

The Foreign Exchange Rates in Nigeria: Convergence or Divergence

by

Auwal Umar and Hamzat Soliu¹

ABSTRACT

This study uses distributed lag model to show whether or not Foreign Exchange Rates in Nigeria converge or diverge from its long run equilibrium. The sample for the study is the monthly data covering the period of one hundred and eight months. This study is an attempt to show whether or not Inter Bank Foreign Exchange Market (IFEM) and Dutch Auction System (DAS) converge to their long run equilibrium. The findings show that the exchange rate under DAS converges to a long run equilibrium while it does not under IFEM. The pattern that exchange rate takes, in the long run, under the DAS could be established but those of IFEM could not be that easily fix.

1.0 INTRODUCTION

There is scarcely any country that live in absolute autarky in this globalised world. The economies of all the countries of the world are linked directly or indirectly through asset or/and goods markets. This linkage is made possible through trade and foreign exchange . The price of foreign currencies in terms of a local currency (i.e. foreign exchange) is therefore important to the understanding of the growth trajectory of all countries of the world.

The consequences of substantial misalignments of exchange rates can lead to output contraction and extensive economic hardship. Moreover, there is reasonably strong evidence that the alignment of exchange rates has a critical influence on the rate of growth of per capita output in low income countries (Isard,2007).

Nigeria, like many other low income open economies of the world, has adopted the two main exchange rate regimes for the purpose of gaining internal and external balance. The augments and conditions for and against each of the regime is clear given that they are all aimed at maintaining stability in exchange rates. Direct administrative control exchange rate policy was used to manage Nigeria's foreign exchange from independence in 1960. The country changed to a market regulated regime in 1986 for obvious reasons.

¹ Auwal (aumar27@yahoo.co.uk) and Soliu (sozatt@yahoo.com) are graduate students of Economics of the Ahmadu Bello University Zaria, Nigeria.

What is however yet to be clear is the relative advantage of the various organized market arrangement for selling and buying the foreign exchange under the dirty float regime that the country now operates. The country has and is still experimenting with various market arrangements. First in 1986, it chose to operate the Second Tier Foreign Exchange Market(SFEM) on an auction basis. More than two decades now after the introduction of the flexible exchange regime, Nigeria has operated several variants of the auction system (Auction System, Dutch Auction System, Wholesale Dutch Auction System, Retail Dutch Auction System) towards determining the exchange rate of the naira to US dollar

This work is different from Obaseki's(1997)because his examined the convergence of foreign exchange in the sense of unifying all the foreign exchange rates(i.e parallel and official) into a single realistic one. This study is interested in relative advantage of the available allocation arrangement of foreign exchange.

Specifically, this paper is written to show whether and how the different allocative arrangements of foreign exchange ensure that exchange rates converge towards a long run stability. Precisely, the paper is interested in showing whether and how the Retail Dutch Auction System(RDAS) and Interbank Foreign Exchange Market would bring about long run equilibrium in Nigeria's foreign exchange rate.

This research is important now more than ever because the naira is facing a lot of challenges as the world faces financial meltdown.

This paper is divided into five sections. Section two outlines the development in Nigeria's foreign exchange market and section three review received knowledges relevant to equilibrium exchange rate and auctions.The paper presents the methodology in section four. Section five is the results and conclusions of the study.

2.0 Exchange Rate Management in Nigeria

Given the centrality of foreign exchange in international economic transactions especially in developing country like Nigeria, the management of scarce foreign exchange has,over the years

been a significant component of national economic management. Basically, there are two phases to economic management in Nigeria.

During the first phase (1970-1985), Nigeria operated a controlled exchange rate regime where exchange rate of the naira was pegged to the dollar. The second phase of exchange rate history in Nigeria began in 1986.

Following the oil glut of early 80s, it became clear that Nigerian economy which depend on oil was not able to sustain the fixed exchange regime because its foreign reserves not only depleted but foreign debt also mounted . As an integral part of the Structural Adjustment Programme introduced in 1986, the country adopted a flexible exchange rate through the Second tier Foreign Exchange Market (SFEM).

