Real Exchange Rate Distortions and External Balance Position of Nigeria: Issues and Policy Options

By

Agu, Chukwuma
African Institute For Applied Economics
128 Park Avenue, G.R.A,
P.O. Box 2147
Phone: +234 (0) 42 256 644
+234(0) 803 704 5453
Fax: +234 (0) 42 256035
E-Mail: shookslife@yahoo.com
aiae@infoweb.abs.net


August 2002
Abstract

This research paper examines the position of the observed real exchange rate (RER) in relation to its unobservable equilibrium position, estimating the time path of the latter using the single equation procedure. It found out that over the sample period, real exchange rate misalignment (measured as the deviation of the actual from the estimated equilibrium path) was irregular but persistent. Misalignment was also found to be higher during the period of deregulation than during that of regulation. After generating the misalignment and volatility of the RER, this work proceeded to ascertain the influence of these distortions on the balance of payment – a gauge of the external balance position of the country. It was then observed that real exchange rate distortions (misalignment and volatility) hurt both the trade balance and the capital account. However, while RER misalignment is critical to the two external sector variables, volatility matters more to the flow of capital. The paper therefore recommends a more realistic management of investment environment (with an eye on stability), public sector expenditure and other fundamentals as a necessary complement to nominal devaluations in the search for stronger external positioning.
1. **Introduction**\(^1\)

This perceived non-response of real variables to nominal devaluations has forced researchers to look into the concept of exchange rate as not just the ratio of exchange between two national currencies, but as that involving the nature and value of other sets of economic activities within an economy. That is the concept of the real exchange rate.

On the nominal front, Nigeria has not fared too well. Structural adjustment programmes have come and gone but the national economic ailment remains. The situation looks even bleaker when considering the fundamentals of production and absorption. Fiscal and aggregate deficits have joined forces with a large debt overhang since the advent of the oil shocks of the 1980s to perpetuate resource leakages out of the country. Gross loss of man–hours and other forms of capital under utilisation occasioned by epileptic energy supply system, industrial disputes and ethnic/religious violence complete the cycle of conditions requisite for low domestic productivity. In the face of these, the maintenance of external balance still remains an absolute necessity. Little doubt, there is a relationship between these real exchange rate variables and the external balance position of the country. (We remember that the interaction of domestic absorption, domestic production and net resource flows define external balance). In the face of relatively low inflow of foreign capital and the perceived ineffectiveness of official development assistance, a re–assessment of the fundamentals of production and absorption becomes the only way to a sustainable external balance position for Nigeria. That is what this work sets out to do.

2. **The Problem**

Optimal exchange rate policies aim at evolving real exchange rate (RER) that maintains internal and external balance in an economy. Internal balance here is defined in terms of the level of economic activities consistent with satisfactory control of inflation and full employment of resources. External balance on the other hand is defined in terms of balance of payment equilibrium or sustainable current account deficit financed on a lasting basis by expected capital inflows (Williamson 1982: 43; 1995; Komolafe 1995: 73; 1996: 65; Baffes et al 1997; 1999). This intricate balance though an absolute necessity for the health of any economy remains difficult to achieve. Improvement on the international competitive edge of any country falls back heavily on the real exchange rates. Any distortions in the real exchange rate will most probably lead to distortions in both internal and external balance. While this is so, a growing debate centres on the nature and level of distortions in the real exchange rate of developing countries, and especially those of sub-Saharan Africa. A major

---

\(^1\) The author is grateful to Professor C.C. Soludo of the African Institute for Applied Economics, Enugu, Nigeria and an anonymous reviewer for helpful comments on an earlier draft
reference point has remained the East Asian miracle largely attributed to effective exchange rate management (see Elbadawi and Soto 1995a for example)

Policy analysts are yet to come to a consensus on what “good exchange rate policies” are and how they can be sustained. But quite a couple of issues are no longer grey in the literature and these include: the macroeconomic trilemma associated with exchange rate and monetary policy management, the need for a competitive exchange rate policy in international transactions, and the primacy of exchange rate stability and structural alignment in promoting this competitiveness. The first two have been subjects of much discussion in the literature. The third, for reasons bordering on methodology and lack of appreciation of its part has been largely neglected especially in relation to discussions on management of exchange rate in sub Saharan Africa. To press this point further, a look at the guiding principles of the World Bank and IMF sponsored structural adjustment programmes undertaken in most countries of SSA shows the prioritisation of issues related to depreciation without equal concern on the equilibrium position of the exchange rates (see Tarp 1993 for example).

Finally, if exchange rate misalignment/volatility matters, it definitely matters through its effects on some measurable variables of economic positioning of a country. The hunch that is to guide this study is that it does so for the balance of payments position of the country. Thus this study intends to look at the current state of the art on the exchange rate literature and obtain the misalignments/volatility of the exchange rate in Nigeria. It shall thereafter disaggregate the balance of payments into the component trade balance and capital account balance and we shall explore the implications of such distortions in the exchange rate on these variables.

Is this effort worth it? This researcher believes it does. For one, we have noticed the widespread interest in the exchange rate by citizens, which in itself is normal. For until the world comes under the same currency, the question of exchange rate management remains one we shall continue to live with. However, most of such interests and the consequent generalisations are often based on false premises. This is the case even among some practicing economists. Beyond that the maintenance of external balance boils down to a firm grasp of the nature of the effects of real exchange rate movements on the balance of payments (BOP). We also acknowledge that different components of the BOP may have different responses to RER misalignment and volatility. Under such circumstances, articulation of policies precisely aimed at the activation and control of either trade balance or net capital flows predisposes an empirical grasp of the nature and magnitude of these differential impacts on the Nigerian external balance variables.
In light of the above, this work intends to estimate the time path of the equilibrium real exchange rate (ERER) for Nigeria conditional on the fundamentals, assess the nature and extent of the misalignment over the years and estimate the impact of misalignment and volatility (if any) on the basic components of the balance of payments (BOP). The maintained hypothesis being that even when there be any distortions, they have no impact on the balance of payments position of the country. It shall not enquire into the sustainability of the equilibrium rates (Aron and Ayogu 1995). Finally, this work is not an assessment of the superiority or otherwise of any exchange rate regime. These areas may yet prove to be viable options for future research in exchange rate in Nigeria.

