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Real Exchange Rates, Terms of Trade and Economic Growth in Nigeria (1980-2012)

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Abstract: This study investigates the impact of real exchange rates on terms of trade and economic growth. A long term relationship between the real effective exchange rate, term of trade and gross domestic product is estimated. The estimation relies on cointegration techniques and error correction model using annual data covering from 1980-2012. The results show that real exchange rates co-move with terms of trade in the long run.

Key words: Terms of trade, real exchange rates and economic growth, jel, C_{23}, F_{31}, O_{13}, term relationship, techniques, Nigeria

INTRODUCTION

In the last few decades, the foreign exchange rate management in Nigeria has undergone tremendous changes especially after the adoption of the Structural Adjustment Programme (SAP) in 1986. It shifted from a fixed regime in the 1960s to a pegged arrangement between the 1970s and the mid-1980s and finally to the various types of the floating regime, since 1986 following the adoption of the Structural Adjustment Programme (SAP) (Dada and Oyeranti, 2012). The fixed exchange rate regime induced an overvaluation of the naira and was supported by exchange control regulations that engendered significant distortions in the economy that gave vent to massive importation of finished goods with the adverse consequences for domestic production, balance of payments position and the nation's external reserves level. These and many other problems informed the adoption of a more flexible exchange rate regime in the context of the SAP, adopted in 1986. A regime of managed float has been the predominant characteristic of the floating regime in Nigeria since 1986.

The issue of exchange rate levels and their relationship with other major economic variables, such as growth, income, current account balances, consumption and trade have led to a great deal of discussion since the beginning of the mid-2000s in particular when global imbalances started to widen. Nigeria, like most developing countries has benefited immensely from capital flows. However, Nigeria's share in global flows is a miniscule when compared to the net private capital flows for developing countries worth US$ 491.0 billion in 2005. In the 1960s and 70s most capital flows to Nigeria were directed to governments in the form of Overseas Development Assistance (ODA) or to the private sector through the banking system. This situation changed in the 1980s and capital flows took the form of Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI). Economic growth is needed by a nation to foster development. Foreign trade and exchange rate played a significant role in enhancing high growth rate and boosting productivity. Nassif *et al.* (2011) recall that various empirical papers have studied the impact which exchange rate overvaluations or undervaluation can have on growth. Some studies have found that overvaluation hinders economic growth while others have found that undervaluation boosts growth. In comparison with the equilibrium values, one can then assess if the real exchange rate is overvalued. Overwhelming evidence exists and there seems to be a consensus that overvaluation has adverse implications for growth (Dollar, 1992; Easterly, 2005). Finally, of late a new literature has sprung up showing that undervalued exchange rates foster economic growth. In one of the most widely cited studies of recent times, Rodrik (2008), having constructed an index of undervaluation based on a purchasing power parity real exchange rate for countries, demonstrates robust evidence of growth-enhancing effect of undervalued currencies. He argues that tradable sectors are more severely affected by bad institutions and market failures, resulting in their size being smaller than optimal. A real appreciation of real effective exchange rate indicates an increase in the domestic cost of producing tradables reflecting the worsening of a country's competitiveness. Conversely, undervaluation or a real depreciation of RER represents an improvement in a country's international competitiveness.

There is need to empirically investigate the extent of exchange rate reforms on trade and on the output productivity of a nation thus this study, therefore

empirically analyse the effect of real exchange rate reforms on trade and the effect of real exchange rate on Nigerian economic growth.

MATERIALS AND METHODS

Mungule (2004) investigated the determinants of real exchange rate in Zambia. He used the real exchange rate as a function of terms of trade, capital inflow and closeness of the economy and excess supply of domestic credit. Using the cointegration technique, he discovered that the REER and the fundamental determinants have a long run equilibrium relationship.