3.0 Received Knowledge.

Discussions and analysis in this paper rest on the underlying knowledge concerning equilibrium exchange foreign rate on one hand and auction sales on the other. The aim is to trace the knowledge that explains realistic exchange rate in a market driven exchange rate. Auction is one of the major allocative arrangement of foreign exchange in Nigeria in recent time. The section also review empirical discussions relevant to the objective of this paper.

Several methodologies have been used to characterize the equilibrium position of the exchange rate in the literature. While some of them are quite simplistic in nature others are conceptually quite complex. All of them, however, involve some conceptual simplifications (Isard, 2007). We summarily adopt Isard's(2007) discussion of these approaches in this paper with few modifications to make it up to date.

The various methodologies that can be used to explain the equilibrium position of exchange rate can be grouped into six groups Isard(2007). The first and most simplistic is the Purchasing Power Parity(PPP) approach. This approach is purely base on price .The theory underlying this approach is that real exchange rates should remain relatively constant over time, or that nominal exchange rates should move in line with ratios of national price levels .Gustav Cassel in 1918

coined the term purchasing power parity to describe such situation. The assumption underlying this approach is that free movement of merchandise would bring about parity between the purchasing powers of the moneys of different countries, as indicated by national price levels.

The challenge against this approach is how to decide on the choice of the price to be used to compare ratios of currencies (Isard, 2007). A classic example of this is Churchill's overvaluation of the British pounds in 1925 (by 12%) after the first world when he used wholesales price to establish PPP instead of retail price suggested by Keynes.

Scholars have modified the PPP approach to take Balassa-Samuelson's conjecture into consideration. The conjecture point to the fact that prices of nontradeable tend to increase relative to the prices of tradable with the growth of an economy. This is borne out of the believe that fast growing economies experience increased productivity in tradable relative to nontradeables.

The weak link, however, in the Balassa-Samuelson hypothesis, as applied to real exchange rates, is the assumption that the relative prices of tradable-goods across countries remain relatively constant over time.

The third major approach towards determining the equilibrium exchange rate is the Macroeconomic Balance (MB) framework approach. This approach sought an exchange rate that guarantees internal and external balance of an economy. In applying the MB framework, it is useful to define the concept of the underlying current account position (UCUR) as the value of current account position (CUR) that would be observed at the prevailing real exchange rate if all countries were operating at full employment or potential output (internal balance) and if the effects of past exchange rate changes had been completely realized. This is the appropriate concept of the medium-run current account position associated with the prevailing real exchange rate. A concept that adjusts for the business cycle (Isard, 2007)

Recent advances in MB approach links current account balance of an economy to the saving-investment gap to arrive at equilibrium exchange rate.

Equilibrium exchange rate could also be explained through assessment of relative competitiveness of tradable goods. The rate of competitiveness of tradable goods will be assessed through some criteria at the prevailing exchange rate to determine whether or not the rate is an equilibrium rate. Commonly-used indicators of competitiveness include measures of profitability, trends in export volumes or shares of world exports, and trends in import penetration ratios.

Exchange rates equations are other major approach often used in the literature to model equilibrium exchange rate. Given some theoretical framework which links equilibrium exchange rate to other variable, this approach estimate some reduced form equation derived from the theoretical conceptions. Recent advance in econometrics has also made it possible the long run behavior of exchange rate to be studied.

Finally, general equilibrium model is another approach to exchange rate modeling .It provides a more complete representation of macroeconomic behavior, it imposes important accounting identities, and generate solutions (forecasts) for endogenous variables that are consistent with those identities Soludo(1998).

While several received knowledges have been offered to explain equilibrium exchange rate, there are, however, few theories on auction market. Besides, empirical works on auctions especially as regard foreign exchange market is also few.

Basically auctions could take one of the following four types: ascending-bid auction (English Auction), descending-bid auction (Dutch Auction), the first price sealed-bid and the second price sealed-bid auctions. Also, objects of an auction could either be privately valued (like art works) or be a common value item (like currency).