3. **Theoretical Framework:**

Hooper and Mann (1989) and Blundell-Wignall and Browne (1991) spearheaded the works on fundamental determination of the real exchange rate. The identified fundamentals are real interest rate (differentials) and current account imbalances. The model asserts that shocks that drive the exchange rate away from the fundamentals will ultimately release it back to levels projected by those variables. A major problem that has tugged at the heart of empirical research is the issue of appropriate definition of the concept of "equilibrium" in the measurement and analysis of the real exchange rate. Four related but distinct concepts have emerged in the literature:

1. The PPP approach which holds that RER for a given country ought to remain constant all through while nominal exchange rate adjustment will instantaneously make up for any price differential between a country and its trading partners (Elbadawi and Soto 1995 b).

2. The Equilibrium Real Exchange Rate (REER) concept of Edwards (1989) which seeks to estimate an inter-temporal time path of the equilibrium RER predicated upon both the current and anticipated values of the fundamentals.

3. The Fundamental Equilibrium Exchange Rate (FEER) is associated with Williamson (1994), and assumes behavioural specifications of the fundamentals, thereafter deriving the equilibrium RER in the context of a bigger model given the assumed path of the fundamentals.

4. The fourth concept of RER - the desired Equilibrium Exchange Rate (DEER) is attributed to Bayoumi et al (1994) and stresses the fact that equilibrium RER concept is first and foremost associated with a set of "desired" macroeconomic objectives.

Stryker (1990:276-282) applied the PPP to equilibrium exchange rate determination for the export of agricultural commodities in Ghana. He obtained the real exchange rate (RER) and compared that with the nominal exchange rate (NER) during the sample period and concluded that over-valuation of the national currency became a problem when exchange controls were strongly enforced (alongside expansionary monetary policies) - a situation that resulted in unmanageable
inflationary pressures. He however used an arbitrary base period. Stryker's result was consistent with the findings of Edwards (1989) who showed that given a pegged exchange rate regime, expansionary fiscal and monetary policies would lead to persistent real over-valuation.


Elbadawi and Soto (1994), Baffes et al (1997), Elbadawi and Soto (1995) estimated equilibrium RER for Chile, Cote d'Ivoire, and Burkina Faso, 4 SSA countries and 3 other developing countries respectively, using the co-integration ECM. In each case, it was found that the difference stationary values of the fundamentals were significantly correlated with the equilibrium RER and that the sustainability of the former depended highly on the values of the latter.

Finally, the effects of such distortions on the West African integration effort have been explored by Ogunkola [2000] who followed a rather conventional approach based upon the assumptions connecting the real exchange rate with the three basic conditions of monetary union success i.e. labour mobility, trade diversification and the openness criteria [Vaubel 1978]. Assuming two country groups, one with fixed exchange rate and the other without, Ogunkola defined relative exchange rates of the two country groups as the deviations of the sum of the logarithm of domestic price level and that of the nominal exchange rate a country within a group with that of the rest within the region less the domestic prices of the other country groups. However, while concluding that a monetary union will be more sustainable now in West Africa than before, the submitted that there will still be need for greater convergence between the two country groups to cement this already bright outlook.

Given the above, the relevance of this work derives from the following observed weaknesses of the reviewed models

1. Despite the structural deficiency of the PPP approach as outlined earlier, most of the empirical works reviewed above adopted it in the estimation of equilibrium RER.
2. Some others like Soludo and Adenikinju (1997), and Komolafe (1995; 1996) that used the ECM to estimate the RER and its misalignment took a micro approach to the application of their findings and handled only individual countries.

3. The models reviewed have not adequately covered current developments especially as regards to the implications of these distortions on monetary integration projects.

4. In addition, the assessment of the effects of real exchange rate distortions on the balance of payments and the effects these will have on the long run sustainability of the monetary union efforts of the sub region through the pressures they will exert on the balance of payments have not been explicitly modeled.

4. **The Analytical framework**

   Following the Salter-Swan definition of the real exchange rate RER of the mono product, non-industrial developing country as the relative price of tradables to non-tradables, we assume a three sector (and three commodity) economy consisting of exportables, importables and non tradables (Hinkle and Nsengiyumva (1999: 176 - 201); Williamson (1995: 19); Elbadawi and Soto (1994:2-4); Soludo and Adenikinju (1997: 8); Baffes et al, (1997: 2: 1999); Ogun (1998: 8)). The international prices of tradables are assumed exogenous (the familiar small country assumption). Domestic price of tradables is given as-

   \[ P_T = P_T (e, t_x, t_m, P_x^*, P_m^*) \]  (1)

   While that of non-tradables is given as

   \[ P_N = P_N (P_x, P_m, P_n). (A/Y - g) + g_N. g \]  (2)

   Where \( P_T \) = Price of tradables, \( P_N \) = price of non tradables, \( e \) = exchange rate, \( t_x \) = taxes on exports, \( t_m \) = import taxes, \( P_x, P_m \) and \( P_N \) are domestic prices of exports, imports and non tradables respectively, while (*) represents their foreign counterparts, \( A/Y \) is the absorption to output ratio, \( g \) is government expenditure while \( g_N \) is the proportion of these expenditure that goes to non tradables. Absorption is conceptualised here as the total of the economy’s consumption, investment and government expenditure. Our exchange rate equation thus becomes:

   \[ e = e(P_T/P_N) = e \frac{(e, t_x, t_m, P_x^*, P_m^*)}{(P_x, P_m, P_N)(A/Y - g) + g_N. g} \]  (3)

