NEEDS)³. The model has 44 equations, 24 stochastic and 20 definitional, covering 6 sectors – domestic production and supply, domestic absorption, central government activities, monetary policy, domestic prices and the external sector. In this section, we lay out the broad outline of the provisions of the model. Detailed equations are presented in the appendix 1.

III.1 Production and Supply

Aggregate output in the model is given as the sum of both the oil and non-oil sectors and production in the oil sector is a function of the country's quota from OPEC which is divided between domestic consumption and exports. Non-oil output is modelled to follow a simple growth model with aggregate production function relating non-oil output to the capital stock and the labour force. Following Soludo (1996), capital is disaggregated into public and private capital stocks and includes raw materials imports (including oil imports) as factors of production. The non-oil production function is standard Cobb-Douglas. Net factor payment is the sum of debt repayments and servicing, and payments on invisible services. Demand for labour is specified as a function of output and the wage rate while import demand is determined by output, the real exchange rate and tariff.

III.2 Domestic Absorption

Private consumption is specified as a function of disposable income and wealth. Private investment expenditures, on the other hand, are modelled to follow the burgeoning literature in investment and risk.

III.3 Government Operations

Government operations consist of its expenditure and revenue, and monetary policy. Government revenue consists of oil and non-oil revenues. Oil revenues are also broadly divided into Petroleum Profits Tax and other oil-related revenues.

³ NEEDS is the reform agenda of the Federal Government of Nigeria. Components of the agenda include the reining in of government through reducing access to Central Bank financing of deficits, reducing the maximum size of deficits, strict organization and tracking of public expenditure through a medium-term expenditure framework, growing the private sector and a social charter that commits government to poverty reduction and empowerment of private agents. Under NEEDS, real private consumption is expected to grow by 4.83% per annum, consistent with the broad objectives of poverty reduction and reallocation of investible resources.

Petroleum profits tax is modeled to depend on oil production with appropriate deflator. Other oil-related revenues depend on domestic oil consumption and price. Non-oil revenues consist of tariff and income tax revenues. Tariff revenue depends on imports while income tax revenue depends on the tax rate and aggregate income. Estimations of all specified equations in this section are in logs, even where not so explicitly indicated.

Government expenditure is disaggregated into debt payments and public capital and consumption expenditures. Public debt further comprises domestic debt and foreign debt. Domestic debt servicing depends on the local interest rate (proxied by the minimum rediscount rate) and the debt stock while foreign debt is a function of the stock of foreign debt and foreign interest rate (proxied by the London Inter-bank Offer Rate, LIBOR). For both capital and recurrent expenditures, government is assumed to follow WAMZ protocol which requires it to limit Central Bank's financing of Central Government deficit to no more than 10 percent of previous year's tax revenue.

We also present an inter-temporal fiscal closure rule imposed externally on the economy. In the rule, lending agencies and creditors compare the country's rate of output growth with the relevant interest rate for debt servicing in making financing available to government for expenditures beyond its current income.

III.4 Monetary Policy

A monetary policy reaction function is specified linking the policy interest rate to domestic price level, output, reserves and the exchange rate. The traditional money supply identity (as the sum of domestic credit and international reserves) is presented. Change in credit to the public sector comes either from the domestic banking sector or borrowing from abroad, but private sector credit depends on output growth. The stock of money is made a function of real income, interest rate and expected inflation.

III.5 Domestic Prices

Changes in domestic prices are affected by movements in the levels of non-oil production, nominal exchange rate (to capture pass-through of the exchange rate), government activities, and broad money supply. Domestic wages on the other hand is determined by capacity utilization (also in the non-oil sector) and changes in the domestic price level following an adaptive expectation framework. Stock prices follow a random walk indicating that macroeconomic fundamentals matter.

Exchange rate changes affect domestic prices in two main ways – a direct channel which runs through the price of imports and an indirect channel which runs through domestic wage and other production cost structures (see Hufner and Schroder 2002: 2; Hampton 2001: 2; Goldberg and Knetter 1997). Given its open structure, other domestic and foreign prices also affect the domestic level such that it can be safely assumed that uncovered interest parity relationship holds. Given the size and structure of government, fiscal policy stance, without adequate intervention from monetary policy quickly translates to changes in price level. The credibility of the monetary authorities is fast gaining relevance as a major determinant of the direction and pace of inflation. This last point is incorporated using a measure of expected inflation, in this case following adaptive principles as earlier expounded.

III.6 The External Sector

Exports constitute both oil and non-oil. The value of oil exports are determined by production quota and the international price of oil appropriately deflated. Non-oil exports on the other hand, is determined by output and prices at the international market. Capital flows is the sum of both short- and long-term net capital movements. Total capital outlay are modelled to follow a risk-return framework which is influenced by both monetary and fiscal policy measures. Relative risk is captured using the volatility of the real exchange rate while monetary and fiscal policies are captured with fiscal deficit and money supply. Capital flight is made a function of volatility, output, government expenditure (proxying fiscal policy stance) and the minimum rediscount rate (proxying monetary policy stance).

IV. Empirical Results

Summary of the estimated results are presented in Appendix 2. One of the major confirmations of the estimates is the positive interaction between domestic real and monetary sectors with the external sector (especially the current account balance). Output in the oil sector is simply driven by exports and local consumption while output in the non-oil sector is driven by shifts in imports of raw materials and combined public and private sector consumption. Domestic output, import taxes (represented by implicit tariff) and economy-wide relative price (the real exchange rate) determine aggregate imports. Gross consumption in turn is a function of output and gross domestic savings, while capital formation depends on the lending rate and real exchange rate volatility. Unlike its relationship with the lending rate, the relationship between gross capital formation and real exchange rate volatility is much weaker. Petroleum taxes as expected simply respond to total oil exports (even though relatively weakly at 5%

level of significance⁴), while other oil taxes depend on the proportion of total output that is consumed locally.

