EQUILIBRIUM REAL EXCHANGE RATE AND CAPITAL FLOWS IN NIGERIA (1960-2011)

Ibrahim W.
Department of economics
Al-Hikmah University, Ilorin

Abstract

The paper investigates the effects of real exchange rate misalignment on capital inflow in Nigeria between the year 1960 and 2011. The paper computes real effective exchange rate using 17 trading partners of Nigeria while the purchasing power parity (PPP) adjusting for Ballassa-Samuelson approach was employed to obtain equilibrium real exchange rate over time. Also, the two stage error correction method developed by Engel and Granger (1989) was used to find the effects of real exchange rate misalignment on foreign direct investment (FDI) inflow in the country. The paper observed that the extents of misalignment vary from time to time within the period of study and that this misalignment has a significant depreciating effect on the inflow of FDI to the country. The study recommends an open guided exchange rate system in order to minimize the extent of real exchange rate misalignment and thus reducing its effects on major economic indicators such as foreign direct investment.

1.0 INTRODUCTION

At an international policy discussion held in Paris, 2011 by G20 finance ministers and their Central Bank Governors, the need to pursue domestic stabilization and correcting external imbalances were stressed. The forum intends to achieve their mission by strengthening multilateral co-operations. Also, giving due consideration to exchange rate movements, fiscal and monetary policies, and these countries agreed to develop indicative guidelines to deal with external imbalances. Issues were also raised concerning real exchange rate misalignment, deficit current account positions and excessive fluctuations in capital flows. This has prompted the needs to redirect macroeconomic policies toward correcting exchange rate misalignment and unsustainable current account balance.

In a developing country such as Nigeria, Capital inflow provides much needed investment as its finances current account deficits. For instance, the rise of the Asian tigers has been linked to openness including rising foreign investment. This is the reason why trade liberalization has become part of an overall growth and development strategy for many less developed countries.

One of the major determinants of capital inflow to any country is the equilibrium real exchange rate. When the actual real exchange rate deviates from the 'ideal' rate, the exchange rate has misaligned. Real exchange rate misalignment can lead to inadequate resource allocation which in turn affects the economic structure of the economy. Currency overvaluation can hinder economic growth and affect over all competitiveness of the economy, it can as well lead to capital flight. As a result of the role usually play by exchange rate misalignment, developing countries are encourage to get their policy right. As well, attention of researchers has been

drawn to how to minimize this menace of over time in order to reduce its impacts on various economic indicators such as capital flows and current account balance.

This paper focuses on the effects of real exchange rate misalignment on capital inflows in Nigeria between the year 1960 and 2011. In order to achieve this objective, the paper estimated the equilibrium real exchange rate over time using the purchasing power approach (PPP) adjusting for Ballassa- Samuelson effect. Misalignment is computed as the difference between the actual real effective exchange rate and the computed equilibrium real exchange rate. The belief of this paper is that, before a corrective measure can be taken, the extent of distortions must be established, then, the effects of the distortions on the inflow of capital to the country are examined.

Apart from this introductory section, the next section deals with the review of relevant literature, section three is concerns with research methodology, in section four, the analysis of result was done while section five concludes the work.

2. REVIEW OF RELEVANT LITERATURE

2.1 Equilibrium Real Exchange Rate through PPP Adjusted for the Balassa-Samuelson Effects

In an attempt to answer the question 'what meaning can be attached to an international comparison of exchange rates and PPP' Balassa(1964) amended the traditional two-countries, two commodities model of international trade. In his analysis, a non-traded good (services) and one factor of production (labour) were included. With the assumption of constant input coefficient and constant marginal rates of transformation, he opined that, 'when one of the countries has absolute advantage in the production of all commodities, but the advantage is greater in regard to traded goods than non-traded goods, the relative price of the non-traded commodity will be higher in the country with higher productivity levels than the other country'.

Formulating this proposition in terms of absolute prices (expressing the prices in terms of wage units), the prices of traded goods remain unaffected since they are equalized in the two countries through international exchange. Accordingly, irrespective of which country's consumption patterns used as weight, the PPP between the currencies of the two countries will be less than the equilibrium rate of exchange. Buttressing this position, using international productivity differential, they opined that, if productivity differential between countries are greater in the production of traded goods than that of non-traded goods, the currency of the country with higher productivity levels will be over-valued in terms of PPP. They used per capita income as a representative of levels of productivity, thus, the ratio of PPP to the exchange rate will be an increasing function of income levels.

