CAPITAL FLIGHT AND NIGERIA’S ECONOMY

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Abstract
This research empirically examines the impact of capital flight on Nigeria economy using two-stage least square technique for the period 1970 -2008. In the estimated model, capital flight reported a negative and significant impact on economic growth. Also the findings indicate that non performance of domestic resources can trigger capital flight. Therefore, growth and development in Nigeria can be sustained through reduction of capital flight. From this aforementioned relationship, this research suggests policy measures that will make the economy competitive and more attractive to private investment. These among other things, include anti-inflationary policies and more stable exchange rate, which allow foreign capital inflow so as to boost private domestic investment.

Keywords: Economic growth, capital flight, exchange rate

Introduction
Over the years, the issue of capital flight from developing countries, including Nigeria has received appreciable attention from researchers. Scholars have expressed concern over the magnitude, causes and consequences of these net flows. Investors from developed countries are seen as responding to investment opportunities while investors from developing countries are said to be escaping the high risks they perceive at home (Ajayi, 1997). Thus, according to Schneider (2003), Capital flight involves the outflows of resident capital which is motivated by economic and political uncertainties in the home country. Such lost of resources do not contribute to the expansion of domestic activities or to the improvement of social welfare of domestic resident. On the contrary, they imply forgone goods and services essential to sustaining economic growth. (See, Beja, 2006).

The lack of financial resources for appropriate economic development has pushed most African countries including Nigeria into external borrowing to augment domestic resources in their quest for economic growth. Acquisition of foreign assets by residents has escalated even as developing countries search for external borrowing to enhance the capital inflow. Authors like Cuddington (1987) and Pastor (1990) opined that developing country borrowing is substantially diverted into private assets abroad, thus, the paradoxical situation of accumulation of external debt by developing countries and the corresponding acquisition of external assets by resident has been an additional motivation behind the interest on capital flight. In Nigeria, one of the unresolved and perturbing macroeconomic problems for the past two decades is the growing rate of capital flight. Furthermore, the recent global financial crisis and its generated problem of massive movement of funds massively out of the country has undoubtedly contributed to the regeneration of the growth of capital flight as well as the present consolidation crisis which is threatening the development of the banking sub-sector. According to Sanusi, over $20 billion left the country from 2008-2009 as a result of capital flight (Vanguard Newspaper, 29August, 2009). This is just one way in which capital flight can adversely affect a country’s economic growth. The IMF (1996) reveals that Nigeria suffered a loss of $7,573million between 1972 and 1989 to capital flight. Out of this total, the sum of US$7,362 million was lost between 1972 and 1978 against a capital inflow of $270 million within the same period. The CBN Bulletin (2008) also shows the net flows in Nigeria from 1970 to 2008 as represented on the table below
Table 1: Capital flow trend in Nigeria

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Flows in million</th>
<th>Year</th>
<th>Net Flows in million</th>
<th>Year</th>
<th>Net Flows in million</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>9.8</td>
<td>1983</td>
<td>90</td>
<td>1996</td>
<td>708</td>
</tr>
<tr>
<td>1971</td>
<td>28</td>
<td>1984</td>
<td>53</td>
<td>1997</td>
<td>462</td>
</tr>
<tr>
<td>1972</td>
<td>16</td>
<td>1985</td>
<td>59</td>
<td>1998</td>
<td>4385</td>
</tr>
<tr>
<td>1973</td>
<td>37</td>
<td>1986</td>
<td>94</td>
<td>1999</td>
<td>378</td>
</tr>
<tr>
<td>1975</td>
<td>30</td>
<td>1988</td>
<td>287</td>
<td>2001</td>
<td>-53</td>
</tr>
<tr>
<td>1976</td>
<td>64</td>
<td>1989</td>
<td>525</td>
<td>2002</td>
<td>777</td>
</tr>
<tr>
<td>1977</td>
<td>35</td>
<td>1990</td>
<td>517</td>
<td>2003</td>
<td>1266</td>
</tr>
<tr>
<td>1978</td>
<td>17</td>
<td>1991</td>
<td>669</td>
<td>2004</td>
<td>2504</td>
</tr>
<tr>
<td>1979</td>
<td>79</td>
<td>1992</td>
<td>227</td>
<td>2005</td>
<td>3256</td>
</tr>
<tr>
<td>1980</td>
<td>51</td>
<td>1993</td>
<td>5011</td>
<td>2006</td>
<td>5209</td>
</tr>
<tr>
<td>1981</td>
<td>42</td>
<td>1994</td>
<td>430</td>
<td>2007</td>
<td>6511</td>
</tr>
<tr>
<td>1982</td>
<td>66</td>
<td>1995</td>
<td>10858</td>
<td>2008</td>
<td>4817</td>
</tr>
</tbody>
</table>


Figure 1 Changes in Foreign Share Capital in Nigeria

This problem as seen is more pronounced in the mid 1960s, with low values (1965, 4.2, 1966, 2.8) of net capital flow. The worsening situation was recorded in 1974 and 2001 with -39.3 and -53.4 respectively. Although this situation appreciated in 2002, it started falling back in 2008.