Government expenditure is affected by ECOWAS WAMZ protocol, gross output and money supply while monetary policy reflects the parallel exchange rate, output, interest rate spread (between deposit and lending rates) and broad money supply. The relationship of domestic prices (inflation) and the specified monetary policy reaction function with real variables seem weaker than a priori expectations. Domestic price changes follow changes in parallel market exchange rate, government expenditure to output ratio and real money supply. The closeness between average wage movements and capacity utilization in the manufacturing sector is comparatively weaker than that between wages and broad money supply. The adoption of the standard random walk hypothesis as done in modeling the stock market is a statement of a weak relationship between the stock market and real sector (and indeed, other macroeconomic) fundamentals. Interestingly, the coefficient estimates of the random walk specification confirm this position, even though only up to the first lag.

Oil export is simply a reflection of oil production and the terms-of-trade though industrial disputes, expectedly, play a significant part. Oil sector volatility manifests in increased hostility between oil firms and their host communities. For a long period within sample, for example, a number of the major oil-producing firms lost significant output and exports to disputes and other forms of socio-economic instability in the Niger Delta. Non-oil exports on the other hand did not show much of the variations arising from disputes and other forms of volatility as oil exports. It is in any case very small in both absolute and relative terms, and depends mainly on output in the non-oil sector.

It was difficult pinning private capital inflow to any of the regular economic fundamentals. Even as a function of its own lag, it was not significant. This owes much to a number of reasons. Some aspects of the literature indicate that private capital inflow does not respond significantly to regular policy variables. The suggestion for future studies may be to try modeling it as autonomous component of capital flow. Capital outflow, on the other hand, is positively influenced by two major indicators of macroeconomic distortions – real exchange rate volatility and output variability. This is the only place where the impact of output variability is felt and such impact is equally very weak. However, while the impact of real exchange rate volatility is very high, that of output

⁴ It might be probably helpful for future research to link oil taxes to total production instead of just exports as capturing other activities of oil firms might be a bit delicate and difficult to do.

variability is not. Net errors and omissions are affected by real exchange rate volatility, government expenditure and the minimum rediscount rate. Real exchange rate volatility is impacted by coups and capital flight and displays a ratchet effect.

In the capital account, greater attention was paid to private capital flows (indeed public flows over the sample period could in some sense be considered exogenous)⁵. The model tried to capture all components of the account – private inflows and outflows and net errors and omissions (the latter standing in for capital flight and unrecorded flows) – independently. A number of instability indicators were severally used – real exchange rate volatility, number of man-days lost on account of social and industrial disputes and dummies for coup d'etat and changes in regimes.

Changes in domestic capital formation (GFCF) are determined mainly by the lending rate and real exchange rate volatility. As noted earlier though, the impact of real exchange rate volatility was not as strong as that of the lending rate, but at least it showed stronger than most other instability indicators used in the modeling at one stage or the other. Higher volatilities of both the real exchange rate and output translate to higher outflows of capital. It could not be confirmed that fiscal and monetary policy instruments affect real exchange rate volatility, which itself has been a major determinant of both domestic and external indicators of capital flows.

From the estimation output then, it becomes clear that with the exception of capital inflows, which exhibit high policy independence, both legal private capital outflows and net errors and omissions are highly circumscribed by indicators of volatility. However, net errors and omissions seem to be much more highly sensitive to both monetary and fiscal policy instruments.

Finally, an attempt was made to endogenize real exchange rate volatility. This was not originally proposed in the theoretical model, but the idea is that there may be some information content of such an estimate that may be useful in explaining the whole gamut of relationships and interconnectivity among the variables as outlined above. It was difficult to identify any systematic

⁵ For a highly indebted country like Nigeria, long years of positive current account balance have often been offset by negative capital account balance owing to the high net factor payments that are made. Such factor payments in many cases do not depend on output for any current year as they do on the proportion of total debt for which amortization is either due or remitted as well as the size of the interest payments made (some of the latter of which may have little or no relationship with either the origins of the debt or output but more with the nature of penalties attachable to the debt in question).

dependence of real exchange rate volatility on any one of the established variables. Both monetary and fiscal policy variables were introduced into the model but in each case, they showed up inconsequential in determining volatility. Of course, the component of policy that was taken into consideration in the equation could only be that captured by data i.e. government fiscal balance and the minimum rediscount rate. The limitation to quantitative component of policy owes more to the fact that personal experience in modeling instability has shown that choosing a representation for political instability could be quite tricky and would largely depend on the context and issues under investigation. Four other measures of instability were introduced – two dummy variables representing coups and regime changes, GDP variability and man-days lost on account of disputes. The modeling shows that of all the indicators of socio-political instability, only coup seemed to have any significant impact on volatility. Interestingly though, capital flight in turn matters for volatility.

Incorporating the impact of risk on capital flight in the model involved at least three alternative approaches. The first of these is the estimation of a capital flight equation incorporating almost all the risk variables alongside other regular explanatory variables. The second involved a two-way independent evaluation of private capital movement within the macro model to capture the varying factors that individually might account for capital flows. Yet the third approach involved modeling volatility itself as a function of some measures of fiscal and monetary policies, also among other variables. For the capital flight equation (the first approach), only real exchange rate volatility proved a significant variable in flight capital. One way to read this is that having captured much of macroeconomic and policy distortions, real exchange rate volatility 'crowds out' the rest of the measures of instability. Whatever the case though, it was highly significant, and none of the rest of the measures was significant. This direct estimation also showed both monetary policy (through the MRR) and fiscal policy (through government expenditure) as very significant factors in influencing capital flight. Some slight difference, however, emerges when this result is compared with the result from the real exchange rate volatility equation (approach number three). None of the monetary and fiscal policy instruments is significant in determining real exchange rate volatility, itself a major determinant of capital flight. The implication is that the channel of transmission which we proposed in this work (i.e. influencing capital flight through influencing real exchange rate volatility) using monetary and fiscal policies, does not hold and that monetary and fiscal policies have direct impacts in determining capital flight. Interestingly, capital flight in turn affects real exchange rate volatility which makes for a loop. Breaking the chain of impact in this sort of relationship could be

difficult given that volatility leads to capital flight and more capital flight engenders even more volatility. All the while, monetary and fiscal policies cannot affect the volatility.