Agbola (2004) used Johansen multivariate co-integration procedure to examine the impact of depreciation/devaluation on trade balance of Ghana with the use of data spanning the period 1970 and 2002 in his analyses found that Ghana's trade balance and key determinants are co-integrated and exhibit a long-run equilibrium relationship but depreciation/devaluation does not improve the trade balance of Ghana in the long run.

Akinbobola and Oyetayo (2010) examined the impact of real exchange rate on domestic output growth in Nigeria using data spanning through period 1986-2004. The study found that the real exchange of Nigeria has a positively impacts on output growth after a considerable lag.

Cashin *et al.* (2004) examine 58 commodity-exporting countries and find that commodity terms of trade affect the real exchange rate in about a third of them.

Mohamad *et al.* (2009) conduct panel data estimation to account for the role of the real exchange rate and other economic fundamentals such as macroeconomic stability, terms of trade, capital goods investment, external demand and human capital on the export performance of Indonesia, Malaysia, Singapore and Thailand. They find that appreciation of real exchange rate and also its misalignment and volatility have strong negative impact on export performance.

Kemme and Roy (2005) examined both the short-run and long-run movements in the real exchange rate for Poland and Russia, using both the Engel Granger static OLS procedure (for long-run estimation) and the Johansson procedure (for the number of co-integrating vectors). They used terms of trade, openness, net capital inflow, the ratio of total government of GDP, long-term capital to GDP and total factor productivity differential. The long-run result showed that openness, the increase in government consumption and capital inflow caused depreciation in the real effective exchange rate while an increase in real investment to real GDP and improvement in the total factor productivity differential led to real effective exchange rate appreciation. In conclusion, most of the econometric analyses indicated that devaluations (either increases in the level of the real exchange rate or in the rate of depreciation) were associated with a reduction in output and increase in inflation. However, only few studies have been conducted on the chain relationship of real exchange rate and foreign trade on output growth in sub-Saharan Africa, particularly Nigeria, thus warranting research on the subject.

Theoretical framework: The best known explanation for secular trends in the real exchange rate is the Balassa-Samuelson (BS) biased productivity growth hypothesis. The hypothesis focuses on the role that the internal price ratio-the ratio of non-traded to traded goods prices-can play in introducing systematic trends into real exchange rates. The hypothesis states that a country with relatively high productivity in its traded goods sector will have an appreciated real exchange rate. Hence, if the country exhibits relatively high productivity growth in its tradable sector over time it will have a secular appreciation of its real exchange rate. The Balassa-Samuelson hypothesis focuses on the implications of trends in productivity for long-run real exchange rates, ignoring short-run adjustments. The long-run nature of the model means that relative prices are driven by supply side factors with demand side factors being ignored. The model forecasts that the domestic economy will experience real appreciation if its productivity-growth advantage in tradable exceeds its productivity growth advantage in non-tradable.

A simple framework to catch this effect is given by Cashin *et al.* (2004). The model depicts a 2 sector home economy composed by an exporting sector (X) producing a primary commodity aimed at being exported and a non-tradable sector (N). The foreign country produces 3 types of goods: Non tradable (N*), an intermediate one (I*) and a tradable one (T*), produced by assembling the intermediate good and the imported primary commodity. The Real Exchange Rate (RER) is defined as usual:

$$RER = \frac{EP}{P^*}$$

Where:

E = Exchange rate, expressed as the number of foreign currencies per 1 unit of domestic currency (when E increases, the exchange rate appreciates)
P = Domestic Consumer Price Index (CPI)
P* = The CPI in the foreign country
RER = Function of terms of trade

$$RER = \left[\frac{A_x A_n^*}{A_n A_1^*} \right]^{\gamma} TT$$

Where:

A = Sector k's productivity in the home country

$^*A$ = Sector k's productivity in the foreign country

$TT = P_X/P_T$ = Terms of trade defined as the home country's export price to import price ratio