There is no doubt, that capital flight has damaging consequences on the economy. For instance, capital that is transferred abroad from the country cannot contribute to domestic investment and other productive activities. International Financial Corporation (1998) and Ndikumana (2000) observed that Nigeria is among many African economies that have achieved significant lower investment levels as a result of capital flight. Such low level investment brought about by high rate of capital flight in Nigeria also has multiplier consequences on other aspect of the economy including the alarming rate of unemployment as well as pronounced regressive effects on the distribution of wealth in Nigeria. Capital flight is therefore, both a cause and symptom of weak investment performance in Nigeria.
Capital flight has been regarded as a major factor contributing to the mounting foreign debt and inhibiting development efforts in the third world countries (Cuddington, 1986). External debt in Nigeria for example, increased by 700 percent from $3.5 in 1980 to $28.0 in 2000 (Ajayi, 2000). Similarly, the outflow of capital may augment foreign finance problems of heavily indebted poor countries if potential creditors like IMF and other donors are de-motivated to give further assistance as a result of capital outflow. That is to say, the damaging effects of capital flight have made rational foreign lenders hesitant to increase credits to the debtor’s countries. This, indeed, affects Nigeria.

It is surprising that despite these unspeakable problems high rate of capital flight poses to Nigerian economy, Nigerian case studies are grossly lacking in existing literature. Based on these aforementioned problems, this study is therefore undertaken to fill this gap and to investigate on the impact of capital flight on Nigeria’s economic growth using recent econometrics techniques. The study will be of immense benefit to Nigeria’s economic policy implementers as it will augment the findings of Agu (2006) which established that effective monetary and fiscal measure policies are tools of capital flight reversal in Nigeria.

The rest of the paper is organized as follows; Section 2 discusses the empirical issues on capital flight and economic growth. The model and the estimation techniques of the study is stated in session 3, section 4 looks at the discussion of the results of the estimated model while section 5 focused on the policy implication and concluding remarks.

Literature review

Several studies have been carried out on capital flight. But most of these studies concentrated on the determinants of capital flight with studies being carried for Latin America. Cuddington (1986) and Conesa (1987) for example emphasized the overall investment climate factors while Dooley (1986) focused on the discriminatory treatment of resident against non resident capital. Studies on capital flight for Africa include those by Ajayi (1992) for Nigeria, Njimanted (2008) for Cameroon, Ng’eno (1994) for Kenya, and Olopoenia (1995) for Uganda.

Ng’eno (2000) in his study analysed the magnitude of capital flight in Kenya using different methods of estimation. He empirically determined the causal factor of capital flight placing importance on macroeconomic variables. He concluded that capital flight peaked in the year of balance of payment crisis, meaning that capital flight was used to hedge against the poor economic conditions. It also suggests that without credible reforms growth in economy would lead to increase capital flight.

In the study carried out by Kadochnikov 2005, he examined the economic impact of capital flight from Russia within the institutional environment in which it occurs and whether capital flight was detrimental to the economy. New institutional Economics approach was adopted to argue that in Russian’s case capital flight might be considered not just a consequence as some researchers have argued earlier, but also an optimal solution to the institutional deficiencies with its economic role being neutral. To support the in validity of this claim modified Granger non-Causality test was used to determine whether capital flight dynamics have a causal effect on the interest rate differential and vice versa, that is to test whether price mechanism is not working. Rethinking the nature and the economic impact of capital flight allows postulating that within the existing institutional context the observed capital flight is a normal economic process which per se does not require any policy response and restricting capital flight by imposing capital controls cannot be an element of a pro-growth policy, as it would instead lead to boom-burst sort of growth.

Mariana Cervena (2006), analysed the impact of capital flight on long-term economic growth using different methodologies for a set of 75 countries for the period of 1994-2003. He employed pooled cross-section analysis based on the fixed effects model estimated by feasible generalized least squares method and presents the results. The results suggest that countries with higher capital flight to GDP ratio have experienced slower growth of GDP per capita, with poorer countries being punished more by the phenomena.

Beja et al (2006) measure capital flight from Thailand over the period 1980 to 2000 and
analysed the relationship between capital flight and capital inflows, economic growth and crisis and financial liberation. The authors were able to confirm relatively substantial capital inflows in periods of economic expansion with capital inflows larger than capital flight and the reverse in periods of economic crisis – with capital flight exceeding capital inflows. They also investigated the relationship between economic growth and capital flight. Conventional analysis suggests that economic growth implies high returns to capital, and an attractive investment environment in general. In the case Thailand, capital flight has negative relationship on economic growth.

Njimanted (2008), estimated the determinants, measurement and impact of capital flight on real economic growth in Cameroon using two-stage least squares technique after the application of co-integration error correction mechanism of Engle and Granger (1987), using time series data from 1970 to 2005. The quantitative results reveal that large capital outflows from Cameroon is accounted for by political instability, fiscal deficit, interest rate inflation differential and external debt servicing GDP ratio.

Gusarova (2009), analyses the impact of the capital flight on growth of real GDP using panel data set, which contains estimates of capital flight by different proxies for all developing countries in the world. He used newly available data set, consisting of 139 countries for the period of 2002-2009 and found out that capital flight has negative impact on GDP growth. However, its significance is ambiguous. The results are not robust to specifications, which account for region or year effects. ARDL was adopted. Among the few studies carried out in Nigeria are, the study carried out by Onwioduokit (2002). He estimated the determinants of capital flight from Nigeria for the period of 1970-2000. The data were analyzed using ordinary least square (OLS). The results of the analysis revealed that domestic inflation, availability of capital, parallel market premium and competitive growth rate of the economy are the major determinants of capital flight in Nigeria.