For the two-way capital flows (inflow and outflow), policy and macroeconomic impact seems to rest more on capital outflows (reinforcing the results obtained on capital flight). Capital outflow was made a function of real exchange rate volatility, output and output variability. The implication again is that real exchange rate volatility is a key factor in determining outflow of capital from the economy. Put in other words, instability leads to high capital outflow from the economy. Contrary to specification, the estimations were unable to establish the same kind of relationship between private capital inflows on the one hand and key macroeconomic fundamentals, including instability on the other. Private capital inflow outcomes do not seem to respond to changes in major macroeconomic fundamentals. Indeed, it was not even possible to establish significant temporal dependence of the inflows. The signal sent by the estimated result is that historical data do not suggest that policies to attract capital into the economy work; it rather makes better sense to assume capital inflows into the economy exogenous to both policy and macroeconomic changes. This though is subject to future verification. Income changes also affect both regular (and recorded) capital outflows and capital flight. Increasing income increases the chances of leakage through capital flight as well as through recorded private capital outflow.

V. Conclusions

The work confirms that volatility and risk are critical factors in determining capital flight corroborating previous studies like Chen and Funke (2003), Chang and Cumby (1991) and Cones (1987). In making policy recommendations after his study, Onwioduokit (2002), after making the point of the necessity of appropriate fiscal and monetary policies adds "...policy measures should be instituted to make the domestic economy more attractive for private investment if capital flight is to be confronted and flight capital recaptured. Specifically, anti-inflationary policies such as non-expansionary monetary and fiscal policies and positive real interest rate should be instituted. Furthermore, market-determined exchange rate policy should be pursued. Foreign exchange reserves build-up should also be pursued as a policy priority..." Shibuya (2001) on his part makes a strong case for sequencing of liberalization and introduction of policies to combat capital flight "... the economy may be trapped in (the) low capital equilibrium if liberalization is implemented before sufficient accumulation of domestic capital." Of course, there may be a few disagreements among authors

and policy advisors on the exact nature and components of such risk and instability factors as well as the composition and sequencing of corrective policies, but there is no disagreement as to the fact that risk ranks high among the factors causing and sustaining capital flight. Many African countries (with Nigeria at the forefront) already risk not meeting the MDGs even when, according to Boyce, the continent is a net creditor to the world. Most investors consider the continent too risky and unstable for investment. Reducing this risk is a major means of increasing investment, generating employment and reducing poverty. The fact of Africa having high returns to investment cannot count in investment decisions as long as the continent is so prone to wars and other forms of political instability.

However, the other question is the effectiveness of domestic fiscal and monetary policies in curbing capital flight. Several forms of volatility and instability were tried as proxies for the work – real exchange rate volatility, coup, man-days lost on account of disputes, output variability, etc. In many cases, the real exchange rate volatility showed up very significant unlike many other volatility measures. This is probably due to the encompassing nature of real exchange volatility as an economy-wide distortion. As such, real exchange volatility was modelled as a function of monetary and fiscal policies. However, the outcome was not significant. If anything, capital flight itself and coup are the two variables that seem to affect real exchange rate volatility – beside the linear dependence on its own lag, that is. Thus, it seems real exchange rate volatility answers little to quantitative indices of fiscal and monetary policies. However, there is need for some caveats. The use of quantitative data is admittedly incomplete, as policy (including fiscal and monetary) instruments numerously transcend the quantitative. In addition, the composition of real exchange rate (as a relative price) definitely transcends the quantitative such that the numbers generated indicate underlying macroeconomic characteristics that include the unquantifiable. Thus, there would definitely be other forms of government activities that affect real exchange rate volatility and other indicators of instability. Also, federalism in Nigeria implies fiscal instruments that go beyond the Central Government (accounting for approximately than 50% of consolidated government activity) and includes the states; but in the course of the work, it was not possible to lay hands on consolidated expenditure and revenue. The implication could have been that while volatility measures is encompassing and includes outcomes of activities of states, monetary and fiscal policy instruments used to evaluate impact here belongs only to the Federal Government. Under such circumstances, the challenge then is to kick-start the process of data

generation and storage to include consolidated fiscal and monetary activities of all tiers of government.

There is yet an option, even though the window for its use is gradually closing with trends in integration of both the financial and technological systems of the world. This is the use of capital account controls to minimize capital flight. While flight capital consists mainly of unrecorded flows, stringent penalties could be attached to illegal shipment of funds out of the country. However, it is important, if this is ever to be used, to also create incentives and improve the domestic investment environment to ensure that when such capital outflow is made difficult, there are domestic options for returns to capital. This is a great challenge to institutional capacity building as it would entail a great deal of monitoring and incentive packaging, which is currently lacking in the country. This recommendation is made on the strength of the impact that monetary and fiscal policies have on capital flight when evaluated directly; but such controls are gradually becoming unattractive. Incentives rather than sanctions are increasingly preferred. The challenge then is to maximize the use of incentives in such a way that they impact maximally on the direction of capital movements in the economy.

This section has included caveats to the findings in order to show that there is undoubtedly an array of instruments available to the policymaker that cannot be quantified. Policy control goes beyond government expenditure and the minimum rediscount rate as used here. The structure of the political system and the nature of enacted laws all impact upon the macroeconomic environment in profound ways. These need also to be straightened. Indeed, as shown in the first section of the methodology, these are the forces that lead to capital flight in the first place. As such, regularizing the political system, making laws that promote free economic enterprise and increase chances for gainful employment could all go a long way in controlling the movement of capital out of the economy. Second, it is possible that given that much of the funds classified as flight capital were acquired through corruption, the challenge would not be that of finding means of instilling stringent capital controls using traditional stabilization programmes and instruments, but that of controlling the corruption that aid the private acquisition of such funds in the first place. The fight against corruption by the government is laudable in this direction, but there is need for its prosecutors to engender more credibility to the project. Also, the present work purposefully limited the regressors to the traditional variables – fiscal balance (the net of revenue and expenditure capturing fiscal policy) and the Minimum Rediscount Rate (capturing policy interest rate and monetary policy). Intermediate policy

instruments like the tax system, for varying reasons, could not be used. This again would also prove a fruitful area for future research on this issue.

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Appendix 1 – Detailed Equations

1 Production and Supply

Production in the oil sector is given as:

$$Y^o = \{X^o + DOil - M^o\} * OilP \quad (1)$$

Where X^o is oil export, M^o is oil import, $DOil$ is domestically consumed oil, and $oilP$ is (average) oil price.