   Here we assume also that the terms of trade (TOT) variables \( (P_x^*, P_m^*, P_x, P_m) \) are captured by variations in the current account balance (Pikoulakis 1995). Net capital flows as a ratio of output \( (K/F/GDP) \) and expected exchange rate \( (e_{t+1} - e_t) \) define private sector absorption while fiscal policy reflecting in the BOP accounts as either autonomous or accommodating transactions represents our \( g_N \). We however decompose capital flows into long run and short run flows, portfolio investment
and FDI. Because there is inadequate data on portfolio investment, (none exists up to 1985 in the Central Bank of Nigeria Statistical Bulletin) we exclude it from the estimation variables. Our exchange rate equation therefore becomes

$$e = e \left( \frac{LK_F}{Y}, \frac{SK_F}{Y}, \frac{FDI}{Y}, t_x, t_m, g_N, g, e_{t+1} - e_t \right)$$

(4)

Following Elbadawi and Soto, we proxy $t_x$ and $t_m$ by volume of exports and imports as ratio of GDP which we define here as openness (EXM). This is justified on two grounds:

a. The difficulty of obtaining good time series data on $t_x$ and $t_m$ in Nigeria.

b. EXM may account not only for explicit commercial policy but also for implicit factors such as quotas, and exchange controls that affect trade significantly.

Finally, we bring in public debt to output ratio and political instability proxied by coups as country specific instability factors. On the nominal front, recommendations for devaluation are often based on the non-sustainability of deficits and public debt and frequent changes in regime also mean frequent changes in the fundamentals of exchange rate. Our final exchange rate equation, expressed in logs becomes:

$$\log e_t - \lambda \log e_{t-1} = \alpha_0 - \alpha_1 \log EXM + \alpha_2 \frac{g}{Y} - \alpha_3 \frac{D}{Y} + \alpha_4 \frac{LK_F}{Y} + \alpha_5 \frac{SK_F}{Y} + \alpha_6 \frac{FDI}{Y} - \alpha_7 C + \mu_t$$

(5)

The sum of exports ($X$) and imports ($M$) to GDP ratio, given as EXM, is expected to impact negatively on the exchange rate through the influences of the various exogenous shocks (changes in international price of oil given constant prices of the nation’s imports, technological improvements by either the country or its trading partners) on domestic terms of trade (TOT). High EXM $G/Y$ (government consumption expenditures) which proxies for government propensity to spend on non-tradables is expected to positively impact on RER as it raises the relative price of non-tradables and so appreciates RER. The balance of payments (BOP) components - long run capital flows ($LK_F$), short run capital flows ($SK_F$) and foreign direct investment (FDI) - are all expected also to have positive impacts while the instability factors, Debt to GDP ($D/Y$) and Coups ($C$) are expected to have negative influences on RER. $\mu_t$ is a white noise error term satisfying all the assumptions on the stochastic random variable (Koutsoyiannis 1977; Gujarati 1995). Expressing the equations in log form permits a linear expression of otherwise non-linear relationships and allows for the definition of the estimated co-efficients as elasticities besides simplifying the estimation processes.

**Equilibrium Real Exchange Rate and the Single Equation System**

theoretical framework to simple equation terms, it has the advantage of providing a powerful framework for separating long run and short run effects of variables on the real exchange rate (RER). It also avails a simple computation of its equilibrium level. We can solve equation (5) recursively to get
\[ \log e_t = \sum \lambda_t \alpha_t F_{t+1} \quad (6) \]
And applying the co-integrating vector, we have that
\[ \log e_t = \frac{1}{1 - \lambda} \alpha_t F_t + \mu_t \]

The error correction term \[ ((1/ (1 - \lambda)) \alpha_t - \log e_t] \] incorporates the forward looking sources of RER dynamics and is the result of the regression of the residuals from the co-integrated equation introduced to capture the effects of short run variations in the fundamentals and its coefficient lies between 0 and 1, indicating the speed of adjustment.

**Sustainable Fundamentals and the Equilibriums Real Exchange Rate**

There are several approaches to the generation of the 'sustainable' fundamentals in the determination of ERER (Baffes et al, 1997: 19 - 20; 1999: 445 - 446). One very popular method used by Soludo and Adenikinju (1997), Elbadawi and Soto (1994) is the Beveridge-Nelson (B-N), decomposition technique. The B-N technique assumes that each of the fundamentals follows a univariate Autoregressive Integrated Moving Average (P, 1, q) process with the autoregressive (AR) and moving average (MA) components generating stationary fluctuations about an underlying random walk. The permanent component, \( Z_t \) of the non-stationary variable \( Y_t \) becomes
\[ \Delta Z_t = \mu_t + \frac{1}{1 - \theta_1 - \theta_2 - \cdots - \theta_q} V_t \quad (9) \]
Where \( \mu_t, \theta_i, \) and \( p_i \) are parameters describing the ARMA (P,q) process of the first difference of \( Y_t \) and \( V_t \) are innovations of the original series.

Another method is to calculate the values of the sustainable values using centred moving averages of the fundamentals in both the stationary and non-stationary cases. This method has been argued to smooth the individual series more substantially than the B-N decomposition technique. Again the B-N approach particularly raises problems in small samples as the result obtained can be very sensitive to the underlying ARIMA specification and can blow up turning points in theoretically implausible ways. In the MA method, the corresponding MA of Bf is taken to be the equilibrium rate. (Soludo 1997: 13 - 14; Baffes et al 1997; 1999).