Agu (2006), in his work on capital flight and domestic macroeconomic policy in Nigeria, he tried to evaluate the concepts of risk and returns and presents a perspective on assessing their contributions to capital flight using micro portfolio management model. He also analyzes the impact of political risk and concludes that it is a central to capital flight. The second part of his work proposes a macroeconomic model with the intent 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. However, I did not find evidence to support indirect control of capital flight through using fiscal and monetary policies to control uncertainty.

Ajadi (2008) examined the econometrics analysis of capital flight in developing countries. The study investigated the linear determinants of capital flight (with a constraint to economic growth) in Nigeria utilizing the ordinary least squares (OLS) and the error correction method (ECM) for the period of 1972 to1989. The study also found among other things, the validity of the portfolio theory which postulates how risk adverse investors can build portfolio in order to optimize or maximize expected returns given a level of market risk. This was confirmed in the international realm as private sector engaged in international arbitrage. Capital flight is caused by the interest rate differential both in the short and in the long run. In addition, exchange rate depreciation significantly increases capital flight in Nigeria. Output growth which measures the domestic opportunity cost of flight in Nigeria is negative and indicating that non performance of domestic resources can trigger capital flight.

Research methodology

Analytical framework of the model

In order to properly estimate the impact of capital flight on economic growth in Nigeria, Two Stage Least Squares (2SLS) estimation technique was adopted. As the name indicates, the method involves two successive applications of Ordinary Least Squares (OLS). Two Stage Least Squares (2SLS) is used to overcome the problems of multicollinearity evident in large sample, identification, simultaneity as well as the likely correlation between the stochastic explanatory variables and the stochastic disturbance term. However, the model adopted for this study is in
line with the work of Gusarova (2009), which is autoregressive-distributed lag model (ARDL). Autoregressive - distributed lag model (ARDL) is chosen among other methodologies because of its usefulness and flexibility form of adjustment technique. The ARDL involves estimating of over-parameterized model with an arbitrary number of lags for both the dependent and explanatory variables. Although the transformation procedure reduces the over parameterized ARDL to a parsimonious simplification of the general representation, it produces a model that is consistent with the theory and data through the imposition of coefficient restriction. In econometric applications, the ARDL is used to model an over-parameterized representation of the error correction model and therefore ensures that all the variables in the ECM are integrated of order one (1,1) (Iyoha, 2004). However, the choice of ARDL model was adopted because capital flight entails the spillover of the past regime into the current set. This is a typical autoregressive phenomenon and the model wants to capture this effect in the lag structure.

In order to ensure the parsimonious nature of the model, the variables required for the model are, gross domestic product, capital flight, inflation rate, real interest rate differential, real exchange rate.

**Model specification**

Following the identified variables from this model, the mathematically representation of it is specified as:

\[ rgdp = f(kf, ind, rer, inf) \]

(1) Assuming a linear relationship between our dependent variable and the independent variables, the statistical equation of the above function becomes

\[ rgdp_t = \lambda_0 + \lambda_1 kf_{t-1} + \lambda_2 ind_{t-1} + \lambda_3 rer_{t-1} + \lambda_4 inf_{t-1} + \epsilon_t \]

\[ \epsilon_t \] denotes in the equation above. These instrumental variables are assumed to be uncorrelated with the error term (\(\epsilon_t\)), but highly correlated with \(rgdp\).

\[ COV(\epsilon_t, \epsilon_i) = COV(\epsilon_t, \epsilon_j) = 0 \]

And for this, the method of moments approach suggests obtaining the estimators, \(\hat{\lambda}_0, \hat{\lambda}_1, \hat{\lambda}_2, \hat{\lambda}_3, \hat{\lambda}_4\) by solving the sample counterparts of equation 4 and presenting it in matrix forms as in equation 7 below.

and the methodology defined above, equation (2) translates to an Autoregressive Distributed lag (ARDL) model as stated below.

\[ rgdp_t = \lambda_0 + \lambda_1 rgdp_{t-1} + \sum_{j=1}^{m} \lambda_j X_{t-k} + \gamma kf_{t-1} + \epsilon_t \]

\[ \epsilon_t \]

Where:

- \(X_t\) = All other explanatory variables (i.e., inflation rate, interest rate differential real exchange rate, and real gdp.
- \(i, t-k, t-1\) = Unknown lags to be determined by various criteria.

Though, following the simultaneous nature of the two models specified in equations 1, that is, equation (1) has its dependent variables existing as explanatory variables in each equation. As a result, we transform these structured equations into a reduced form equation for 2SLS estimation in the following processes:

\[ RGDP_t = \lambda_0 + \lambda_1 (RER_t = \alpha_0 + \alpha_1 KF_{t-1} + \alpha_2 TOTAL + RER_{t-1} + \alpha_3 KF + \alpha_4 IND + \alpha_5 INF + \epsilon_t) \]

Note that estimating equations 4 with OLS will be biased, and for this reason, we seek an instrumental variable for \(RGDP\) say \(KF_{t-1}, IND, and INF_{t-1}\) as denoted in the equation above. These instrumental variables are assumed to be uncorrelated with the error term (\(\epsilon_t\), but highly correlated with \(RGDP\).

Also, we assumed that \(\epsilon_t\) have zero expected values, which is without loss of generality when the equation contains an intercept.

\[ E(\epsilon_t) = E(\mu_t) = 0 \]

\[ \epsilon_t \]

\[ COV(RGDP, \epsilon_t) = COV(RER, \mu_t) = 0 \]

\[ \epsilon_t \]

(5)

(6)

(7)

Based on the aforementioned theoretical postulates, following the practice in most studies...
The set of linear equations 7 in the $\hat{\lambda}_1, \hat{\lambda}_2, \hat{\lambda}_3$, unknown is easily solved given the data on the variables. The estimators are called instrumental variables estimators.