2 Domestic Absorption

Gross output is given as:

$$Y = Y(PK, GK, L, RM) \quad (2)$$

where PK is private capital, GK is public capital, L is labour and RM is raw materials imports (taken as intermediate inputs). Expressing the output function above in growth rates gives

$$\frac{dy^n}{y^n} = f_{PK} \cdot \left(\frac{dPK}{y^n} + f_{GK} \right) \cdot \frac{dGK}{y^n} + \left\{ \left(f_L \cdot \frac{L}{y^n} \right) \frac{dL}{L} \right\} + \left\{ \left(f_{RM} \cdot \frac{RM}{y^n} \right) \cdot \frac{dRM}{RM} \right\} \quad (3)$$

dPK and dGK above are the rates of gross real investment in both the private and public sectors, which can otherwise be represented with IRp (for the private sector) and IRg (for the public sector) respectively⁶. So a log-linear approximation to the equation above would render the capacity output growth equation as:

$$\Delta \log Y^n_t = \alpha \log \left(\frac{IR_G}{Y} \right)_t + \beta \log \left(\frac{IR_P}{Y} \right)_t + \delta \log \left(\frac{L}{Y} \right)_t + \gamma \Delta \log \left(\frac{RM}{Y} \right)_t \quad (4)$$

where $\alpha = f(Gk)$; $\beta = f(Pk)$; $\delta = f(L)$; $\gamma = f(RM)$; $\alpha + \beta + \delta + \gamma = 1$

⁶ While we treat IRg as exogenous, IRp is contextually important. As such, we endogenise private investment as responding to several risk factors and macroeconomic policy instruments. Flight capital is assumed to have private identity; in which case, it is a part of the stock of private capital. The implication here is that it has impact on gross private investment.

Thus, total capacity output is given as

$$Y_{CAP} = Y^o + (Y^n - RM) \quad (5)$$

where Y_{CAP} is total capacity output, Y^o and Y^n are output in the oil and non-oil sectors while RM is raw materials imports.

Net factor payments (NFP) are specified as follows:

$$NFP = i^* (TDebt) + AMT + (TDebt - Tdebt_{t-1}) + NPFS \quad (6)$$

where amortization AMT , interest payments on debt ($i^*(TDebt)$), change in debt ($TDebt - Tdebt_{t-1}$) and payment on invisible services ($NPFS$) are defined in net value terms.

So Gross National Product (GNP) is given as

$$GNP = C + I + G + (X-M) + i^* (TDebt) + AMT + (TDebt - Tdebt_{t-1}) + NPFS \quad (7)$$

Where C , I , G , $(X-M)$ all follow standard notations and the rest are as earlier defined.

Given the rigidities and segregated nature of the Nigerian labour market, it is assumed that the demand for labour in the non-oil sector⁷ is a function of output and the wage rate as follows.

$$LD_t = \alpha RW_t + \beta Y_t + \gamma LD_{t-1} \quad (8)$$

where LD is the demand for labour and RWG is real wage. Taking logarithms and obtaining growth rates, real wage would be defined as nominal wage rate (W) less inflation rate (INF) i.e.

$$\log(RW) = \log(W) - \log(INF) \quad \text{such that}$$

$$\Delta \log(RW) = \Delta \log(W) - \Delta \log(INF) \quad (9)$$

⁷ We refrain from specifying labour demand in the oil sector given that the sector absorbs only a small proportion of total labour demand and the incentive structure in the market is not closely linked to that in the non-oil sector.

The incorporation of period t-1 labour demand takes care of structural non-market characteristics of and rigidities affecting the labour market.

Import demand is specified to be a function of output (demand) and two price variables, the real exchange rate (RER) as a relative price and tariff as an absolute price of imported inputs⁸ as follows:

$$M_t = \alpha GDP_t + \beta RER_t + \delta Tariff_t + \gamma M_{t-1} \quad (10)$$

where M is import demand and GDP is gross output. The real exchange rate (RER) captured as calculated real effective exchange rate figures of the Central Bank of Nigeria is defined as

$$RER = NER_{dj} * \frac{\left(\sum_i^j P_{ij}^* \cdot TW_{ij} \right)}{P_{dj}} \quad (11)$$

where NER is the nominal exchange rate of the domestic currency vis-à-vis the currencies of the country's trading partners, and P* is the price level in individual trading partners, P_d is the domestic price level, TW is the trade weight of the ith country at period j.

Standard consumption models assume that private consumption is the weighted average of consumption by constrained and unconstrained intertemporal optimizing consumers (Soludo, 1996). So consumption is related to disposable income and wealth as follows

$$C_t = \alpha + \beta Yd_t + \eta RW_t \quad (12)$$

Where C_t is consumption at current period, Y_d is disposable income (i.e. total income less taxes and depreciation on capital) and RW is real wealth.

⁸ The relationship between REER and tariff in the import demand function is a subject for continuous empirical debate. For an economy with a relatively overvalued exchange rate and highly variegated tariff regime, a widely held view is that the impact of tariff might be outweighed by that of the real exchange rate. While this is unresolved, the intuitive approach is to specify import demand as a function of both REER and tariff – each representing a different set of price that affects imports.

We specify private investment expenditures using the uncertainty and irreversibility approach, which has quickly gained acceptance as a realistic representation of investment decisions (Dixit and Pindyck, 1994; Chen and Funke 2003; Alvarez and Stenbacka 2003, Zilberman 1999; Erdal 2003; Ingersol and Ross, 1992). As such, instead of merely modelling returns, the risk factors in investment are considered very important. Within this framework, the derivation of the movement of the risk factors like the real exchange rate, interest rate, political risk, among others follow a Brownian or Weiner process of the form

$$di = (-i)dt + i(dz) + et$$

where i is the risk variable of interest differentiated with respect to time (t) and a vector of other determinants (z) and time constrained error term (e). However, the approach shall be non-restrictive so as to give room for empirical validation of findings within the model. This leads to the specification of a non-restrictive model of private investment as a function of volatility in the real exchange rate, interest rate, and political risk as follows

$$i = \alpha + \beta RER + \delta IR + \eta PR \quad (13)$$

where RER is the real exchange rate; IR is the interest rate; PR is a measure of political risk.