In order to improve upon the predictive power of the PPP theory, various authors have specified their models for testing the PPP theory to include the variable of productivity differentials in both tradable goods and the non-tradable goods sector (Edwards and Savastano, 1999:23; Egert, 2005:15; Ivanova, 2007:16; Rodrick, 2007:17 among others).

According to Isard(2007:12-13) and Miao and Berg(2010:7), at empirical level of application of Balassa-Samuelson effect, real exchange rate function is usually expressed to include among other fundamentals the GDP per capita or a proxy for productivity differentials where data on tradable and non-tradable outputs could not be obtained.

The work of Rodrick(2007:17-22) extensively account for Balassa-Samuelson effect in his analysis of equilibrium exchange rate. He started by fitting a regression equation as follows:

$$LnRER_{it} = \alpha + \beta PGDP_{it} + f_t + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.1$$

Where RER is the real exchange rate, PGDP represent per capita GDP, f_t is a fixed effect for time period and u_{it} is the error term. The author uses panel data set consist of 184 countries and

eleven 5-year time periods from 1950-54 through 2000-2004. Using OLS to estimate equation 2.1, the result obtained (β= -0.24, with high t-statistic of around 20.0) suggested a strong support for Balassa-Samuelson effect. In order to obtain the index of under-valuation, he takes the difference between the actual real exchange rate and the Balassa- Samuelson adjusted rate. The value above unity indicates under-valuation and when the value is below unity, an over-valuation is suggested. Berg and Miao (2010:7-9) employed a similar model as in Rodrick(2007) and the result obtained corroborates the former study.

In another empirical study using this approach, Ivanova (2007:16) opines that in order to capture the Balassa-Samuelson effects one needs to proxy for sectoral productivity. To do this, due to data limitations for Russia, he employs the use of time trend as a proxy for productivity gains in the exportable sector. In an attempt to implement the macroeconomic balance approach to equilibrium real exchange rate, he introduced into his export function additional variable (time trend) to capture the Balassa-Samuelson effect.

He stated an export equation that captures the effect as follows:

$$LnX_t = \alpha + \varepsilon_x LnRER_t + \eta_x LnY_t + \delta_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots 2.2$$

Where X is volume of export over time, RER is the real exchange rate over time, Y is output, δ is time trend capturing Balassa-Samuelson effect over time and μ is the error term. The result obtained later indicates a serious serial correlation in the error terms when static OLS was used and time trend prove insignificant when he adopted dynamic OLS and Johansen ML method. He finally analyzes his result without taking the effect into consideration.

This study then estimates a real exchange rate equation such as equation 2.1. The fitted values from such equation represent equilibrium real exchange rate over time, while the difference between the actual real exchange rate and the equilibrium rate indicates real exchange rate misalignment. The absolute values of the misalignment indicators obtained are later incorporated into a theoretical based capital flows model.

2.2 Real Exchange Rate Misalignment and Capita flows

Literature on the effects of real exchange rate misalignment on capital flows are hard to come by. In most cases, literature in this area is only concentrated on either the impact of real exchange rate on capital flows or vice versa. For instance, Elbadawi and Soto (1994) examine the relationship between four components of capital flows (short-term capital flows, long-term capital flows, portfolio investment and foreign direct investment) on the equilibrium real exchange rate. Despite the fact that the basic theory allows the estimation of the long-run link between capital flows and the real exchange rate, they opined that, the cointegration equilibrium does not offer any guidance on the direction of causation. In order to address the issue, they test for the existence of feedback effects from the real exchange rate to capital flows using the method suggested by Phillips and Loretan (1991). The result obtained indicates that the leads of the fundamentals used for feedback effect test are not significant. This result is consistent with the granger causality test previously adopted. In their final analysis, their error correction model shows that short-term capital flows and portfolio investment have no significant effect on the equilibrium real exchange rate but long-term capital inflows and FDI have a significant appreciating effect on the equilibrium real exchange rate.

