

AN ECONOMETRIC ANALYSIS OF THE IMPACT OF EXCHANGE RATES ON THE NIGERIAN ECONOMY

F. K. EMENI AND P. O. IBADIN

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ABSTRACT

We propose that the exchange rate of Naira to Dollar is a function of macroeconomic variables (interest rate, inflation rate, balance of trade and Gross Domestic Product (GDP)). We made OLS estimates of the relationship between the exchange rate of Naira to Dollars and the macroeconomic variables, and found that there is a significant relationship between the exchange rate and interest rate, the balance of trade and GDP; but we did not find any significant relationship between exchange rate and inflation rate. The conclusion was that, foreign exchange rate deregulation has positive impact on the Nigerian economy. Some recommendations were made based on the conclusion reached. Prominent among these recommendations is that, there is the need to move the exchange rate towards an equilibrium level before fixing bank rates; this will remove the depreciation in Naira.
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KEYWORDS: Exchange rate, Nigeria economy, econometric analysis.

INTRODUCTION

According to Akinmoladun (1990) Nigeria is one country that has faced and is still facing multifarious economic problems. Chief among which include high inflation rate, high level of unemployment, fiscal indiscipline, high debt profile, economic growth without development and of course, consistent balance of payment deficit. But it must be quickly pointed out that whatever a nation achieves in terms of economic development especially in the committee of nations is a function of the nation's trading relationships with other nations.

Obaseki (1991) opined that, the value of the nation's export in relation to her import determines the stability and or the fluctuating pattern of the exchange rate. And this rate is one rate too many in the determinants of the development of a nation's economy. Recall the major macroeconomic objectives namely:

- (1) increase in national output or national income;
- (2) reduction in inflation rate or maintaining price stability;
- (3) providing employment opportunities or reducing the level of unemployment; and
- (4) maintaining favourable balance of payment position among other objectives.

A close look at all these objectives shows that as much as the objectives are interwoven, so also are they closely related to exchange rate.

LITERATURE REVIEW

The Exchange rate system in Nigeria: (Overview before 1996)

According to Ollisadebe (1995), the exchange rate of a currency is the price of that currency in terms of other currencies. It generally represents the number of units of domestic currency that exchange for a unit of foreign currency. Just as the price of any commodity is determined by the interplay of supply and demand, the exchange rate is primarily determined by the supply and demand for foreign currency.

Komolafe (1996) opined that, foreign exchange problems in Nigeria were not seen as policy issues of concern until the late 1990s because the country was classified as a beggar nation just like many other developing countries. The naira exchange rate was pegged initially to the British pound sterling and subsequently to the United States dollar as part of a global exchange rate management under the Bretton Woods System.

According to Ogiogio (1996), developments in Nigeria's exchange rate policy can be divided into periods or stages. The first period of exchange rate policy in Nigeria, which spanned over 1960-1967, was the period of a one-to-one relationship between the Nigerian Pound (N#) and the British Pound Sterling (B#). This fixed parity lasted until the British Pound Sterling was devalued in 1967. As a result of the war that was going on at the time, the monetary authority did not consider it expedient to devalue the Nigerian Pound in sympathy with the British Pound.

The Dual Exchange Rate System (1986-1987).

According to Ahmed (1996), the dual exchange rate system was introduced in 1986 at the inception of SFEM and there were two different rates in the first and second exchange rate markets. All government official transactions were carried out through the official first-tier rate. The Dutch Auction System (DAS) was introduced as the pricing methodology on 2nd April 1987, owing to the continued depreciation of the currency. Under the system, the marginal rate was used to determine the successful banks but the latter were debited at their various bid rates plus 1 percent exchange equalization levy. There was, however, the problem of multiplicity of rates with the system. The rate that emerged at each of the first two sessions under the SFEM system were N4.6174 and N5.0839 to \$1 dollar. This fell to N3.0156 at the third bidding session, but rose again to N4.20303 in March 1987.

The Unified Exchange Rate System (1987-1998)

Adubi (2002) submitted that, owing to the subsidy in the dual exchange rate system, it was subjected to a lot of abuses. Subsequently, the two rates were merged on 2 July 1987, under a unified exchange rate market called Foreign Exchange Market (FEM), and all transactions were subjected to market-determined exchange rates sessions continued as the mode of exchange rate determination. The market featured a total of 30 bidding sessions during the period at which \$2,353 million was offered for sale. Record, however, indicates that dealers on the other hand, sought to purchase a total of \$2,787. This unsatisfied demand continually exerted pressure on the naira and a number of measures were made to stabilize the currency.

According to Ogiogio (1996), the interbank market (where banks are allowed to transact official foreign exchange business among themselves) was separated from the FEM and was made an autonomous market owing to persistent fluctuation of the exchange rates. This interbank market had

an independent rate for the privately sourced foreign exchange. It also introduced some elements of instability to the naira exchange rate. Initially, it was linked to the second-tier exchange rate but later the link was broken. The interbank rate, therefore, diverged widely from the FEM rate, which implied that resources were not being rationally allocated.

Ojo (1989) submitted that, banks official and authorized dealers were accused of corruption and allocation of foreign exchange to favoured customers. Data on the interbank rates show that in July 1987, the rate stood at N4.3550, compared to N3.8081 to \$1 in the foreign exchange market. Although the differential reduced in 1987, it widened progressively to 38 percent in April 1998 and in December 1988 it stood at 54.8 percent with the exchange rate at N5.35 to \$1. By the end of 1988, therefore, it was clear that the multiplicity of rates under the Dutch auction system as well as the large differential between foreign exchange market and autonomous rates was exerting undue pressure on the exchange rate and intensifying the problem of resource mis-allocation and exchange rate instability.