Vickrey's(1961) work cited in Klemperer(2004) is the first formal attempt to recognize the game-theoretic treatment of auctions. Through this work, he proposed some special cases of the now most celebrated theory of auction sales (Revenue Equivalence Theorem,) (Klemperer,2004). A more general form of Revenue Equivalence Theorem (RET) assume that a number of risk-neutral potential buyers of an object has a privately known signal independently drawn from a

common, strictly increasing, atomless distribution. Then any auction mechanism in which (i) the object always goes to the buyer with the highest signal, and (ii) any bidder with the lowest-feasible signal expects zero surplus, yields the same expected revenue (and results in each bidder making the same expected payment as a function of her signal). This theory is applicable not only to privately valued objects. The results of all design of auctions (ascending, descending, first price sealed-bid, second price sealed-bid e.t.c) also yield the same expected revenue (Klemperer, 2004).

RET could be characterized and algebraically specified very simply as follows: in an auction where n bidders compete, bidder's i valuation v_i of the object is private information to her, each of the bidders' v is independently drawn from the same continuous distribution function $F(v)$ on $[\underline{v}, v]$, $F(\underline{v})=0$, $F(v)=1$ and all bidders are assumed to be risk neutral. Suppose $S_i(vp)$ is the surplus accruing to bidder i for participating in any auction design. This surplus is a function of a person's type denoted by vp . The expected surplus $S_i(vp)$ is given by

$$S_i(vp) \geq S_i(vp + dvp) + -dvpP_i(vp + dvp) \dots \dots \dots (1)$$

where P_i is the probability of receiving the object in the equilibrium and dvp is deviation from a bidder's type, vp , A bidder's type vp is the uniqueness underlying her bid. This is determined by the private information available to her, signals e.t.c. Rearranging (1) yield

$$P_i(vp + dvp) \geq \frac{S_i(vp + dvp) - S_i(vp)}{dvp} = P_i(vp) \dots \dots \dots (2)$$

Taking the limit as $dvp \rightarrow 0$

$$\frac{ds_i}{dvp} = P_i(vp) \dots \dots \dots (3)$$

Integrating both sides of (3) we get :

$$S_i(vp) = S_i(vp) + \int_{x=v}^{vp} p(x)dx$$

If we know where the surplus function starts from i.e $S_i(v_p)$, it follows that all auction mechanisms and design have the same expected revenue.

Few empirical studies have attempted to validate theoretical models of auction in Sub-Saharan Africa Aron and Elbadewi (1994b). Most empirical works only test the implication of the theory through the reduced-form model. For instance, they try to explain bids in terms of a reserve price, the number of potential bidders, characteristics of the auctioned object which affect the common distribution of private values (eg. Hasen 1985; Hendricks and Porter, 1988). Adamgbe's (2006) work on RDAS assumes that the Efficient Market Hypothesis (EMH) holds in the foreign exchange market. His work showed that RDAS has brought about relative stability in the exchange rate in the forex market in Nigeria. This work was interested in a short-run relationship between exchange rate under RDAS and other variables. So the author used VAR to model exchange rate on inflation rate and lending rate. His conclusion can therefore not be applicable to a long-term period.

The important variables to the theoretical analysis of auction system are foreign exchange demand, supply and opportunity cost (i.e. parallel market rate). Empirical findings have corroborated the suggestion of the theory of auction given these variables Aron and Elbadewi, 1994a) cited in Auwal (2009). Their findings show that increased supply of foreign exchange brings about appreciation of local currency and increased demand for foreign exchange causes devaluation of local currency. Aron and Elbadewi (1994a) cited in Auwal (2009) also found that increased number of bidders lead to equilibrium auction rate depreciation in Nigeria.

4.0 Methodology

4.1 Nature and Sources of Data.

The data for this study are sourced from CBN's website and its 2006 Statistical Bulletin. 2000 to 2008 is the period covered. Inter Bank Foreign Exchange Market (IFEM) was operative between 1999 to July 2002 in Nigeria and the Dutch Auction System was operative between 2000 to 2008. The study therefore makes use of both foreign exchange rates and quantity traded during these two allocation market arrangements.