Also, Edwards (1998) examined the relationship between capital flows, real exchange rate and international competitiveness in selected Latin American countries. Three types of capita flows were distinguished; FDI, portfolio investment and other flows. The paper using descriptive analysis method, observed that, increase in capital inflows to Latin American countries during half of the 1990s increase most countries aggregate expenditures, which

generated a pressure on domestic prices and resulted in large real exchange rate appreciation. This phenomenon, according to the paper, leads to a loss in international competitiveness. The paper proceeded to perform a Granger causality tests for the two variables (capital flows and real exchange rate). The result obtained shows that in seven out of eight cases, it was not possible to reject the hypothesis that capital flows cause real exchange rate. In three of the seven countries, it was not possible to reject two-way causation, and in none of the seven cases analyzed, it was found that real exchange rate caused capital flows.

According to the paper Edwards (1998), the exact way in which capital inflows will be translated into a real exchange rate appreciation will depend on the nature of the nominal exchange rate system, and in the way in which the monetary authorities react to changes in the key macroeconomic variables. In order to gain further insight into the relationship, the paper estimated unrestricted VARs for sub-group of countries using quarterly data. The VAR model include as variable; log of a bilateral real exchange rate index relative to the US, growth of domestic credit, capital inflows, interest rate differentials adjusted by a proxy for expected devaluation and the rate of inflation. In all cases, cyclical component of the series obtained through Hodrick-Prescott filtering procedure were used for the estimation. The result shows that the capital flows shock generated an appreciation in the real exchange rate. This result was supported by their impulse response analysis and variance decomposition analysis.

In his own work Siourounis (2003), it was observed that a good portion of some selected OECD countries (UK, US, Germany, Japan, Switzerland) exchange rate movement can be explained by net capital flows. In order to access which asset flow is relevant for the modeling of the exchange rate, the paper performs a number of likelihood ratio tests and estimated a bilateral VARs for all four currency pairs of the selected countries.

3. METHODOLOGY

The model used to achieve the objective of this study exploits the direct links between capital flows and their major determinants. In order to avoid the data limitation problem of portfolio capital flows in Nigeria, this study focuses mainly on the implications of real exchange rate misalignment on the flow of Foreign Direct Investment (FDI) to the country.

The augmented model based on the work of previous studies in the field (Anyawu, 1998:219-256; Ibrahim, 2008:224-233) is stated as follows:

$$\ln FDI_t = \varphi_0 + \varphi_1 \ln Y_t + \varphi_2 \ln OPEN_t + \varphi_3 \ln D_t + \varphi_4 mal_t + \xi_t \quad ....3.1$$

$\varphi_0, \varphi_1, \varphi_2 > 0$; $\varphi_3 < 0$; $\varphi_4 <> 0$

Where, Y_t is the real output of the economy capturing the market size, $OPEN_t$ was used to capture the effect of trade policy on the flow of FDI over time. The variable D_t represents debt position of the country. Real exchange rate misalignment (mal_t) is expected to serve as disincentive to FDI flows to the country.

In order to estimate equation (3.1), the study tests for the stationarity of the variables using Augmented Dickey Fuller (ADF) test and later adopted the two stage Engle-Granger estimation techniques to determine the dynamics relationships between FDI and its major determinants, most especially, the real exchange rate misalignment.

3.1 Data Measurement

The Nominal Effective Exchange Rate (NEER): This is measured as the weighted average of all bilateral exchange rates between Nigeria and its 17 selected trade partners. This study uses

1960, the starting period of the study as the base year and the computation take cognizance of US dollar to which all countries currencies are related. In this study, NEER is computed as follows:

$$NEER_t = \left[\frac{r_j}{r_{j0}} - \sum_{i=1}^{17} w_i \frac{(E_i - E_{i0})}{E_{i0}}\right] * r_{j0} \quad \text{.....3.2}$$

Where:

r_j = nominal exchange rate (N/$)

r_{j0} = N/$ in the base period (1960)

E_i = Bilateral exchange rate of each trade partner per US dollar

E_{io} = Bilateral exchange rate in the base period (1960)

w_i = weight attached to each trade partner

In order to convert the above formula to index, equation 3.2 is written as follows:

$$NEER_t = \left[\frac{r_j}{r_{j0}} - \sum_{i=1}^{17} w_i \frac{(E_i - E_{i0})}{E_{i0}}\right] * 100 \quad \text{.....3.3}$$