Yet, a third technique takes an ex-ante approach to modelling of the permanent components of
the fundamentals. It proceeds by generating counterfactual simulations of the values of the fundamental basis of a priori theory and knowledge of country specifics. It is closely related to Bayoumi's (1981) desired RER concept, though it aims more to reflect the reality of the values of these fundamentals. Some of the advantages of this method include the fact that it breaks the implicit assumption of zero misalignment within sample, which the other two methods based on time series adopt. Again time series decomposition and moving average methods make it difficult to distinguish persistent but unsustainable changes. To a large extent also, it can be used to look into potential effects of changes in the fundamentals especially for those that may be under policy control. This study shall take the first two methods (i.e the Beveridge-Nelson and the Moving Average methods) and compare the results. We shall also estimate misalignment using the equilibrium exchange rate estimates obtained from both, and assess their policy implications. For the dummy, Coups, we shall use the Halvorsen and Palmquist (H-P) methodology for dummy parameter estimation in the calculation of the ERER. The H-P methodology takes the antilog to base e of the estimated parameter and subtract 1 from it.

**Estimating Extent and effects of misalignment/Volatility**

We take misalignment to be the percentage difference between RER and its estimated equilibrium value. This is summarised as

\[ M_t = [\ln e_t - b F_t] + b(F_t - F_t^p) \]  

In the above equation, misalignment is decomposed into a term that implies the deviation of current fundamentals from sustainable values \( b(F_t - F_t^p) \) and an error correction term that captures the deviation of exchange rate from the estimated RER. Soludo and Adenikinju (1997) and Ogun (1998) estimated misalignment using the equation

\[ M_t = \frac{ERER - RER}{RER} \times 100 \]

We expect the results obtained to tally with that of the former equation.

For volatility, we follow the leads by Mlambo (1997) and use the standard error of the RER estimated from a first order autoregressive equation. Our function becomes

\[ RER - ERER = b_1 (RER_{t-1} - ERER) + \mu_t \]

If we denote equation (12) by \( e_t \), \( V_t \) becomes \( \sqrt{[(Q^2).e_t]} \) ie Standard Deviation of \( e_t \).

To assess the effects of RER misalignment and volatility on the BOP, we estimate reduced form equation for the BOP, which incorporate the RER distortionist variables i.e.

\[ BOP = BOP (DEF, RES, Mt, V_t, r_t, r_{t-1}, NX) \]
But then, we note that RER movement and distortions may not have the same impact (both in direction and magnitude) on the different components of BOP. So we decompose the BOP into trade balance and net capital flows and estimate reduced form equation for both variables viz

\[ TB = TB \left( RER, NER, M_t, V_t, \Delta GDP, NX \right) \]  
\[ (14) \]

\[ KFL = KFL \left( RER, NER, M_t, V_t, \Delta EF, RES, r_t \right) \]  
\[ (15) \]

Where TB is the trade balance, RER is the real exchange rate, NER is the nominal exchange rate, RES is the ratio of foreign reserves to GDP, \( \Delta GDP \) is the growth rate of GDP, NX is the net export, \( r_t \) is interest rate, DEF stands for government deficits while \( M_t \) and \( V_t \) stand for misalignment and volatility of the real exchange rate. These we will estimate using ordinary least squares (OLS). Tests for stationarity and co-integration shall be conducted using the Augmented Dickey Fuller (ADF) procedures.

5 Empirical Results: The Real Exchange Rate Model

The estimated real exchange rate model is presented in Table 1 of the Appendix. The initial estimations started with over-parameterised Autoregressive Distributed Lag (ADL) models of the real exchange rate (RER) including lags of up to 4. (See Banerjee et al 1991, Adam 1992: 28-34).

The model shows that a high FDI to GDP ratio appreciates the RER. This is probably on account of the fact that most FDI come with foreign inputs. Large amount of the (non-oil) productions made with such inputs are resold at the domestic market thereby raising the price of non-tradables relative to exportables.

Terms of trade improvement lead to RER appreciation. This implies that the substitution effect of terms of trade changes dominates the income effect. This is much to be the case in Nigeria with a high proportion of increases in income being channelled into imported products. Also increases in the real interest rate appreciate the real exchange rate (necessitating the depreciation of the equilibrium rate). The Mundell – Fleming framework identifies interest rate differential as a major determinant of the movement of resources across borders. High interest rate raises stock demand for domestic assets thereby increasing capital inflow. This raises domestic absorption relative to production.

A rather interesting result came with the lag of real GDP. Growing income appreciates the exchange rate. The implication is that higher income levels are not channelled to higher production of exportables within the economy but are spent on non-tradables such that the price of non-tradables rises relative to that of exportables on account of increased demand. This is a debatable position though, but consistent remodelling attempts presented us with the same results.

The openness variable consistently depreciated RER. Classical economic theory is in line with this finding. Policies that restrict trade unduly have also been known to reduce overall competitiveness
of countries. On the whole, both long and short run capital flows, recurrent expenditure to GDP, trade balance and number of man-days lost as a risk variable all appreciate the RER. The first two variables mentioned impact directly on the nominal exchange rate, interest rate and domestic absorption. In whatever form, capital inflows, by increasing domestic absorption relative to income leads to real appreciation. Another avenue through which long run capital inflows may appreciate RER is through its imposition of the obligation to repay. This serves as reinforcement on future loss of competitiveness (see Montiel 1999:282). Obviously, one implication of a negative relationship between RER and recurrent expenditure is that the latter had been concentrated on non-traded goods and that distortions arising from such expenditures had been borne more by the tradable sector (Soludo 1997:17). For the variable LMDL (log of man-days lost), the sign is not surprising. The persistent labour unrest in the country has helped to erode the country's competitive ability by increasing overall cost of production. It also reduces domestic productivity relative to consumption.