3. Government Operations

Government revenue historically consists of oil and non-oil revenues. Oil revenue further consists of petroleum profits tax (PPT) and other oil-related revenues.

$$OILTAX_t = \alpha_0 + \alpha_1 PPT_t + \alpha_2 OILRX_t \quad (14)$$

Following Soludo (1996), petroleum profits tax is specified as a function of nominal oil exports and log-linearized as follows:

$$\Delta PPT = \alpha + \beta \Delta \log (OILP * GDPDef) \quad (15)$$

PPT is petroleum profits tax, OILP is nominal oil production and GDPDef is GDP deflator.

Other oil-related revenues consisting of oil sales revenue/tax and the rents and royalties of the petroleum firms (OILRX) are presented as an identity reflecting the

consumption of oil in the domestic economy (OilC) and the domestic price of oil (OilP)⁹. This is given as,

$$OILRX_t = a_0 + a_1 \text{Log}(\text{OilC}_t + \text{OilP}_t) \quad (16)$$

Another major source of government revenue is imports tariff, yielding a sizable proportion of total government revenue. This is posited to be a function of total imports and average tariff rate.

$$TRev_t = \delta_1 \text{Tariff}_t + \delta_2 (M * \text{ExtDefl}) \quad (17)$$

TRev is total revenue from tariff and other import taxes, M is the imports value and ExtDefl is the external sector deflator.

Other income taxes are assumed to be a function of total domestic output and the tax rate as follows:

$$YTax = \text{TRate} * (\text{GDP} * \text{CPIDefl}) \quad (18)$$

Where CPIDefl is the domestic output deflator and TRate is the income tax rate, YTax is the income tax.

Thus, total government revenue is the sum of revenue from all four sources as follows

$$GRev = \text{PPT} + \text{OILRX} + \text{TRev} + \text{YTax} \quad (19)$$

Government expenditure is discussed under the main headings of public debt service and public capital and consumption expenditures

Public debt is the sum of domestic and external debts. Domestic debt service payment is a function of total stock of domestic debt and the domestic interest rate as follows:

$$\text{DDServ} = i * \text{DDebt} \quad (20)$$

⁹ For convenience we will assume that this price is uniform nationwide and is fixed by government. However, the fact is that government is gradually pulling out of fixing domestic prices of oil consumption in its liberalization programme. This is still a contentious issue in the Nigerian economy and though the hand of liberalization is going steady, the impact of that on the data may yet come in the future.

External debt is postulated to be a function of total government external debt stock and the external debt service rate proxied by the London Inter-bank offer rate (LIBOR) such that

$$EDServ = LIBOR * EDebt \quad (21)$$

where DDServ is the domestic debt service, DDebt is the domestic debt stock and i is the domestic interest rate proxied by the minimum rediscount rate. EDServ is the external debt service, LIBOR is the London Interbank Offer Rate and EDebt is the external debt stock¹⁰.

For the rest of government expenditure, it is assumed that government will constrain itself by the WAMZ protocol to which it is a signatory and to the medium term expenditure framework with both providing the levels of allowable deficits. Thus, both capital and recurrent expenditures are subject to the deficit financing constraints under the WAMZ protocol. Other determinants of government expenditure are domestic output and money supply. The respective specifications for recurrent and capital expenditures are as follows:

$$\text{Log (REXP)}_t = a_0 + a_1 (1.125 * \text{Def}_{t-1}) + a_2 \text{log GDP}_t + a_3 \text{log RMS}_t \quad (22)$$

$$\text{Log (CEXP)}_t = a_0 + a_1 (1.125 * \text{Def}_{t-1}) + a_2 \text{log GDP}_t + a_3 \text{log RMS}_t \quad (23)$$

Where RExp and CExp are recurrent and capital expenditures respectively and variables captured under coefficient a_1 are the West African Monetary Zone provision of no more than 12.5% of previous period deficit for current year financing.

Given the small and almost inelastic domestic non-oil tax base, there exists little room for instituting a closure rule by assuming significant changes in the tax structure (as is the case with Soludo, 1996) Experience has rather shown that government expenditure and debt are often exogenously constrained. Such external constraint considers the trajectory for debt, interest rate and growth summarized in the relation

$$\Delta dt+1 = dt * (r - g)/(1 + g) \quad (24)$$

¹⁰ It is assumed that the bulk of public debt is held by the Central Bank and Commercial banks at concessionary rates. In the same vein, Nigeria has not followed any systematic strategy in amortization of its external or domestic debts. As such, it may not be helpful to specify equations tracking amortization of debt.

Further debt accumulation and lending are considered unsustainable when growth rate (g) is lower than interest rate (r).

4. Monetary Policy

Monetary policy follows a base money targeting framework (see CBN 2002) assuming a stable money demand function of the form:

$$M_t = P_t + kY_t - \eta i_t + v_t \quad (25)$$

where M_t is the money supply, Y_t is aggregate income, i_t is the interest rate, P_t is the price level, and v_t is a white noise error term. Re-writing the equation to endogenize interest rate and normalize base money impact on interest rate to unity, the policy interest rate is specified to react to domestic price level, output, reserves and the exchange rate¹¹.

$$i_t = \frac{P_t}{n} - \frac{M_t}{n} + \frac{k}{n}(Y_t) + \alpha PREM_t + \beta \log\left(\frac{RES_t}{RES_t^*}\right) - (\text{int diff}_t) + \gamma \mathcal{R}_t + \mu_t \quad (26)$$

where $PREM_t$ is the premium in the parallel market for exchange rate defined as

$$PREM_t = \left\{ \frac{(\text{off}_e - \text{par}_e)}{\text{par}_e} \right\} * 100 \quad \text{and} \quad \text{int diff}_t = \text{Lendr} - \text{depr}, \quad i_t \text{ is the policy}$$

interest rate (in this case the minimum rediscount rate – MRR), P_t is the price level, M_t is broad money supply, $PREM_t$ is the premium of the parallel market exchange rate, RES_t is foreign exchange reserves, intdiff_t is interest rate differentials defined in this case as the difference between average lending (lendr) and average deposit rates (depr) each at time t within chosen frequency.

For money supply, the traditional identity of money as the sum of the banking system's balance sheet in the form of domestic credit and international reserves holds i.e.