4.2 Model Specification

The study adopts an Autoregressive Distributed Lag (ARDL) model to explain the long run relationship between exchange rate and quantity of foreign exchange traded. This is partly because we subscribe to the conclusions of studies that have found out that Efficient Market Hypothesis is near reality in the foreign exchange market. Cointegration could also be used for the same purpose. The study uses ARDL because one do not need to worry about level of integration of the series .

An ARDL model of exchange rate and quantity of exchange rate traded is therefore given as

$$MR_t = f(MR_{t-1}, MR_{t-2}, \dots, MR_{t-k}, DD_{t-1}, DD_{t-2}, \dots, DD_{t-k}) \dots \dots \dots (4)$$

$$t = 0, 1, 2, \dots, k$$

We reparameterised (4) in terms of levels and first difference to obtain

$$\Delta MR = f(DD_{t-1}, \Delta DD_t, \Delta DD_{t-1}, \Delta DD_{t-2}, \dots, \Delta DD_{t-k} + MR_{t-1} + \Delta MR_{t-1} + \Delta MR_{t-2} + \dots + \Delta MR_{t-k} + \mu_t \dots \dots \dots (5)$$

for DAS and

$$\Delta IFEMRATE = f(DD_{t-1}, \Delta DD_t, \Delta DD_{t-1}, \Delta DD_{t-2}, \dots, \Delta DD_{t-k} + MR_{t-1} + \Delta IFEMR_{t-1} + \Delta IFEMR_{t-2} + \dots + \Delta IFEMR_{t-k} + \mu_t \dots \dots \dots (6)$$

for IFEM

Where MR, IFEMR and DD denotes marginal rate of exchange, rate of exchange at the IFEM and demand respectively.

The models specified in (4) is the longrun model of foreign exchange rate regardless of the allocation arrangement used to obtain the data. For the purpose of this study we used MRATE for exchange rate under DAS and IFEMRATE under IFEM .

5.0 Results and Conclusions

The results of the test of a long run relation between exchange rate and the volume of foreign exchange during the DAS regime show a significant relationship only when information on exchange rate in the three or previous days are taken into consideration. This is shown in table 2 in the appendix because the coefficient of the lagged dependent variable(MRATE_{t-1}) is significant at 7.6 %. Table three(in the appendix) shows the results of estimation of variables that significantly impact on MRATE. It should be noted ,however, that the fit of the model (35%) is weak. When the differenced terms (in table three) are equated to zero, the long run relation between exchange rate (MR) and quantity traded (DD) is

$$0.394767MR_{t-1} + 44127802 - 0.399405DD_{t-1} = 0 \dots\dots\dots(5)$$

$$MR_{t-1} = 1.0117487DD_{t-1} + 111781892 \dots\dots\dots(6)$$

From (6) , it is clear that the rate at which exchange rate under DAS moves towards its long run equilibrium is 1.0117.

For IFEM, the results of estimation of the relationship between exchange rate and quantity traded are shown in table for four and five of the Appendix below. These results show long run relationship between exchange rate and quantity traded does not exist in the long run as the coefficient of the lagged dependent variable (IFEMR_{t-1}) is not significant at 5% not even at 10% level of significance. Table four takes information about exchange rate in the two previous days into consideration while table five takes those of three previous days into consideration.

The conclusion of the paper therefore is that while long run relationship exist when DAS is the allocative arrangement for foreign exchange market, it however does not exist when IFEM is the allocative arrangement for foreign exchange.