γ = Share of non-tradables in the consumers' basket

In this simple model, a change in terms of trade prompts a 1-1 variation in the real exchange rate. A more general formulation of the real exchange rate could be a function of terms of trade and relative productivity:

$$RER = \alpha + tt + \gamma\left(a_X - a_N + a_N^* - a_I^*\right)$$

Model specification: From the theoretical framework earliear, the model between real exchange rate, term of trade and the real GDP is built.

$$RER = \beta_0 + \beta_1 TT + \beta_2 GDP + \beta_3 TGDP + \beta_4 NER + \mu_t$$

Where:

RER = Real effective exchange rate

Y = Real gross domestic product growth rate

TT = Net barter term of trade a proxy for terms of trade

TGDP = Merchandise trade as a share of GDP

NER = Nominal exchange rate

μ_t = Stochastic error term

RESULTS AND DISCUSSION

Since, the study deals with time series macroeconomic variables, OLS regression was conducted to show the relationship between the variables while econometric test of unit root is employed to test for the order of integration and determine the stationarity of the data. To determine the long run relationships of the variables, cointegration tests is conducted while Error Correction Model (ECM) is used to adjust and correct for the possible short run dynamic behaviour of the variables.

Table 1 mention earlier gives the OLS result test for the variables. Both the term of trade and the GDP are significant. There is a positive relationship between the real effective exchange rate and economic growth as expected. It has been discussed in the literature that the growth in aggregate output can also lead to RER appreciation. This is popularly known as the Balassa-Samuelson effect. The negative relationship between term of trade and RER is in line with the theory that increase in terms of trade indicates an increase in the domestic cost of producing tradables reflecting the worsening of a country's competitiveness. The R^2 value 0.67 implies that 67% total variation in real effective exchange rate is explained by the regression equation. The goodness of fitness of the regression is high at an adjusted R^2 value of 0.62. Durbin Watson statistic is 0.671112 which is a bit higher than R^2 value 0.62 indicating that the model is spurious. Durbin Watson statistic is very low indicating the presence of autocorrelation, therefore the unit root test became important to make the data to be stationary.

Table 1: Ordinary least square regression dependent variable: RER

Variables	Coefficient	SE	t-statistic	Prob.
C	-1816.283000	296.034100	-6.135386	0.0000
TT	-2.502781	0.662723	-3.776510	0.0008
GDP	27.062340	4.319126	6.265699	0.0000
NER	-0.000371	0.000675	-0.548992	0.5875
TGDP	3.808941	1.931355	1.972160	0.0589

Researchers computation: R^2 0.670503; Adjusted R^2 0.621689

Unit root test: The unit root test result shows that 2 of the variables are stationary at levels while the others were made stationary at first difference. Assessing the short run dynamics of the real exchange rate makes the test for co-integration necessary which forms the next stage of analysis. If 2 or more time series are not stationary, it is important to test whether there is a linear combination of them that is stationary. This phenomenon is referred to as the test for co-integration. The evidence of co-integration implies that there is a long run relationship among the variables. Hence, the short-run dynamics can be represented by an error correction mechanism (Engle and Granger, 1987) (Table 2).

Table 3 earlier, the results show that the trace test statistics indicates an existence of a long-run equilibrium stationary relationship among the observed variables.

The error correction variable from an estimated short run dynamic model showed reasonable speed of adjustment towards the long run equilibrium path that is any short run disturbance which may offset the economy along the long equilibrium path. The result of the short run error correction model shows that lag 1 and 2 of real effective exchange rate, term of trade lag 1, nominal exchange lag 3 are significant at 1% while lag 1, 2 of

Table 2: Results: unit root test using Phillip-perron test statics

Series	At levels	5% critical value	1st diff	5% critical value	Order of integration
TT	-1.026123	-2.960411	-5.656072	-2.963972	I (1)
RER	-1.636647	-2.960411	-3.250233	-2.963972	I (1)
GDP	-1.682157	-2.960411	-4.926056	-2.963972	1 (1)
TGDP	-3.662062	-2.960411	-15.414050	-2.963972	1 (0)
NER	-5.616260	-2.960411	-29.385220	-2.963972	1 (0)