¹¹ Prior estimations of the impact of exchange rate both in pass through and reaction function show that the parallel market exchange rate is the more useful indicator of the effects of changes in exchange rate on other macroeconomic variables (see Agu et al 2003 for example). While output growth is one of the broad targets, instrument variation with respect to output is not well defined and so it is considered more practicable to target credit growth and leave output as an implicit target. For reserves, the WAMZ protocol which gives a minimum of six months imports cover and to which Nigeria is signatory will be of relevance.

$$M_t = DA_t + NFA_t \quad (27)$$

where DA is domestic assets comprising domestic credit (DC) and other assets (net) and NFA is net foreign assets consisting reserves and other components of net foreign assets. While other assets (net) is a large component of money supply, it will not be distinctly determined in this model partly because it could be difficult explicitly defining its determinants. Domestic credit, however, is further divided between private and public credit. Change in credit to government comes from either the domestic banking sector (given weak capital market) or borrowing from abroad i.e.

$$\Delta DCG_t = G_t - T_t - \Delta FIG_t \quad (28)$$

while change in private credit ($\Delta DCPT$) is a function of output growth and interest rate i.e.

$$\Delta DCPT = \alpha_0 + \alpha_1 \Delta Y_t + i_t \quad (29)$$

Following neoclassical conventions, real money balances is related to income, interest rate and expected inflation in a log-linear relationship as follows:

$$\text{Log}(M/P) = a \log(Y) + b\pi \quad (30)$$

Introducing interest rate and defining inflation in terms of expectation (adaptive expectations consistent with earlier specifications), the money demand function is expressed as a standard demand for money equation relating the desired stock of real money balances (m^d) to real income (y), the rate of interest on deposits (r), and the expected rate of inflation π_e (see Mallick, 1997) as follows;

$$Md_t = \alpha Y_t - \beta r_t - \delta \pi_e \quad (31)$$

5. Domestic Prices

Change in price level is given by:

$$\text{Ln} \Delta P_t = \alpha + \delta \ln \Delta Y_t^n - \gamma \ln NERP_t + \eta \left(\frac{GEXP}{GDP} \right)_t + \beta \ln \Delta M_{2t} + \lambda \ln_{t1} \Delta P_t \quad (32)$$

$\gamma, \eta, \beta, \rho$ and $\lambda > 0$ while $\delta < 0$

where Y_t^n is non-oil production, NERP is the parallel market exchange rate, GEXP/GDP is the ratio of government expenditure to GDP and M2 is broad money supply.

The determination of wages in this work pays more attention to the non-traded sector, as the traded sector consists basically of oil with total employment of only about 2%. Proxying the non-traded goods sector with non-oil output and given the production function expressed earlier, real wage is, therefore, expressed as a function of labour demand in the non-traded sector. Meanwhile, labour demand in the non-tradables sector will be assumed to reflect in total capacity utilization, so that the wage determination function is given as

$$\Delta RW = \Delta W - \Delta PN = \alpha_0 \Delta CU - \beta \Delta PN \quad (33)$$

Plausible assumptions, however, have to be made about changes in the price level and the implicit formation of expectation for the wage bargaining adopting an adaptive process as follows¹².

$$\Delta RW = \Delta W - \Delta PN = \alpha_0 \Delta CU - \beta \Delta PN = 1 \quad (34)$$

where domestic absorption inflation $\Delta PN=1$ is given as the weighted average of output and imported inflation.

Given both its age and size, the testable form of the standard random walk model is adopted to capture the behaviour of the Nigerian stock market as follows:

$$\Delta R_t = \alpha_1 \Delta R_{t-1} + e_t \quad (35)$$

Where R_t is the stock return at time t ; e_t is a sequence of an independent and identically distributed random variable.

¹² While the modeling of expectation is an empirical issue, historical trends in Nigeria seem to indicate that agents make demands for wage increases with reference to the impact of previous inflation rates on their real wage. Soludo (1996) used a mix of adaptive and rational expectations termed 'incomplete forward-looking' expectation. But we observe that the politics of wage setting has been that of reactionary wage bargaining especially in the public sector where agents tend to always bargain for wages in order to make up for 'erosion of real wages' by previous inflation rates. Indeed, the history of wage setting is such that given the employment situation and generally declining output, workers are 'shy' to make bold demands for increases in anticipation of future inflationary trends

Intuitively, the random walk efficiency hypothesis implies that macroeconomic fundamentals matter but it is a different issue determining which ones they are that matter. Empirical evidence varies widely in this aspect.

6. The External Sector

Oil production is determined by the OPEC cartel and exports closely follow production as most of domestic consumption consists of imports. So underneath, the work proceeds to specify exports as a function of the quota as follows:

$$OILX = \alpha + \beta(PQUOTA * POIL / NER) / ExtDef \quad (36)$$

where OILX is total oil exports, PQUOTA is the OPEC production quota, POIL is the international price of oil denominated in US dollars, NER is the nominal exchange rate and ExtDef is the external sector deflator.

In the non-oil export market, Nigeria is a typical price-taker with a basket of primary and semi-processed commodities. These commodities are assumed to be the residual of domestic production over domestic consumption. So non-oil export is specified as follows:

$$NonoilX = \alpha + \beta \log GDP + \delta \log PX / NER \quad (37)$$

Total exports (TX) is the sum of oil and non-oil exports

$$TX = OILX + NonoilX \quad (38)$$

For accounting purposes, total capital flows sum up short-term and long-term capital movements. But here a risk-return summary of capital flows is presented, where high risk premium raises the attractiveness of short-term and highly convertible capital inflows while low risks acts otherwise. Assuming total capital outlay to be a zero-sum game, the two components of capital movement may no longer be viewed as complementary but substitutionary. As such, both long-term and short-term capital flows are modelled as exclusive and each depending on the nature and size of the international risk premium r . If relative risk premium is captured in the equations using volatility of the real exchange rate, the equation for both the short-term and long-term capital flows will be given as

a function of growth of domestic output, monetary and fiscal policy variables as follows¹³.

$$K_{st} = \alpha + \beta RERVOL + \delta \log GDP + \eta Def + \gamma MS \quad (39)$$

$$K_{lt} = \alpha + \beta RERVOL + \delta \log GDP + \eta Def + \gamma MS \quad (40)$$