However, if RGDP is an exogenous variable and we choose an instrument as

$$RER = (KF_{i-1} + TOT + RER_{i-1} + INF_{i-1}) + RGDP$$

for instance, equation 7 is exactly the first order conditions for OLS estimators.

We transform these structural equations into reduced form equation as

$$RGDP = \pi_0 + \pi_1 RGDP_{i-1} + \pi_2 KF_{i-1} + \pi_3 IND + \pi_4 INF_{i-1} + \mu_1$$

Where

$$RGDP_{i-1}, KF_{i-1}, IND, \text{ and } INF_{i-1}$$

are the respective instrumental variables for the model.

Also, $E(v_2) = 0, COV(z_2, v_2) = 0$.

Given that $z_2$ is instrumental variable for the model,

$$\pi_1, \pi_2, ..., \pi_4 = 0$$

Tests for endogeneity

The 2SLS estimator is less than OLS when the explanatory variables are exogenous. As we have seen, 2SLS estimates can have very large standard errors. Therefore, it is useful to have a test for endogeneity of an explanatory variable that shows whether 2SLS is even necessary.

To illustrate this, suppose we have a single suspected endogenous variable.

$$RGDP = \phi_0 + \phi_1 RER + \phi_2 KF_{i-1} + \phi_3 TOT + \phi_4 INF_{i-1} + \phi_5 U$$

.........(8)

If $(z_2, u_i) = (q_2, e_1) = 0$, then we use OLS.

Hausman (1978), suggested directly comparing the OLS and 2SLS estimates and determining whether the difference is statistically significant. If there is difference, we then conclude that RGDP must be endogenous.

$$RGDP = \pi_0 + \pi_1 RGDP_{i-1} + \pi_2 KF_{i-1} + \pi_3 IND + \pi_4 INF_{i-1} + \mu_1$$

.........(9)

Now, since $z_2$ is uncorrelated with $u_i$ but RGDP is also correlated with $u_i$, this is because, $v_2$ is uncorrelated with $u_i$, the easiest way to test this is to include $z_2$ and $u_i$ as additional regressors in the equations and do t-test.

For example,

$$Y_1 = \beta_0 + \beta_1 Y_2 + \beta_2 Z_1 + \beta_3 Z_2 + \delta v_2 + \epsilon_1$$

...............(10)

Estimate the equation OLS and test $H_0: \delta = 0$, using t-statistics, if we reject $H_0$ at 5% level of significance, we conclude that $Y_2$ is endogenous because $v_2$ and $u_i$ are uncorrelated.

Presentation and analysis of results

Most time series data tend to contain infinite variances that are not mean- reverting and lie on the unit circle. It is, however, observed that equations estimated from such series are usually resulting in spurious regression that makes little or no economic sense. Indeed, the loading of the endogenous variable is infinitesimal when in fact a long-run relationship exists between it and the economic fundamentals driving it; [See Granger and Newbold (1974), Engle and Granger (1987), Dicky and Fuller (1981), Enders (1995), Sims (1990), and Pindyck and Rubinfeld (1998)]. Thus each of the underlying variables was examined for unit root and co integration.
ADF unit root test

Arising from the above discussion, we started the modeling by running the Augmented Dickey–Fuller (ADF) unit root test of stationarity on the levels of the variables at the first differences and the result displayed in Table 4.1

<table>
<thead>
<tr>
<th>Variable</th>
<th>DLRer</th>
<th>DLinf</th>
<th>DLrgdp</th>
<th>Dkf</th>
<th>Dind</th>
</tr>
</thead>
<tbody>
<tr>
<td>I \sim (d)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lag length</td>
<td>2, 1, 0</td>
<td>2, 1, 0</td>
<td>2, 1, 0</td>
<td>2, 1, 0</td>
<td>2, 1, 0</td>
</tr>
<tr>
<td>Critical @ 5% &amp; 1% values</td>
<td>-1.951</td>
<td>-1.951</td>
<td>-1.951</td>
<td>-1.951</td>
<td>-1.951</td>
</tr>
<tr>
<td>5% &amp; 1% values</td>
<td>-2.63</td>
<td>-2.63</td>
<td>-2.63</td>
<td>-2.63</td>
<td>-2.63</td>
</tr>
</tbody>
</table>

NB ** indicates significance at both 5% and 1% critical value, * indicates significance at 5% and D= number of differencing

As shown in Table 4.1; all the variables examined were stationary (significant) at first differenced; that is, it was integrated of order one (I \sim (1)). In effects, the order of integration as shown by the unit root clearly left us with the suspicion of evidence of co-integration from the variables. And for this reason, we conduct co-integration test as shown below.