Researchers computation

Table 3: Co-integration test (the co integration result of real exchange rate, terms of trade, merchant trade share of GDP, real GDP and nominal exchange rates)

Hypothesized No. of CE	Eigen value	Trace statistics	Critical value at 5%	Prob**
None*	1.000000	1128.518000	69.818890	1.0000
At most 1*	0.674910	69.190940	47.856130	0.0002
At most 2*	0.449737	34.357690	29.797070	0.0139
At most 3*	0.397974	15.839580	15.494710	0.0444
At most 4	0.003493	0.108486	3.841466	0.7419

Trend assumption: Linear deterministic trend; trace test indicates 4 co-integrating trace test at the 0.05 level; *rejection of the hypothesis at the 0.05 level

Table 4: Parsimonious error correction model of RER, TT, TGDP, GDP and NER

Variables	Coefficient	SE	t-statistic	Prob.
RER (-1)	1.795886	0.246674	7.280395	0.0000***
RER (-2)	-1.231589	0.232936	-5.287248	0.0001***
NER (-2)	-0.000504	0.000342	-1.475685	0.1583
NER (-3)	-1.649677	0.410464	-4.019053	0.0009***
TGDP (-1)	-1.885589	1.099886	-1.714350	0.1046
TGDP (-2)	-2.522551	1.164009	-2.167123	0.0447**
TGDP (-3)	2.379628	1.353935	1.757565	0.0968
GDP (-1)	-13.683560	6.702974	-2.041416	0.0570
GDP (-2)	8.349501	4.774458	1.748785	0.0984
GDP (-3)	7.078817	3.671315	1.928142	0.0707
TT (-1)	1.357351	0.396086	3.426907	0.0032***
ECM (-1)	-0.725380	0.306890	-2.363648	0.0303**

Researchers computation: R^2: 0.9498; Adjusted R^2: 0.9173; Durbin Waston Stat 2.154; **, ***Significance level 5 and 1%, respectively

merchant trade share of GDP are significant at 5% level. A unit change in lag 2 of real exchange rate will lead to 1.23 changes (decrease) in real exchange rate itself; 1 unit change in lag 1 of real exchange rate causes 1.79 changes (increase) in current period in the model. Also, a unit change in 3 periods lag nominal exchange rate leads to 1.6 unit change in the current period of the real exchange rate. The 1 unit change in term of trade will lead to 1.36 changes in real exchange rate.

The coefficient of ECM suggests the speed of adjustment of the model. It implies that in the current period 72% of the disequilibrium can be removed from the system (Table 4).

CONCLUSION

This study, examines the relationship among the real effective exchange rate, the term of trade and economic growth by investigating the long run relationship among the variables, as well as determining their short run dynamics in the periods of 1980-2011. The real effective exchange rate is a measure of the international competitiveness of an economy and an overvalued real exchange rate increases the price of domestic goods abroad, leading to lower demand for exports thereby deteriorating the trade balance. In Nigeria, nominal effective exchange rate increased in the 1970s and 1980s. OLS regression analysis indicates that both term of trade and gross domestic product are significant factors that can affect real exchange rate in Nigeria. The real exchange rate has a positive impact on growth, this implies that revaluation or appreciation of real exchange rate might be growth enhancing and currency strengthens provided that a realistic exchange rate policy can be ensured. The term of trade and the nominal exchange rate both exhibit a negative relationship with the real exchange rate. The study also makes use of Johansen cointegration technique to investigate the long run relationship in the variables. Evidence from the Johansen cointegration provides existence of long run stable relationship among the variables under investigation. The error correction model indicates that the adjustment is in the right direction to restore the long-run relationship.

RECOMMENDATIONS

The study recommends the pursuance of a sustainable, stable exchange rate policy. Measures that will promote greater exchange rate stability and improve terms of trade is also to be adopted by the government to promote export trade.

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