Total capital flows is the sum of short-term and long-term capital flows i.e.

$$K_t = K_{st} + K_{lt} \quad (41)$$

Where K_{st} and K_{lt} are short-term and long-term capital movements respectively, $RERVOL$ is real exchange rate volatility, a measure of policy deviations; Def is Central Government Fiscal Deficits and MS is money supply (the last two capturing monetary and fiscal policy stance)

Finally, an attempt is made to incorporate 'net errors and omissions' as a function of basic fiscal and monetary policy variables. No doubt, standard capital account equations would reflect the interactions between capital and policy instruments. But an explicit capital flight equation would complement whatever information that could be obtained from the estimates obtained from standard capital account interactions with monetary and fiscal policy variables. Given the scenario then, net errors and omissions is made a function of volatility, output, government expenditure (proxying fiscal policy stance) and the minimum rediscount rate (proxying monetary policy stance). The equation is given as

$$NEO = NEO(RERVOL, Y, GEXP, MRR) \quad (42)$$

¹³ A potentially interesting aspect of enquiry into the possible crowding out relationship between long-term and short-term capital will be the growth of financial instruments and market relative to real sector activities. The current study, however, will not delve deep into this

Appendix 2 – Summary of Coefficients and Tests for Behavioural Equations

Total system (unbalanced) observations 607

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	7.108376	0.435122	16.33650	0.0000
C(2)	0.153691	0.030091	5.107555	0.0000
C(3)	5.463055	0.679400	8.040995	0.0000
C(4)	0.138947	0.020959	6.629459	0.0000
C(5)	0.290981	0.077045	3.776756	0.0002
C(6)	0.166876	0.046503	3.588516	0.0004
C(7)	1.325731	0.030744	43.12117	0.0000
C(8)	-1.099271	0.077680	-14.15121	0.0000
C(9)	-0.013113	0.004499	-2.914601	0.0037
C(10)	0.988373	0.002252	438.9696	0.0000
C(11)	-6.81E-06	1.26E-06	-5.404121	0.0000
C(12)	10.08332	0.214338	47.04402	0.0000
C(13)	-0.052887	0.013774	-3.839679	0.0001
C(14)	-0.001480	0.000886	-1.670192	0.0954
C(15)	5.426429	1.886973	2.875732	0.0042
C(16)	0.337162	0.189000	1.783924	0.0750
C(17)	-3.591146	1.326527	-2.707178	0.0070
C(18)	0.882485	0.093675	9.420757	0.0000
C(19)	-4.831456	2.457508	-1.965998	0.0498
C(20)	-1.37E-05	4.78E-06	-2.874798	0.0042
C(21)	0.798349	0.218616	3.651827	0.0003
C(22)	0.564487	0.108303	5.212113	0.0000
C(23)	59.32856	23.91409	2.480904	0.0134
C(24)	-0.105743	0.014136	-7.480313	0.0000
C(25)	-7.154948	2.183147	-3.277355	0.0011
C(26)	0.906388	0.085462	10.60574	0.0000
C(27)	2.895479	0.255918	11.31411	0.0000
C(28)	-0.150357	0.101186	-1.485953	0.1379
C(29)	-57.34852	43.65718	-1.313610	0.1895
C(30)	3.582580	1.162216	3.082543	0.0022
C(31)	5.301335	1.332217	3.979333	0.0001
C(32)	0.602639	0.096574	6.240197	0.0000

C(33)	0.004852	0.002500	1.940553	0.0528
C(34)	-0.184458	0.046647	-3.954351	0.0001
C(35)	1.396583	0.720943	1.937162	0.0532
C(36)	0.766502	0.125951	6.085719	0.0000
C(37)	-19.71953	4.131222	-4.773292	0.0000
C(38)	2.248034	0.302061	7.442330	0.0000
C(39)	-0.169086	0.072056	-2.346610	0.0193
C(40)	0.003205	0.000994	3.223445	0.0013
C(41)	0.619240	0.010392	59.58858	0.0000
C(42)	6.388275	0.217908	29.31636	0.0000
C(43)	0.000201	0.000112	1.800129	0.0724
C(44)	68.84239	10.73390	6.413548	0.0000
C(45)	-0.008607	0.001957	-4.398424	0.0000
C(46)	-5.557764	0.944773	-5.882644	0.0000
C(47)	-0.015407	0.008128	-1.895610	0.0585
C(48)	-3784.165	1263.420	-2.995176	0.0029
C(49)	1.018226	0.255784	3.980810	0.0001
C(50)	454.1835	122.0164	3.722315	0.0002
C(51)	-133.8057	58.83627	-2.274204	0.0233
C(52)	-21.02056	4.799306	-4.379917	0.0000
C(53)	0.625288	0.087026	7.185037	0.0000
C(54)	69.94718	23.79924	2.939051	0.0034
C(55)	0.196744	0.041780	4.709027	0.0000
Determinant residual covariance		1.56E-08		
Equation: LOG (OILGDP) = C(1) + C(2)* LOG ((OILX + OILCONS - OILM)*OP)				
Observations: 34				
R-squared	0.434155	Mean dependent var	9.327469	
Adjusted R-squared	0.416472	S.D. dependent var	0.187009	
S.E. of regression	0.142854	Sum squared resid	0.653032	
Durbin-Watson stat	0.480515			
Equation: LOG (NONOILGDP) = C(3) + C(4)*LOG (MRM) + C(5)*LOG (PRIVCONS) + C(6)*LOG(GOVTCONS)				
Observations: 34				
R-squared	0.899513	Mean dependent var	11.24902	