All variables in the equation are significant at the 5% level test except the index of openness (LEXM), which is significant only at the 10% level. The most significant individual explanation of the variation in real exchange rate is from foreign direct investment to GDP (FDI/GDP) with about 39% explanatory power. GDP and the two-year lag of RER explain 27% apiece and the lag of real interest rate 25%. The entire model accounts for approximately 72% of the variation in RER and is statistically significant. With a calculated Durbin Watson value of 1.88, the model passed the test for first order autocorrelation. The calculated F for Heteroscedasticity tests is .18 with an acceptance probability of .68, and a tabulated F of 4.45 showing that the variance of the estimated equation is time-invariant within sample and so we can pursue policy analysis and forecasting with the estimates. The test for Normality showed that the model is normal only at the 10% level. The regression specification test also satisfied the laid down conditions. Each of the tests conducted showed high levels of acceptance probability.

**Generating the Equilibrium Rate, Misalignment And Volatility.**

We promised to follow two methods in generating the sustainable fundamentals necessary for the calculation of the equilibrium real exchange rate (RER) i.e the Beveridge-Nelson and the Moving Average methods. The generation of the centred moving averages using SPSS was fairly straightforward. However we cannot say the same of the autoregressive integrated moving average (ARIMA) specifications necessary for the Beveridge-Nelson (B-N) methodology. A number of problems were encountered.

First the B-N technique simply makes assumptions of the variables following a univariate
Autoregressive Moving Average (ARMA) process of the first difference. The challenge was that some of the variables, being stationary ought not be differenced again. Besides, using the standard autocorrelation function (ACF) and partial autocorrelation functions (PACF) correlograms, the processes of the individual variables and/or the orders of the processes did not explicitly follow ARMA processes. As such, we restricted the ACF and PACF tests to finding out the necessary orders of the processes. We were also constrained to using the same order for both processes in each of the variables. Both information criteria (the Akaike and Schwartz Bayesian criteria) indicate some levels of mis-specifications but the restricted assumption of the B-N technique demands autoregressive moving average (ARMA) specifications of the first order. The values obtained from the technique were quite implausible and not amenable to meaningful economic interpretation. We also experimented with a third approach, which involves obtaining equilibrium real exchange rate (ERER) estimates using the de-trended series of the fundamentals. However as in the B-N approach, this also yielded implausible results. The equilibrium values obtained from both techniques consistently went beyond 200% of the observed. Accepting such results implies that there was never any overvaluation within the sample period. As such, in the estimation of the ERER and subsequent applications, we restrict use to the values obtained using the MA technique.

To obtain the real exchange rate (RER) volatility over the sample period, we estimated a first order autoregressive function (AR\textsubscript{1} process). The key variables in the autoregressive equation for the estimation of volatility are the same as in the model for the calculation of the long run RER except for such variables that became insignificant in the latter model. The calculated values for the autoregressive consistency and for normality tests are presented under the equation. Having judged the equation satisfactory, we proceed to obtain the volatility as the product of the standard error (SE) and the original real exchange rate series. We also tried two alternative estimation of volatility: the first as the product of the deviations of the RER from the ERER and the standard error of the AR\textsubscript{1} process, and the second as the product of the same standard error and the fitted values of the RER from the AR\textsubscript{1} equation. However, we settled for the results obtained using the first methodology. This is on account of the fact that the deviations of the original series should be more reflexive of actual variability than those obtained from derived series. Besides, the values obtained from the latter methodologies were not amenable to meaningful economic interpretations. The summary of the distortionary position on regime classification is presented in Table 2 in the Appendix section.
**Misalignment Summaries**

<table>
<thead>
<tr>
<th></th>
<th>Average Misalignment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre – Liberalization</strong> (1970 - 1985)</td>
<td>1.1425</td>
<td>18.28</td>
</tr>
</tbody>
</table>

Having obtained the values of misalignment and volatility, we then proceed to estimate the BOP equations (decomposed into the trade balance and the capital account equations). For each of the equations, we again begin with over-parameterised auto distributed lags (ADL) models and track down the relevant parsimonious form. Hereunder, we present the final models of the two.

### 6. The Trade Balance Model

The estimated trade balance equation is summarised in Table 3 in the Appendix.

Table 4 in the appendix shows the final equation of the trade balance. With the exception of nominal effective exchange rate, the rest of the variables are statistically significant. The model explains about 86% of total variation in the trade balance to GDP ratio and is significant. The tests conducted showed that there is no first order autocorrelation (with a D. W value of 1.95). The residual sum of squares is considerably low at 0.02. The tests for autoregressive heteroscedasticity showed no serial dependence of the explanatory variables or of any systematic information absorbed by the error term (see full tests under the diagnostic test section above). From the regression equation, we notice that RER misalignment exerts the most significant and negative influence on the terms of trade. A 1% rate of RER misalignment leads to .07% rate of change in the trade balance to GDP ratio. In absolute terms, this is obviously a much higher value.

The impact of RER volatility however is negligible in the model. Initial estimations produced values that were neither significant nor consistent with a priori expectations of the signs, so we dropped the variable. We thereafter, introduced other measures of economic uncertainty, for example, the total number of man-days lost owing to industrial dispute especially the oil (Shell BP) and the Niger Delta crisis. The latter has a very significant and negative impact on the trade balance. Another important factor in the determination of the trade balance to GDP ratio is the openness index (EXM). The model shows that the less the restrictions on trade, the greater the trade balance to GDP. Depreciation of the nominal effective exchange rate, positive variations in the terms of trade and increase in GDP itself are three other variables that exert significant influence on the trade balance.
These are all in line with the postulations of economic theory and other empirical findings.