References

- Adamgbe .E.T(2006) “Exchange Rate Management Under the Wholesale DAS in Nigeria:Policy Implications”, *West African Journal of Monetary and Economic Intergration* Vol.6 No.1
- Aron J. and Elbadawi A b.(1994b)”Foreign exchange auction market in Sub-Saharan Africa: Dynamic Models for the Auction Exchange rate” *The World Bank Policy Research Working Paper No.1395*
- Auwal U(2009) “(G)ARCH and ARDL model of exchange rate: evidence from Nigeria” Economics Dept, Ahmadu Bello University Zaria, Ph.D *class presentation* (unpublished)
- Hansen R.(1985) “Empirical Testing of Auction Theory” *Economic Enquiry*,24,125-142.
- Hendricks K and Porter R. (1988): “An Empirical Study of an Auction with Asymmetric Information” *The American Economic Review*,78,865-883.
- Isard P. “Equilibrium Exchange Rates: Assessment Methodologies” *IMF Working paper* WP/07/296
- Klemperer.P(2004) *Auctions: Theory and Practice* . Oxford: Oxford University press,
- Nnana O.J (2002) “Towards Exchange Rate Stability in Nigeria” in *Monetary Policy and Exchange Rate Stability*, NES Proceedings of a One day Seminar Held on 23 May 2002 Federal Palace Hotel Lagos.
- ObasekiP.J(1997) “The Need for Exchange Rates Convergence in Nigeria” *Central Bank of Nigeria Economic Review* Vol35 No3.
- Obaseki P.J(2001) “Issues in Exchange Rate design and Management” *Central Bank Economic and Financial Review* Vol39 No.2
- Soludo C(1998) *Macroeconomic Policy Modelling of African Economies*. Enugu:ACENA Publishers

Van'tdack J.(2001) "The Framework of Monetary Policy: An Overview of Issues" in proceedings :conference on Monetary policy frameworks in Africa, Reserve Bank of South Africa Pretoria.

Appendix

Table 1.

Dependent Variable: DMR
 Method: Least Squares
 Date: 06/08/09 Time: 20:25
 Sample(adjusted): 2002:11 2008:12
 Included observations: 74 after adjusting endpoints
 White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26779004	17314888	1.546588	0.1267
DEMAND(-1)	-0.221526	0.181264	-1.222117	0.2260
D(DEMAND)	-0.333463	0.079391	-4.200243	0.0001
D(DEMAND(-1))	-0.426455	0.152251	-2.800996	0.0067
D(DEMAND(-2))	-0.035372	0.182209	-0.194130	0.8467
MRATE(-1)	-0.204774	0.202225	-1.012607	0.3149
D(MRATE(-1))	-0.250556	0.360340	-0.695331	0.4893
D(MRATE(-2))	-0.443697	0.166692	-2.661783	0.0098
R-squared	0.330575	Mean dependent var	2117115.	
Adjusted R-squared	0.259575	S.D. dependent var	64071554	
S.E. of regression	55132244	Akaike info criterion	38.59017	
Sum squared resid	2.01E+17	Schwarz criterion	38.83926	
Log likelihood	-1419.836	F-statistic	4.656012	
Durbin-Watson stat	1.903040	Prob(F-statistic)	0.000277	

Table 2

Dependent Variable: D(MR)
 Method: Least Squares
 Date: 06/08/09 Time: 20:29
 Sample(adjusted): 2002:12 2008:12
 Included observations: 73 after adjusting endpoints
 White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	36611371	17575230	2.083123	0.0413
DEMAND(-1)	-0.321338	0.182601	-1.759784	0.0833
D(DEMAND)	-0.339278	0.080434	-4.218090	0.0001
D(DEMAND(-1))	-0.331003	0.154317	-2.144955	0.0358
D(DEMAND(-2))	0.060917	0.176354	0.345423	0.7309
D(DEMAND(-3))	0.098632	0.240031	0.410911	0.6825
MRATE(-1)	-0.316687	0.175697	-1.802465	0.0763

D(MRATE(-1))	-0.102631	0.308354	-0.332837	0.7404
D(MRATE(-2))	-0.266151	0.157071	-1.694460	0.0951
D(MRATE(-3))	0.343175	0.227731	1.506936	0.1368
R-squared	0.355118	Mean dependent var	2146117.	
Adjusted R-squared	0.262992	S.D. dependent var	64514472	
S.E. of regression	55385130	Akaike info criterion	38.62417	
Sum squared resid	1.93E+17	Schwarz criterion	38.93793	
Log likelihood	-1399.782	F-statistic	3.854703	
Durbin-Watson stat	2.008282	Prob(F-statistic)	0.000624	

Table 3.