Results from co-integration test

Given the unit root properties of the variables, we proceed to implement the Engle-Granger co-integration procedure. All the variables have the same order (I \sim (1)) of integration; we estimate their linear combination at their level form without the intercept term and obtain their residual which is then subjected to co-integration test as shown in Table 4.2

Table 4.2: co-integration tests

<table>
<thead>
<tr>
<th>Residual</th>
<th>t-adf</th>
<th>Lag</th>
<th>5% Critical val</th>
<th>1% Critical val</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1.7455</td>
<td>2</td>
<td>-1.955</td>
<td>-2.656</td>
</tr>
<tr>
<td>Residual</td>
<td>-1.5877</td>
<td>1</td>
<td>-1.955</td>
<td>-2.656</td>
</tr>
<tr>
<td>Residual</td>
<td>-1.3688</td>
<td>0</td>
<td>-1.955</td>
<td>-2.656</td>
</tr>
</tbody>
</table>

From the table, since the residual t-adf of -1.7455, -1.5877 and -1.3688 at lag length 2, 1, and 0 respectively are less than the 5% and 1% critical values of -1.955 and 2.656 in absolute terms, it means that the residual is not stationary and hence there is no long-run linear relationship or co-integration among the variables. Consequently, we dropped the Error Correction Model which was specified in case, co-integration was established among the variables.

Presentation and analysis of 2SLS estimation

Unlike OLS estimation, Two Stage Least Square (2SLS) is built on certain assumptions, such as; linear in parameters, random sampling of the exogenous variables, exogenous instrumental variables, rank condition for the choice of instruments, homoskedasticity (equal variance), and finally, the no-serial correlation. All this assumption will be fully implemented in this section, but before we present the 2SLS model results, we will first of all examine the endogeneity and the validity of instrument test to avoid biased results and parameter estimates.

i. Endogeneity test

This study adopted exclusively, Hausman (1978) method of endogeneity test. He suggested the direct comparing of the OLS and 2SLS estimate and determining whether the differences are statistically significant. And if found any appreciable differences between the two methods, (OLS and 2SLS), we conclude that the endogenous explanatory variable(s) must be endogenous.

Hypothesis
**H₀**: δᵢ = 0 (no problem of Endogeneity)

Against

**H₁**: δᵢ ≠ 0 (there is serious Endogeneity problem)

Decision Rule: reject H₀ if \( t_{cal} > t_{tab} \), and accept otherwise at 5% level of significant.

The endogeneity result for the model is presented as:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>t - value</th>
<th>t - prob</th>
<th>Part R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.31085</td>
<td>0.16613</td>
<td>1.871</td>
<td>0.0702</td>
<td>0.0959</td>
</tr>
<tr>
<td>KF_1</td>
<td>0.000025</td>
<td>0.00028</td>
<td>0.908</td>
<td>0.3707</td>
<td>0.0244</td>
</tr>
<tr>
<td>TOT</td>
<td>-0.00000105</td>
<td>0.00000059</td>
<td>-1.784</td>
<td>0.0837</td>
<td>0.0879</td>
</tr>
<tr>
<td>LRER_1</td>
<td>1.0294</td>
<td>0.033044</td>
<td>31.152</td>
<td>0.0000</td>
<td>0.9671</td>
</tr>
<tr>
<td>LINF_1</td>
<td>-0.075536</td>
<td>0.061250</td>
<td>-1.233</td>
<td>0.2262</td>
<td>0.0441</td>
</tr>
<tr>
<td>Constant</td>
<td>9.8695</td>
<td>0.50953</td>
<td>19.370</td>
<td>0.0000</td>
<td>0.9214</td>
</tr>
<tr>
<td>KF</td>
<td>0.0000155</td>
<td>0.0000698</td>
<td>0.222</td>
<td>0.8257</td>
<td>0.0015</td>
</tr>
<tr>
<td>IND</td>
<td>-0.017225</td>
<td>0.024975</td>
<td>-0.690</td>
<td>0.4954</td>
<td>0.0146</td>
</tr>
<tr>
<td>LRER</td>
<td>0.51823</td>
<td>0.10340</td>
<td>5.012</td>
<td>0.0000</td>
<td>0.4398</td>
</tr>
<tr>
<td>LINF</td>
<td>0.38213</td>
<td>0.17626</td>
<td>2.168</td>
<td>0.0377</td>
<td>0.1281</td>
</tr>
<tr>
<td>ERROR1</td>
<td>0.92306</td>
<td>0.47838</td>
<td>1.930</td>
<td>0.0626</td>
<td>0.1042</td>
</tr>
</tbody>
</table>

F – value (5, 32) = 13.938; P – value = 0.0000

However, judging from the hypothesis and its subsequent decision rule, the error terms in the structured form equation has no correlation with the error term in the reduced form equation. This decision was arrived at following a 2-t Rule of Thumb; a variable is statistically significant if its t-value is greater than 2 in absolute value at any 5% level of significance. In other hand, it is statistically insignificant if its t-value is less than 2 in absolute value at any 5% level of significance; Gujarati, (2004). This is because the error terms included in the subsequent estimates in each model examined above is not statistically significance, and for this reason, we concludes that there is no endogeneity problems in the models.

**ii. Test for validity of instruments**

This work adopted a validity test designed by Danis Sargan as advised by Liviaton (1963) cited in Gujarati (2004) who suggested a way to choose Instrumental Variable(s) (IV) and the test for validity of such instrument called Dubbed SARG Test or by using the F – statistic since we have a multiple instrumental variables.

**Hypothesis**

**H₀**: \( \pi_1 = \pi_2 = \pi_3 = \pi_4 = 0 \) (the instrumental variables chosen did not associate with the endogenous explanatory variable in the model)

Against

**H₁**: \( \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq 0 \) (the instrumental variables chosen did associate with the endogenous explanatory variable in the model)

Test statistic is given as:

\[
SARG = (n - k)R^2
\]

Where \( n = 39 \) (the number of observations); and \( k = 5 \) (the number of coefficient in the original regression equation).