7. **The Capital Account Model**

The capital account equation is presented in Table 4 of the Appendix. On the whole, the model is also significant explaining about 85% of the variations in the capital account. The Durbin Watson value for first order autocorrelation test is 2.00 with a residual sum of squares of 232. On both the autoregressive and constant variance tests, the model is judged satisfactory. The same goes for the normality and regression specification tests (see full tests under the diagnostic test section above). Real exchange rate misalignment and volatility seriously affect capital flow. The former has significant influence on the capital flow at both level forms and three-year lag. On the average, a 1% misalignment of the real exchange rate leads to over 4% decrease in the capital flow to GDP ratio. This is not a good story given that within the sample period, a gross over valuation of the RER of about 300% was recorded. In the same vein, RER volatility also matters much to the net position of the capital flow to GDP ratio. The implication is that the low capital inflow into the country and high capital flight out of the country (situations that have persisted despite many incentives to the opposite) are offshoots of real exchange rate distortions. Growth in GDP, real effective exchange rate depreciation, and the trade balance form another set of variables that affect capital flows positively. From the equation, it is obvious that misalignment and volatility affect the external balance more through the capital account than through the trade balance. The latter responds more to the level of openness to international trade, internal stability and the level of economic activity in the country.

8. **Summary**

This paper examined the position of the observed RER in relation to the unobservable ERER and estimated their time paths using the single equation procedure. We realized that over the sample period, RER misalignment was irregular but persistent. (A potential characteristic of the model-based estimates of ERER is the tendency towards zero mean value of the misalignment within sample). Having generated the misalignment, this work proceeded to ascertain the influence of these distortions on the balance of payments - a gauge of the external balance position of the country.

Obstfeld and Rogoff (1995) believed that should shocks (to the fundamentals) have short run effects due to nominal rigidities, they might lead to temporary current account imbalance. However we have shown here that such shocks have effects on the current account (the trade balance
specifically) and the capital account, which are not just temporary and negligible. From the models, RER volatility may not be a potential problem for the trade balance but for the capital account, it sure is. RER misalignment however, affects both the trade balance and the capital account significantly. Mussa (1986) also demonstrated that real exchange rates tend to be more volatile under floating than under fixed exchange rate regimes. This model did not find exactly that. It was rather observed that the misalignment spread throughout the whole of the sample period with no more remarkable increase in period of floatation than in period of fixation. So the distortions could have arisen from more fundamental factors in the economy. On external balance, it was observed that capital flows are more responsive to RER distortions than the trade balance - especially to RER volatility. However terms of trade, trade liberalization and industrial stability affect the trade balance significantly.

9 Implications For Policy

The recent efforts to woo foreign investors may yet need to focus on the question of the profitability of production in Nigeria if it is ever going to yield any fruit for the emerging economy. The real exchange rate of the country is high and distorted. Meanwhile, the average citizen tends to attach so much weight to nominal bilateral exchange rates (of the Naira viz–a–viz the U.S dollar), and believes so much that it holds the answer to the question of economic rebirth that we desperately need. But this study did not validate that view. Ajakaiye (1985) for example showed that the effect a nominal devaluation may have on the BOP depends on the structure of imports. Ghei and pritchett (1999) buttressed this. While this study did not delve into critical analysis of the nation’s import structure, we have shown, sixteen years after Ajakaiye’s work, that nominal devaluation may not be so much a critical factor in promoting competitiveness as a proper alignment of the structural fundamentals of the real exchange rate and domestic absorption. A particularly important set of variables to which the policy makers in the country may need to pay attention to are industrial disputes and the level of openness to international trade of the country. Again, there may be the need to restructure public spending in favour of tradables and minimise market distortions emanating from such spending exercises in order to minimize RER appreciation.

Capital flows estimates under this study support the findings of Kuczynski (1992:323) that the final outcome of such flows on an economy depends critically among other things, on the development of domestic fixed-income capital markets and political and social reforms. We also found that the instability that stems from the failure of existing institutions to channel savings (both
human and capital) into productive assets for the people may, by and large, hurt economic growth more. The call is not to legislate for or against capital inflow, but to restructure the institutions necessary for the proper channeling of the incoming capital into productive uses. The problem may not so much be with the capital as with the environment under which it is utilized.

No country struggles towards openness to international trade for its own sake. Its effects on the RER here justify economic theory. Therefore, less use of policy restrictions in international trade circles may help the country to reap more the dividends of surplus resources from the outside world. As nations move closer to one another, a critical complement to openness remain political and economic stability, an environment conducive to meaningful investment; policies that sharpen the competitive edge of private investors in the word market.

Stevenson et al (1988: 219) noted that “- - - a country running a continual current account deficit may be regarded in international capital market as being diminishingly credit–worthy and that, as a consequence, the capital account surplus required for overall external balance may only be secured at progressively higher domestic interest rates” (we may add 11- - - and other potential costs”). On the strength of that, misalignment and volatility negatively affect capital flow while the former also affects the trade balance. The potential effect of continual RER imbalances therefore is to trigger off a chain reaction that is self-perpetuating, continually reducing the relative competitiveness and income generating strength of the economy. This has been the Nigerian experience and is so grievous that often, nominal devaluation, large as they may be, are not strong enough to reverse these negative trends and set the economy back on the path of positive growth. For example, taking government expenditure over the sample period, one observes that overall deficits grew from N5290.9m in 1983 to N107,735m in 1993, an increase of close to 2000%. These deficits were financed mainly from domestic money creation (see CBN 1996). In 1982 and 1994, about 2.9 million workers and 1.54 million workers stopped work in 363 different occasions giving rise to 9.65 million and 244 million man-days lost for the two years alone. Real interest rates for the greater part of the sample period were negative. This discourages investment in capital goods and promotes involvement in rent–seeking enterprises and nominal transactions. The same story could be told for virtually all the other fundamentals. Even the country’s attempt at trade liberalization is continually being undermined. In the face of such debilitating factors, a 10% or 20% nominal devaluation cannot perform the miracle of turning the economy around.