Adjusted R-squared	0.889464	S.D. dependent var	0.243283
S.E. of regression	0.080884	Sum squared resid	0.196267
Durbin-Watson stat	1.494031		
Equation: LOG (RM) = C(7)*LOG (GDP1984) + C(8)*LOG (REER1990)			
+ C(9)*IMPTARIFF			
Observations: 34			
R-squared	0.954615	Mean dependent var	9.106517
Adjusted R-squared	0.951687	S.D. dependent var	1.072556
S.E. of regression	0.235751	Sum squared resid	1.722929
Durbin-Watson stat	1.354561		
Equation: LOG (GROSSCONS) = C(10)*LOG (GDP1984) + C(11)			
*SAVINGS			
Observations: 34			
R-squared	0.868221	Mean dependent var	11.14865
Adjusted R-squared	0.864103	S.D. dependent var	0.272198
S.E. of regression	0.100344	Sum squared resid	0.322205
Durbin-Watson stat	0.944060		
Equation: LOG (GFCF) = C(12) + C(13)*PLR + C(14)*RERVOL			
Observations: 34			
R-squared	0.359309	Mean dependent var	9.302971
Adjusted R-squared	0.317974	S.D. dependent var	0.503521
S.E. of regression	0.415832	Sum squared resid	5.360400
Durbin-Watson stat	0.630301		
Equation: LOG (PPT) = C(15) + C(16)*LOG (OILX)			
Observations: 33			
R-squared	0.087954	Mean dependent var	8.785604
Adjusted R-squared	0.058533	S.D. dependent var	0.745172
S.E. of regression	0.723034	Sum squared resid	16.20614
Durbin-Watson stat	0.494879		
Equation: LOG (OTHEROIL) = C(17) + C(18)*LOG ((OILCONS*OP))			
Observations: 34			
R-squared	0.723016	Mean dependent var	8.882616
Adjusted R-squared	0.714360	S.D. dependent var	0.907237
S.E. of regression	0.484876	Sum squared resid	7.523342
Durbin-Watson stat	0.868784		

Equation: $\text{LOG (GEXP)} = \text{C}(19) + \text{C}(20) * (1.125 * \text{FISBAL}) + \text{C}(21) * \text{LOG (GDP1984)} + \text{C}(22) * \text{LOG (RMS)}$			
Observations: 34			
R-squared	0.609672	Mean dependent var	9.777283
Adjusted R-squared	0.570639	S.D. dependent var	0.369655
S.E. of regression	0.242219	Sum squared resid	1.760100
Durbin-Watson stat	0.853483		
Equation: $\text{MRR} = \text{C}(23) + \text{C}(24) * \text{PAREXRATE} + \text{C}(25) * \text{LOG (GDP1984)} + \text{C}(26) * (\text{PLR-ADR}) + \text{C}(27) * \text{LOG (M2)}$			
Observations: 34			
R-squared	0.929313	Mean dependent var	10.91235
Adjusted R-squared	0.919563	S.D. dependent var	5.754474
S.E. of regression	1.632049	Sum squared resid	77.24393
Durbin-Watson stat	1.333215		
Equation: $\text{INF} = \text{C}(28) * \text{PAREXRATE} + \text{C}(29) * (\text{GEXP/GDP1984}) + \text{C}(30) * \text{LOG (M2)}$			
Observations: 34			
R-squared	0.108503	Mean dependent var	20.53971
Adjusted R-squared	0.050987	S.D. dependent var	17.47646
S.E. of regression	17.02510	Sum squared resid	8985.470
Durbin-Watson stat	0.954878		
Equation: $\text{LOG (AVWAGES)} = \text{C}(31) + \text{C}(32) * \text{LOG (AVWAGES(-1))} + \text{C}(33) * \text{MANKUTIL} + \text{C}(34) * \text{LOG (M2)}$			
Observations: 33			
R-squared	0.987924	Mean dependent var	9.158022
Adjusted R-squared	0.986675	S.D. dependent var	1.191455
S.E. of regression	0.137536	Sum squared resid	0.548569
Durbin-Watson stat	1.758397		
Equation: $\text{LOG (NSEVALUE)} = \text{C}(35) + \text{C}(36) * \text{LOG (NSEVALUE(-1))}$			
Observations: 33			
R-squared	0.528814	Mean dependent var	5.716773
Adjusted R-squared	0.513614	S.D. dependent var	1.068765
S.E. of regression	0.745372	Sum squared resid	17.22295
Durbin-Watson stat	1.980186		
Equation: $\text{LOG (OILX)} = \text{C}(37) + \text{C}(38) * \text{LOG (OILPROD)} + \text{C}(39) * \text{LOG (M2)}$			

(DISPUTES) + C(40)*TOT			
Observations: 34			
R-squared	0.730036	Mean dependent var	9.962436
Adjusted R-squared	0.703040	S.D. dependent var	0.645464
S.E. of regression	0.351739	Sum squared resid	3.711614
Durbin-Watson stat	0.830643		
Equation: LOG (NONOILX) =C(41)*LOG (NONOILGDP)			
Observations: 34			
R-squared	-0.030303	Mean dependent var	6.968405
Adjusted R-squared	-0.030303	S.D. dependent var	0.681787
S.E. of regression	0.692040	Sum squared resid	15.80433
Durbin-Watson stat	0.381289		
Equation: LOG (PKINF) = C(42) + C(43)*PKINF(-1)			
Observations: 33			
R-squared	0.089416	Mean dependent var	6.644172
Adjusted R-squared	0.060042	S.D. dependent var	1.009646
S.E. of regression	0.978866	Sum squared resid	29.70353
Durbin-Watson stat	1.670832		
Equation: LOG (PKOUTF) = C(44) + C(45)*RERVOL + C(46)*LOG			
(GDP1984) + C(47)*GDPPTDEV			
Observations: 34			
R-squared	0.510325	Mean dependent var	5.847005
Adjusted R-squared	0.461358	S.D. dependent var	1.287565
S.E. of regression	0.944973	Sum squared resid	26.78921
Durbin-Watson stat	1.085204		
Equation: NEO = C(48) + C(49)*RERVOL + C(50)*LOG (GDP1984) +			
C(51)*LOG (GEXP)+C(52)*MRR			
Observations: 34			
R-squared	0.745626	Mean dependent var	-150.3158
Adjusted R-squared	0.710540	S.D. dependent var	212.5347
S.E. of regression	114.3469	Sum squared resid	379181.3
Durbin-Watson stat	1.330388		
Equation: RERVOL = C(53)*RERVOL(-1) + C(54)*COUP + C(55)*NEO			
Observations: 33			
R-squared	0.798888	Mean dependent var	-3.547576

Adjusted R-squared	0.785481	S.D. dependent var	123.9026
S.E. of regression	57.38703	Sum squared resid	98798.13
Durbin-Watson stat	1.957460		