This test follows a chi-square distribution with \( r \) degree of freedom, and

\[
r = s - q = 3 - 1 = 2
\]

Where \( q = 3 \) (the lag length of explanatory variables correlated with error)

\( s = 1 \) (the lag length of the instrumental variable).

Decision rule: reject H₀ if chi-square calculated \( \chi^*_{cal} \) is greater than chi-square tabulated \( \chi^*_{tab} \) and accept otherwise.

\[
SARG = (39 - 5) \times 0.127977 = 34 \times 0.127977 = 4.35
\]

Comparing the result from chi-square calculated and tabulated, we noticed that \( \chi^*_{cal} = 4.35 > \chi^*_{tab} = 0.103 \), and for this, we reject the null hypothesis and conclude that the instrumental
variables chosen did associate with the endogenous explanatory variable in the model.

Also judging from the F-statistic from the result, the first model gave F-statistic value of 13.938 with the P-value of 0.0000, with 5 and 32 degree of freedom at 5% level of significance. With this result, one can undoubtedly claim that the ranked order condition for identifying an instrument or variable is satisfied.

Interpreting the model result means that the instrumental variables chosen for real gross domestic product (RGDP), which stands as the endogenous explanatory variable in the model; the lagged of real gross domestic product, lagged of capital flight, interest rate differential, and lagged of inflation rate are uncorrelated with the error terms $\mu_t$ but highly correlated with the endogenous explanatory variable, RGDP. The result clearly shows that the stochastic error terms for the model have zero expected value, which is without loss of generality when the equation contained an intercept.

Having satisfied these two conditions of 2SLS, we can now present the graphical trends of the model used, the 2SLS results and the interpretation that follows therein.

The graphical trends of the variables used

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig1.png}
\caption{Show the trend of LRER and the difference between the actual and the estimated parameters.}
\end{figure}

The above trend maintained a steady movement with the interval of $\pm 10$ and move out of the interval in a negative trend in the mid 1990s, but gets back in the early 2000s, with another fail-out around 2007/2008 periods. In the other hand, the fitted graph shows a negative relationship between the residual and the fitted trend with the observed
or actual trend running above the interval of ± 10.

Fig. 2: Line graph presentation of the Trend of the major variables used in the study
Fig. 2: Bar Chart presentation of the Trend of the Major Variables used in the Study

**Presentation of 2SLS result**
The empirical results from modeling both the effects of net capital flight on gross domestic product (RGDP) in Nigeria with 2SLS are presented in table 4.5
Table 4. Modeling of Log of RGDP by 2SLS
Dependent Variable: LRGDP
Method: Two-Stage Least Squares
Date: 01/08/03   Time: 00:19
Sample(adjusted): 1971 2008
Included observations: 38 after adjusting endpoints
Instrument list: KF_1 DTOT LRER_1 LINF_1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>8.756720</td>
<td>1.361635</td>
<td>6.431034</td>
<td>0.0000</td>
</tr>
<tr>
<td>DKF</td>
<td>-4.34E-05</td>
<td>0.000168</td>
<td>-2.259158</td>
<td>0.0022</td>
</tr>
<tr>
<td>DIND</td>
<td>0.186263</td>
<td>0.587665</td>
<td>0.316954</td>
<td>0.7533</td>
</tr>
<tr>
<td>LRER</td>
<td>0.493379</td>
<td>0.128609</td>
<td>3.836267</td>
<td>0.0005</td>
</tr>
<tr>
<td>LINF</td>
<td>-0.779755</td>
<td>0.539871</td>
<td>-2.444392</td>
<td>0.0080</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.857775</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.849711</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>1.356766</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>6.378109</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.000645</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Substituted Coefficients:

\[
\text{LRGDP} = 8.756720235 - 4.34E-05 \times \text{DKF} + 0.18626561 \times \text{DIND} + 0.4933791579 \times \text{LRER} - 0.779754676 \times \text{LINF}
\]

Interpretation of 2SLS result

Evaluation based on economic criteria
In this context, the estimated parameters were subjected to test based on economic theory so as to ascertain whether the estimated parameters are well behaved. In other words this is to know if the coefficients derived from the models conformed to a ‘priori’ expectation in terms of signs and magnitude.

From the above 2SLS result tables, capital flight in the model shows negative coefficients with reasonable slow effects in the contemporaneous periods of estimates. This result clearly proved that capital flight, though has negative effects on economic growth in Nigerian economy, has a slow transmission effects. To be specific, a unit increase in the net capital flight will cause both real gross domestic product to reduce by -0.0000434 units.

Following the 2-t Rule of Thumb, a variable is statistically significant if the t-value of the variable is greater than 2 in absolute term at a given % level of significance. Similarly, a variable is not statistically significance if its t-value is less than 2 in absolute term at a given % level of significance. Therefore, net capital flight in the model is statistically significant having their t – value of -2.259158

Furthermore, interest rate differential also has the expected positive sign of 0.186263 that confirm to a ‘priori’ expectation with its larger transmission effects compared with that of net capital flight. That is, a unit increase in interest rate differential brings an increase of 0.1863 in real gross domestic product all things remaining constant. The robust coefficient of this variable failed to reaffirm by the t-values of 0.316954 that is not statistically significant.