The challenge therefore is to restructure public expenditure and other fundamentals to align with positive growth objectives. The over-valued real exchange rate of the sample period existed side by side with nominal devaluation. In fact, we see that misalignment became more severe for
the period of floatation than for that of fixation (see table on misalignment summaries), proving right the assertions of Taylor (1995:31) that “real exchange rate distortions tend to grow more during periods of floatation than during fixation”. This situation did not arise because macroeconomic variables can no longer respond to nominal devaluations, but because present structural and institutional arrangements inhibit such response. For example, the rate of capital flight from the country has soared astronomically since the 1980s. While the country bemoans the unavailability of capital augmentation from foreigners, we are yet to develop an acceptable formula for holding back even the capital produced within the country. The entire environment is made so hostile for investment and productivity that the only sensible thing an investor can do is to keep away – and that includes our indigenous entrepreneurs. The effect is the perpetuation of all manner of distortions. In the call therefore for stronger external positioning, the country needs to look inwards and re-assess the structure of these variables vis-à-vis its development objectives.
REFERENCES


Ajakaiye, Olu D., 1985. Short run effects of devaluation on the Balance of Payments: the influence of import structures” NJESS Vol 27 No 1 pp 1-10


Central Bank of Nigeria, 1991. *Annual Reports and Statement of Accounts* pp 120 Lagos,


Hooper, Peter and Morton, J., 1982. "Fluctuations In The Dollar: A Model of Nominal And Real Exchange Determination". Journal of International Money and finance, April 1 pp


Komolafe, Oluranti Stella, 1996 "Exchange Rate Policy and Nigeria's External Sector Performance: Implications for the Future" NJESS Vol. 38 No 1, 2 and 3. Ibadan: NES.


Montiel, Peter J., 1999."The Long Run Equilibrium Real Exchange Rate: Conceptual Issues


Appendix

Table 1: The Real Exchange Rate Equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-value</th>
<th>PartR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign Direct Investment</td>
<td>-0.23965</td>
<td>0.069500</td>
<td>-3.448</td>
<td>0.3849</td>
</tr>
<tr>
<td>Terms of Trade_2</td>
<td>-0.51589</td>
<td>0.24060</td>
<td>-2.144</td>
<td>0.1948</td>
</tr>
<tr>
<td>Lag of real exchange rate_2</td>
<td>0.56540</td>
<td>0.21600</td>
<td>2.618</td>
<td>0.2650</td>
</tr>
<tr>
<td>Real interest rate_1</td>
<td>-0.010864</td>
<td>0.004295</td>
<td>-2.529</td>
<td>0.2519</td>
</tr>
<tr>
<td>Recurrent expenditure_1</td>
<td>-0.57417</td>
<td>0.32901</td>
<td>-1.745</td>
<td>0.1381</td>
</tr>
<tr>
<td>Constant</td>
<td>16.872</td>
<td>5.4041</td>
<td>3.122</td>
<td>0.3391</td>
</tr>
<tr>
<td>Output</td>
<td>-1.1400</td>
<td>0.42616</td>
<td>-2.675</td>
<td>0.2736</td>
</tr>
<tr>
<td>Openness_2</td>
<td>0.12023</td>
<td>0.079738</td>
<td>1.508</td>
<td>0.1069</td>
</tr>
</tbody>
</table>

\[
\hat{R}^2 = 0.718842 \quad F(7,19) = 6.9397 \quad [0.0004] \quad \hat{\sigma} = 0.348962 \quad DW = 1.88
\]

RSS = 2.313712597 for 8 variables and 27 observations

AR 1-2 F(2, 17) = 0.22424 [0.8014]
ARCH 1 F(1, 17) = 0.17459 [0.6813]
Normality Chiý(2) = 6.7438 [0.0343]
Xiý F(14, 4) = 0.4702 [0.8686]
RESET F(1, 18) = 0.066146 [0.7999]

Table 2: Equilibrium Real Exchange Rate And Misalignment (1970-1998)