All variables are as defined before for equation 3.2

The real effective exchange rate (REER): This is measured as the nominal effective exchange rate adjusted for relative price differentials between Nigeria and its major trading partners. In this study the arithmetic weighted average method is employed, this is due to its relative simplicity and it application by various authors in the field. Symbolically it defined as follows:

$$REER_t = \left[NEER_t + \sum_{i=1}^{17} w_i \frac{(P_i^* - P_{i0}^*)}{(P_j - P_{j0})}\right] * r_{j0} \quad \text{.....3.4}$$

Where;

$NEER_t$ = Nominal effective exchange rate over time

$REER_t$ = Real effective exchange rate over time

P_i^* = Trade partner's price index (CPI)

P_{i0} = Trade partner's price index in the base period (1960)

P_j = Nigeria's consumer price index (CPI)

P_{j0} = Nigeria's consumer price index in the base period (1960)

In order to convert the above formula to index, equation 3.4 is written as follows:

$$REER_t = \left[NEER_t + \sum_{i=1}^{17} w_i \frac{(P_i^* - P_{i0}^*)}{(P_j - P_{j0})}\right] * 100 \quad \text{.....3.5}$$

All variables are as defined before

The formula used for calculating the trade weights is given as follows:

$$w_{it} = \frac{M_{it} + X_{it}}{\sum_{i=1}^{n} X_{it} + \sum_{i=1}^{n} M_{it}} \quad \text{.....3.6}$$

Where w_{it} = time varying weight of country i in the overall trade volume of the country.

M_{it} = imports of Nigeria from country i at time t

X_{it} = exports of Nigeria to country i at time t

$\sum_{i=1}^{17} X_{it}$ = Exports of Nigeria to the 17 selected trading partners at time t

$\sum_{i=1}^{17} M_{it}$ = Imports of Nigeria from the 17 selected trading partners at time t.

Choice of Trade Partners: In computing Nigeria's exchange rate indices, the study used data from 17 countries; United States, India, Spain, France, Italy, Brazil, Netherlands, China,

Germany, United Kingdom, Belgium, Japan, Denmark, Norway, Sweden, Canada and Switzerland. The choice of trade partner countries was guided by the fact that these countries accounted for at least 80 per cent of trade with Nigeria within the period of study (IMF direction of trade statistics).

3.2 Data Source

The external data especially those of Nigeria's major trading partners were obtained from International Financial Statistics (various issues) and IMF Direction of Trade Statistics (various issues). Data used to obtain the terms of trade were also sourced from (IFS). All other data are sourced from the Central Bank of Nigeria Statistical Bulletin (various issues).

4. Presentation and Analysis Results

The study confirms the unit root status of FDI and it major determinants using ADF tests. The results of the tests are shown table:

Table 4.1: ADF Unit Root Test

Variable	Level	First diff.
Foreign direct investment(FDI)	-0.6714	-4.8544*
Gross domestic product(GDP)	-0.2962	-4.6262*
Openness of the economy(OPEN)	-1.4229	-6.2299**
Debt outstanding(DS)	-1.9468	-3.5311**

* and ** denote, significant at 1% and 5% level respectively

Source: Author's Computation

Table (4.1) shows that all the variables were integrated of order one, I(1). Since the variables were found to be integrated of the same order, the study then proceeds to confirm whether they are co-integrated by testing the stationarity status of residual obtained from FDI regression. The result obtained indicates that the variables are co-integrated. This was shown from the observed ADF t-statistic (-5.8522), that is more negative than any of the critical values (1% = -3.5811; 5%=1 2.9266; 10% =-2.6014) when testing the residual from the long-run regression of FDI on its determinants.

Table (4.2) presents the estimates of the result from the error correction model of equation 3.1.