Similarly, real exchange rate display positive robust coefficient of 0.493379. The results conform to a priori expectation since increase in real exchange rate is expected to boost aggregate domestic production, thereby transmitting positively to the real gross domestic product. The result suggests that holding all other variables constant, a unit increase in real exchange rate brings an increase in gross domestic product by 0.493379 units. The robust coefficient of this variable is reaffirmed by the t-values of 3.836267 that were statistically significant.

The estimated coefficients for inflation rate meet our economic a ‘priori’ expectation and it is in line with the work of Ng’eno (2000). The rate of inflation in the model displayed robust coefficients of -0.779755. The results revealed that a unit increase in the rate of inflation in Nigeria brings about a reduction in both gross domestic product by -0.779755 units, as all things remain constant. However inflation rate is statistically significance in by its t-value of -2.444392

Evaluation based on statistical criteria (First order)

The coefficient of multiple determinations R²
The R² which is the coefficient of multiple determinations for the growth model is 0.857775. That is to say that approximately 86 percent of the variation in the dependent variable (gross domestic product) is attributed to the set of exogenous and the instrumental variables. This result suggests that the exogenous variables adequately explain the behaviour of the dependent variable and this is quite impressive.
F – Test

Though the endogeneity and validity of instrument tests conducted above has proven the fitness of this model, for the avoidance of doubt we conducted the F-test to further ascertain if the model is statistically significant and to know if the data actually fit into the model in order to enable us ascertain the adequacy of the model for our analysis.

Hypothesis

Ho: \( \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = 0 \) (the model is not significant)

H1: \( \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq \pi_5 \neq 0 \) (the model is significant)

Where \( \alpha = 0.05 \) (At 5% level of significance.

Decision Rule: Reject Ho if \( F^*> F_{0.05} \), otherwise accept Ho if \( F^* < F_{0.05} \)

\( F^*(5, 32) = 6.378109 \), while the \( P \)-value = 0.000645

F table = 2.45

Conclusion: Since \( F^* \) calculated is 6.378109 which is greater than \( F^* \) tabulated of 2.45, we reject Ho and accept H1 implying that the model is statistically significant and adequate for analysis and policy implications.

Evaluation based on econometric criteria (2nd order)

Test for auto- correlation

The underlying assumption of autocorrelation is that the successive values of the random \( \mu_i \) is temporally independent. The convectional Durbin Watson d statistics could not work in this case, instead the work adopted Durbin \( h \) – Test, which is best suited for detecting an autocorrelation in an autoregressive models.

Hypothesis

\( H_0: \rho = 0 \) (no first order serial correlation of error term)

\( H_1: \rho \neq 0 \) (there is presence of first order serial correlation of error term)

Test statistic

\[
 h = \hat{\rho} \sqrt{\frac{n}{1-n \text{var}(\hat{\lambda}_2)}} \sim h_{asy} \sim N(0,1)
\]

Where

\[
 n = \text{sample size} \\
 \text{var}(\hat{\lambda}_2) = \text{the variance of the lagged dependent variable (Y}_{t-1} \) \\
 \hat{\rho} = \text{an estimate of the first order serial correlation; and} \\
 h = \hat{\rho} - \frac{1}{2} \left( 1 - \frac{2.108519}{2} \right) = 1 - 1.0542595
\]

The conclusion is derived from the Durbin h asymptotic statistical Rule of Thumb states that the probability that a standard normal variant exceeds the value of \( \pm 3 \) is extremely small. Our Durbin h result is -0.357 which is lesser than \( \pm 3 \), we cannot reject \( H_0 \) and conclude that there exist no first order serial correlation of stochastic errors terms.

Test for multicollinearity.

Multicollinearity test is used here to ascertain the violation of the assumption of randomness of the explanatory variables of 2SLS model. In carrying out the test, we made use of the correlation matrix table.

Decision Rule:

If the pair–wise or zero–order correlation coefficient between two explanatory variables is high, say in excess of 0.8, then multicollinearity is a serious problem (Gujarati, 2004: 359).
Table 4.5: Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>IND</th>
<th>INF</th>
<th>KF</th>
<th>RER</th>
<th>RGDP</th>
<th>TOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IND</td>
<td>1.00</td>
<td>0.33</td>
<td>0.33</td>
<td>0.42</td>
<td>0.56</td>
<td>0.19</td>
</tr>
<tr>
<td>INF</td>
<td>0.33</td>
<td>1.00</td>
<td>0.31</td>
<td>0.39</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>KF</td>
<td>0.33</td>
<td>0.31</td>
<td>1.00</td>
<td>0.39</td>
<td>0.56</td>
<td>0.52</td>
</tr>
<tr>
<td>RER</td>
<td>0.42</td>
<td>0.39</td>
<td>0.39</td>
<td>1.00</td>
<td>0.85</td>
<td>0.74</td>
</tr>
<tr>
<td>RGDP</td>
<td>0.56</td>
<td>0.01</td>
<td>0.56</td>
<td>0.85</td>
<td>1.00</td>
<td>0.77</td>
</tr>
<tr>
<td>TOT</td>
<td>0.19</td>
<td>0.01</td>
<td>0.52</td>
<td>0.74</td>
<td>0.77</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: the variables were taken according to their order of integration.

From the above table, it can be seen that apart from real exchange rate, which shows slight correlation with real gross domestic product, other variables showed no multicollinearity since their pair-wise or zero order matrix is not up to or greater than 0.8. Consequently, we conclude that there is no serious multicollinearity among the variables, and the randomness of the explanatory variables is hereby met.