<table>
<thead>
<tr>
<th>Year</th>
<th>Observed</th>
<th>Fitted</th>
<th>Misalignment</th>
<th>Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>334.7169</td>
<td>623.8588</td>
<td>-86.384</td>
<td>63.2635</td>
</tr>
<tr>
<td>1971</td>
<td>337.3029</td>
<td>429.1959</td>
<td>-27.2435</td>
<td>63.7523</td>
</tr>
<tr>
<td>1972</td>
<td>341.1561</td>
<td>359.1945</td>
<td>-5.2874</td>
<td>64.4806</td>
</tr>
<tr>
<td>1973</td>
<td>347.1549</td>
<td>372.6777</td>
<td>-7.3520</td>
<td>65.6144</td>
</tr>
<tr>
<td>1974</td>
<td>333.1756</td>
<td>161.926</td>
<td>5.3992</td>
<td>62.9722</td>
</tr>
<tr>
<td>1975</td>
<td>299.2967</td>
<td>206.1228</td>
<td>31.1309</td>
<td>56.5689</td>
</tr>
<tr>
<td>1976</td>
<td>277.9626</td>
<td>212.3331</td>
<td>23.6110</td>
<td>52.5366</td>
</tr>
<tr>
<td>1977</td>
<td>246.1059</td>
<td>222.4375</td>
<td>9.6172</td>
<td>46.5155</td>
</tr>
<tr>
<td>1978</td>
<td>234.6239</td>
<td>340.6494</td>
<td>-45.1896</td>
<td>41.3453</td>
</tr>
<tr>
<td>1979</td>
<td>227.5932</td>
<td>193.1722</td>
<td>15.1239</td>
<td>43.0165</td>
</tr>
<tr>
<td>1980</td>
<td>345.5</td>
<td>212.8891</td>
<td>38.3823</td>
<td>65.3016</td>
</tr>
<tr>
<td>1981</td>
<td>269.239</td>
<td>300.3877</td>
<td>-11.5691</td>
<td>50.8878</td>
</tr>
<tr>
<td>1982</td>
<td>280.7773</td>
<td>210.2696</td>
<td>25.1116</td>
<td>53.0686</td>
</tr>
<tr>
<td>1983</td>
<td>325.516</td>
<td>312.2465</td>
<td>4.0764</td>
<td>61.5245</td>
</tr>
<tr>
<td>1984</td>
<td>401.53</td>
<td>523.4523</td>
<td>-30.3644</td>
<td>75.8916</td>
</tr>
<tr>
<td>1985</td>
<td>573.5</td>
<td>382.9979</td>
<td>33.2175</td>
<td>108.3949</td>
</tr>
<tr>
<td>1986</td>
<td>313.3</td>
<td>384.6083</td>
<td>-22.7604</td>
<td>59.2156</td>
</tr>
<tr>
<td>1987</td>
<td>120.2</td>
<td>88.1623</td>
<td>26.6537</td>
<td>22.7185</td>
</tr>
<tr>
<td>1988</td>
<td>120.5</td>
<td>321.4374</td>
<td>166.753</td>
<td>22.7752</td>
</tr>
<tr>
<td>1989</td>
<td>107.6</td>
<td>76.7361</td>
<td>28.6839</td>
<td>20.3371</td>
</tr>
<tr>
<td>1990</td>
<td>100</td>
<td>107.2956</td>
<td>-7.2956</td>
<td>18.9006</td>
</tr>
<tr>
<td>1992</td>
<td>70.5</td>
<td>86.7874</td>
<td>-23.1027</td>
<td>13.3249</td>
</tr>
<tr>
<td>1993</td>
<td>77.2</td>
<td>85.4043</td>
<td>-10.6273</td>
<td>14.5913</td>
</tr>
<tr>
<td>1994</td>
<td>142.8</td>
<td>320.2597</td>
<td>-124.271</td>
<td>26.9901</td>
</tr>
<tr>
<td>1995</td>
<td>122.1</td>
<td>206.029</td>
<td>-88.738</td>
<td>23.0776</td>
</tr>
<tr>
<td>Year</td>
<td>RTB/GDP</td>
<td>GDP</td>
<td>Capital Account</td>
<td>Profit</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-----</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>1996</td>
<td>167.7</td>
<td>141.3718</td>
<td>15.6996</td>
<td>31.6963</td>
</tr>
<tr>
<td>1997</td>
<td>193.1</td>
<td>129.825</td>
<td>32.768</td>
<td>36.4971</td>
</tr>
<tr>
<td>1998</td>
<td>203.6</td>
<td>182.211</td>
<td>10.5053</td>
<td>38.4816</td>
</tr>
</tbody>
</table>

Sources: UNCTAD Handbook of International trade and Development and Estimation Results.

### Table 3: The Trade Balance Equation

**Modelling RTB/GDP by OLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std.Error</th>
<th>t-value</th>
<th>PartR2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.058433</td>
<td>0.045843</td>
<td>1.275</td>
<td>0.0788</td>
</tr>
<tr>
<td>Terms of Trade</td>
<td>0.00098684</td>
<td>0.00030829</td>
<td>3.201</td>
<td>0.3504</td>
</tr>
<tr>
<td>Misalignment_2</td>
<td>-0.00073475</td>
<td>0.00015675</td>
<td>-4.688</td>
<td>0.5363</td>
</tr>
<tr>
<td>Output</td>
<td>0.17759</td>
<td>0.046114</td>
<td>3.851</td>
<td>0.4384</td>
</tr>
<tr>
<td>Openness</td>
<td>0.021134</td>
<td>0.0062602</td>
<td>3.376</td>
<td>0.3749</td>
</tr>
<tr>
<td>Man-days lost_1</td>
<td>-0.016253</td>
<td>0.0049363</td>
<td>-3.293</td>
<td>0.3633</td>
</tr>
<tr>
<td>Nom. effective Exchange rate</td>
<td>0.00093676</td>
<td>0.00063577</td>
<td>1.473</td>
<td>0.1025</td>
</tr>
</tbody>
</table>

R2 = 0.87613  F(6,19) = 22.398 [0.0000]  s = 0.0335887  DW = 1.95

### Table 4: Capital Account Equation

**EQ(11) Modelling RKF/GDP by OLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std.Error</th>
<th>t-value</th>
<th>PartR2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-270.03</td>
<td>47.389</td>
<td>-5.698</td>
<td>0.6309</td>
</tr>
<tr>
<td>Output_2</td>
<td>9.6206</td>
<td>3.9028</td>
<td>2.465</td>
<td>0.2423</td>
</tr>
<tr>
<td>Real exchange rate</td>
<td>32.927</td>
<td>6.5271</td>
<td>5.045</td>
<td>0.5725</td>
</tr>
<tr>
<td>Misalignment_1</td>
<td>-0.029224</td>
<td>0.019319</td>
<td>-1.513</td>
<td>0.1075</td>
</tr>
<tr>
<td>Misalignment_3</td>
<td>-0.039319</td>
<td>0.017070</td>
<td>-2.303</td>
<td>0.2183</td>
</tr>
<tr>
<td>Volatility</td>
<td>-0.46492</td>
<td>0.14312</td>
<td>-3.248</td>
<td>0.3571</td>
</tr>
<tr>
<td>Nominal exchange rate_1</td>
<td>1.9714</td>
<td>0.66662</td>
<td>2.957</td>
<td>0.3152</td>
</tr>
</tbody>
</table>

R2 = 0.789916  F(6,19) = 11.907 [0.0000]  s = 4.10608  DW = 2.44

### Additional Statistical Tests

- AR 1- 2F( 2, 17) = 0.080265 [0.9232]
- ARCH 1 F( 1, 17) = 0.15141 [0.7020]
- Normality Chi2(2)= 2.0697 [0.3553]
- Xi2 F(12, 6) = 1.3716 [0.3646]
- RESET F( 1, 18) = 1.292 [0.2706]