Dependent Variable: D(MRATE)

Method: Least Squares

Date: 06/08/09 Time: 20:33

Sample(adjusted): 2002:11 2008:12

Included observations: 74 after adjusting endpoints

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44127802	22181404	1.989405	0.0507
DEMAND(-1)	-0.399405	0.223176	-1.789644	0.0780
D(DEMAND)	-0.402412	0.110587	-3.638863	0.0005
D(DEMAND(-1))	-0.257385	0.138872	-1.853400	0.0682
MRATE(-1)	-0.394767	0.169838	-2.324368	0.0231
D(MRATE(-2))	-0.291808	0.142638	-2.045789	0.0446
R-squared	0.316015	Mean dependent var	2117115.	
Adjusted R-squared	0.265722	S.D. dependent var	64071554	
S.E. of regression	54902921	Akaike info criterion	38.55764	
Sum squared resid	2.05E+17	Schwarz criterion	38.74445	
Log likelihood	-1420.633	F-statistic	6.283483	
Durbin-Watson stat	2.018791	Prob(F-statistic)	0.000075	

Table 4.

Dependent Variable: D(IFEMRATE)

Method: Least Squares

Date: 06/08/09 Time: 21:02

Sample(adjusted): 2000:04 2002:06

Included observations: 27 after adjusting endpoints

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.83544	15.92336	1.685288	0.1083
D(DEMAND)	6.85E-06	5.88E-06	1.164884	0.2585
DEMAND(-1)	1.30E-05	1.07E-05	1.206947	0.2423
D(DEMAND(-1))	-9.77E-06	9.57E-06	-1.021062	0.3201
D(DEMAND(-2))	-9.51E-06	1.07E-05	-0.887255	0.3860
IFEMRATE(-1)	-0.324476	0.201664	-1.608993	0.1241
D(IFEMRATE(-1))	-0.207909	0.264473	-0.786125	0.4415
D(IFEMRATE(-2))	0.064834	0.257866	0.251424	0.8042

R-squared	0.427819	Mean dependent var	0.661111
Adjusted R-squared	0.217016	S.D. dependent var	4.569053
S.E. of regression	4.042990	Akaike info criterion	5.873041
Sum squared resid	310.5696	Schwarz criterion	6.256993
Log likelihood	-71.28605	F-statistic	2.029469
Durbin-Watson stat	1.907970	Prob(F-statistic)	0.104237

Table 5.

Dependent Variable: D(IFEMRATE)

Method: Least Squares

Date: 06/08/09 Time: 21:09

Sample(adjusted): 2000:05 2002:06

Included observations: 26 after adjusting endpoints

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23.70088	17.98225	1.318015	0.2061
DEMAND(-1)	1.31E-05	1.30E-05	1.011786	0.3267
D(DEMAND)	8.96E-06	1.07E-05	0.834336	0.4164
D(DEMAND(-1))	-7.19E-06	9.52E-06	-0.755075	0.4612
D(DEMAND(-2))	-7.11E-06	9.91E-06	-0.716853	0.4838
D(DEMAND(-3))	1.37E-06	4.67E-06	0.293032	0.7733
IFEMRATE(-1)	-0.298319	0.214914	-1.388087	0.1841
D(IFEMRATE(-1))	-0.201226	0.302589	-0.665015	0.5155
D(IFEMRATE(-2))	0.102530	0.367486	0.279004	0.7838
D(IFEMRATE(-3))	0.073547	0.325619	0.225869	0.8242

R-squared	0.431033	Mean dependent var	0.696154
Adjusted R-squared	0.110989	S.D. dependent var	4.655836
S.E. of regression	4.389865	Akaike info criterion	6.080197
Sum squared resid	308.3347	Schwarz criterion	6.564080
Log likelihood	-69.04256	F-statistic	1.346794
Durbin-Watson stat	1.888569	Prob(F-statistic)	0.288911