**Test for hetroscedasticity**

Hetroscedasticity in the context of 2SLS raises essentially the same issues as with OLS. The primary reason to test for hetroscedasticity after running for 2SLS is to detect violation of assumption 2SLS:5, which is one of the assumptions needed for the usual statistics accompanying 2SLS regression to be valid. The F-statistics can be used to verify this assumption, and the hypothesis is formulated as follow:

**Hypothesis**

- H₀: (There is no hetroscedasticity, i.e. homoscedasticity)
- H₁: (There is hetroscedasticity)

Decision Rule: Reject H₀ if the calculated F value is greater than the tabulated F value, otherwise accept H₀. The hetroscedasticity result is presented as:

### White Heteroskedasticity Test:

<table>
<thead>
<tr>
<th>F-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0260</td>
<td>0.004539</td>
</tr>
<tr>
<td>71</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obs*R-squared</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.067</td>
<td>0.001514</td>
</tr>
<tr>
<td>03</td>
<td></td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/08/10 Time: 06:28

### Coefficients Table

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1.400852</td>
<td>1.38862</td>
<td>1.008633</td>
<td>0.3215</td>
</tr>
<tr>
<td>KF</td>
<td>-0.000669</td>
<td>0.000257</td>
<td>-2.601783</td>
<td>0.0145</td>
</tr>
<tr>
<td>KF^2</td>
<td>1.28E-07</td>
<td>2.82E-08</td>
<td>4.539469</td>
<td>0.0001</td>
</tr>
<tr>
<td>IND</td>
<td>0.067413</td>
<td>0.040588</td>
<td>1.660918</td>
<td>0.1075</td>
</tr>
<tr>
<td>IND^2</td>
<td>0.000719</td>
<td>0.002000</td>
<td>0.359433</td>
<td>0.7219</td>
</tr>
<tr>
<td>LRER</td>
<td>-0.275602</td>
<td>0.399224</td>
<td>-0.690345</td>
<td>0.4955</td>
</tr>
<tr>
<td>LRER^2</td>
<td>-0.029152</td>
<td>0.077544</td>
<td>-0.375493</td>
<td>0.7097</td>
</tr>
<tr>
<td>LINF</td>
<td>0.693512</td>
<td>1.138819</td>
<td>0.608975</td>
<td>0.5473</td>
</tr>
<tr>
<td>LINF^2</td>
<td>-0.233508</td>
<td>0.218354</td>
<td>-1.069403</td>
<td>0.2937</td>
</tr>
</tbody>
</table>

| R-squared | Mean dependent var | 1.000488 |
| Adjusted R-squared | S.D. dependent var | 1.602540 |
| S.E. of regression | Akaike info criterion | 3.150267 |
| Sum squared resid | Schwarz criterion | 3.538116 |
| Log likelihood | F-statistic | 3.026071 |
| Durbin-Watson stat | Prob(F-statistic) | 0.004639 |
Following the above result, calculated F value = 3.026071 and the F probability value = 0.004639. Therefore, since the calculated value of 3.026071 and F probability is not significant we then accept $H_0$ of homoscedasticity and conclude that the conditional variances of the error terms are equal.

**Conclusion**
The study has investigated the impact of capital flight on the economic growth in Nigeria. Furthermore, following the behavioural pattern of the variables, we adopted Autoregressive Distributed Lagged model (ARDL) and Two Stage Least Squares techniques (2SLS) in the study. The result of the Two Stage Least Squares shows that all explanatory variables were statistically significant except interest rate differential and term of trade which are statistically insignificant. Also, the coefficient of determination $R^2$ was found to be high which indicated that the explanatory variables were able to account for greater proportion of the total variations of the dependent variable gross domestic product. (GDP).

The value of Durbin-Watson statistic (DW) shows that there was no presence of auto correlation; hence the model produced a parsimonious result. The result also shows that there was no endogeneity problem and the variables were significant.

From the findings of the study, the following can be inferred:

1. Capital Flight (KF) which is a proxy for net flows shows a negative impact on exchange rate and Gross Domestic Product (GDP).
2. Inflation Rate (INF) which measures the macroeconomic stability of the economy has a negative impact on exchange rate and the Gross Domestic Product.
3. Real exchange rate (REXR) measures price of other currencies has a positive relationship on Gross Domestic Product.(GDP).
4. Interest rate differential (IND) which is the difference between international and domestic interest rate shows positive relationship with the Gross Domestic product.(GDP)

Thus the study recommend in the light of the findings and analysis of this research, that a strategic management of foreign direct investment inflow transactions is needed to avoid possible leakages of the same money going out as capital flight. There is need for policies which stimulates economic growth to be imbibed since increase in economic growth reduces capital flight. The study also recommends that the government should take concerted step to improve security of life and property in the country because security lapse is a threat to investment as well as business. The Amnesty Programme extended to militants in the Niger Delta region should also be sustained and strengthened in order to boost or stabilize economic activities which could lead to sustained economic growth and development in the country.

Furthermore, since high but sustaining economic growth reduces capital flight in the country, there is need to address the decay in the critical infrastructures- power, transport, water etc as this will help to boost domestic investment as well as attract foreign investors.

Finally, the government should partner with anti-graft agencies to ensure that all the channel through which public office holders launder money abroad are stopped. And a stable financial and macroeconomic environment that would reduce domestic economic uncertainty, reverse capital flight and attract foreign direct investment should also be created.

**References**


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Vanguard Newspaper (29 August, 2009) How far Can Sanusi Go To Check Effects of Clampdown on Banks?