Table 4.2: Error Correction Estimates of FDI in Nigeria
Dependent Variable: ΔlnFDI

Variable	Coef/t-values
Δ ln(Foreign Direct Invest.)(1)	-0.30** (-2.23)
Δln(Openness)	0.13* (5.55)
Δln(Debt outstanding)	-0.015** (-2.78)
Δln(Gross Domestic Product	0.03* (5.75)

Δ(Absolute misalignment)	0.28** (2.64)
ECM(1)	-0.21* (-5.73)
Constant	0.89** (2.90)
R^2	0.84
Adjusted R^2	0.72
F	18.06

(*), (**) and (***) denote significance at 1%, 5% and 10% levels respectively
Numbers in parenthesis are t- statistics.
Source: Author's Computation

Table 4.2 shows that most of the variables conform to a priori expectations and are statistically significant. The major variable influencing FDI inflow to Nigeria over the period of study were market size (Proxy by GDP) and openness of the economy. For instance, a 1 percent increase in market size will boost FDI inflow by about 3 per cent.

However, the level of debt outstanding came out detrimental to the inflow of FDI over the period of study. Moreover, the variable proves statistically significant at 5 per cent level. From the result, a 10 percent increase in debt outstanding of the country leads to about 15 per cent decline in the flow of FDI to the country, the result not surprising, such that the debt outstanding of the country has been on the increase for a longer period of time not until 2006 when a debt relief was sought by the government of the country.

The variable of interest, real effective exchange rate misalignment turns out positive. That is, divergence of actual exchange rate from it ideal rate reduces foreign direct investment inflow to the country. In this way, a continued fall in the real value of naira relative to the currencies of Nigeria's trade partners may discourage foreign investors to invest in the country (other things being equal). The absolute misalignment coefficient proves statistically significant.

5. POLICY OPTIONS AND CONCLUSION

Rising from the result obtained from this study, the extent of misalignment has been severe over time such that it effects on foreign direct investment has been great. To minimize the extent of exchange rate misalignment, international finance literature in recent time has been emphasizing 'flexible exchange rate system'. This can be done by reducing the rate of government intervention in foreign exchange market. However, due to the underdeveloped nature of Nigeria's financial market, the extent of flexibility cannot be absolute. Government still need to intervene in the running of the market but all her actions must be done with sincerity of purpose. That is, government should act according to the dictate of the market. The paper belief that by doing this, real exchange rate misalignment may be reduce, thus reducing the likelihood of currency crisis and reduce it effect on capital inflow.

REFERENCES

Anyawu, J.C (1998) " An econometric investigation of the determinants of Foreign Direct Investment in Nigeria" Selected papers for the 1998 Annual conference , *the Nigerian Economic Society.*

Balassa, B (1964), "The Purchasing Power Parity Doctrine: A Reappraisal" Journal of political Economy, Vol. 72(6)

Edwards, S(1998) "Capital flows, Real Exchange Rates, Capital controls: Some Latin American Experiences" *NBER working paper series.6800*

Edwards S. and M.A Savastano (1999) "Exchange Rate in Emerging Economies: What Do we know? What Do we need to Know? *In* Anne O.K *(ed) Economic Policy Reform: The second stage*. Chicago press.

Egert, B. (2005) "Equilibrium exchange rates in South-Eastern Europe, Russia, Ukraine and Turkey: Healthy or Dutch Diseased? Bank of Finland, *Discussion Papers*, No. 3

Elbadawi, I.A and R.Soto(1994) " Capital flows and long-term Equilibrium Real Exchange Rates in Chile" *Policy research paper:* World Bank WPS 1306

Ibrahim W. (2008) "The Impact of Monetary Union on FDI in the West African Countries," *LAPAI International Journal of Management and Social Sciences*. Vol.1, No.1: 224-233.

Isard P.(2007) " Equilibrium Exchange Rates: Assessment Methodologies". *IMF working paper* WP/07/216

Ivanova N. (2007) "Estimation of the Equilibrium Real Exchange Rate in Russia: Trade-Balance Approach". *Centre for Economic and Financial Research Working Paper* No 102.

Miao Y. and A Berg (2010) " The real exchange rate and growth revisited: the Washinton Consensus strikes back? *IMF working paper*. Wp/10/58

Phillips P.C.B and M. Loretan (1991) "Estimating Long-run Economic Equilibrium" *Review of Economic studies*, Vol 55:407-436

Siourounis, G.(2003) " Capital flows and Exchange Rates: An Empirical Analysis" *Working paper series* No 12. London Business School.