Fully Deregulated Exchange Rate System (1999-Date)

On 25 October 1999, the AFEM was replaced with IFEM. Participation in the market was broadened in order to deepen market activities, thus relieving CBN as the major supplier of foreign exchange. The major problem was that the exchange rate was not stable despite several interventions by the CBN. The rate, which was as low as N4.4 to a dollar in 1987, was N86.00 to the dollar in 1998 and N117 in 2000. The CBN also started to investigate the operations of some banks suspected to be flouting the rules governing the interbank foreign exchange market, (Adubi, 2002).

According to Olisadebe (1995), erring banks were barred from IFEM and in line with the CBN rules, banks are to bid for the foreign exchange on behalf of their customers and return unused foreign exchange within five days. The failure of some banks to comply with this rule, prevented the CBN from properly monitoring the level of foreign exchange in the system. The CBN also moved to prevent banks from trading on the dollar bought from it for customers. This was done to ensure effective use of the scarce dollar.

Theoretical framework and Model

In order to arrive at a very good conclusion, this study has resolved to the use of regression method, with the aid of the popular computer software, Statistical Package for Social Scientists (SPSS). And the model to be regressed has been formulated as follows:

$$EXR = f(GDP, BOT, INF, IR)$$

With the linear expression of the model being:

$$EXR = \beta_0 + \beta_1 GDP + \beta_2 BOT + \beta_3 INF + \beta_4 IR + U_t$$

Where:

- EXR = Exchange Rate of Naira to Dollars
- GDP = Gross Domestic Products
- BOT = Balance of Trade
- INF = Inflation Rate
- IR = Interest Rate
- U_t = Error term

$\beta_0, \beta_1, \beta_2, \beta_3$ and β_4 are parameters to be estimated. The apriori expectation is to follow the line of; $\beta_1 < 0, \beta_2 < 0, \beta_3 < 0$ and $\beta_4 > 0$

Note also that the data to be used is a time-series data spanning thirty-four years from 1970-2003. All data are obtained from the CBN's statistical bulletin and from the Federal Office of statistics. The data are attached as appendix at the end of this work.

Data estimate and analysis

The technique of computer estimate of the OLS was employed and the result is as shown in table 1 below. Note

that the regression package used is the Cochrane-Orcutt Statistical Package.

Table 1: Result on computer estimate of the OLS

Regressor	Coefficient	Standard Error	t-ratio
INTERCEPT	110.4099	1012.4	0.10905
INF	0.075762	0.053032	1.4286
GDP	0.00004379	0.000008705	5.0307
BOT	0.002499	0.0002701	9.2516
IR	0.064921	0.18710	0.34699

Source: Research results compiled from the secondary data.

R-Squared = 0.98201 R-Bar-Squared = 0.97710 SER=5.3066
F-statistic = 200.1399 DW-statistic = 2.4718.

The above tabular results can be presented in an equation form as shown below:

$$EXR = 110.4099 + 0.00004379GDP + 0.002499BOT + 0.075762INF + 0.064921IR$$

(0.10905) (5.0307) (9.2516)
(0.053032) (0.34699)

The above result is a product of time series data concerning the values of Exchange rates represented by (EXR), the Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), and the Balance of Trade (BOT). The research seeks to find the relationships between the dependent variable which is the value of exchange rates on the determinants; GDP, INF, IR, and BOT.

With apriori expectation that there will be a positive relationships between the dependent variable and GDP, IR and BOT on one hand, and negative relationship between dependent variable and INF on the other hand it was observed from the result that all the signs came out as expected. This thus means that whereas the exchange rate is positively related to GDP, interest rates and the balance of trade; it is negatively related to inflation rate. From the result it can be deduced that a 1% change in inflation rate will bring about a 0.076% positive change in exchange rate. Likewise a 1% change in gross domestic product will bring about a 0.000044% positive change in the exchange rate.

It is noted that the R^2 , which is a measure of overall goodness of fit in the analysis, is very high. At a high level of 0.98 or what can be regarded as 98%, it means that the proportion explained by the independent variable is 98% while the remaining 2% was explained by the error term. We equally saw that, the adjusted R^2 that allows for degree of freedom is equally high. This R^2 allows for comparison of equations with different explanatory variables and equally to determine one-to-one relation between R^2 and the residual variance. Therefore, the R^2 is most useful in a simultaneous equation with the best predictive ability.

Reported in parenthesis are t-values. The t-values are obtained by the ratio of the estimated parameters to the standard error of the parameters. Therefore, the t-test is a test to determine whether or not a given independent variable belongs to a particular equation. It is a good or reliable indicator for the dependent variable. From the results it is seen that the t-ratio of INF, GDP, BOT and IR are 1.4286, 5.0307, 9.2516 and 0.34699. Using the rule of thumb that gives significance to the t-value higher than 2 at 5%, we may be forced to conclude that the t-values are not significant at 5%. However a proof of this is found that the t tabulated at 5% i.e. $t_{5\%,30} = 2.042$ and since estimated t of 1.4286 (the higher of the t values of INF and IR) is less than the tabulated t values, it shows that the t values are not significant as far as those two variables are concerned.

This means that although the variables may be agreed to be part of the equation, they are not reliable indicators. However, for GDP and BOT with the values 5.0307 and 9.2516 respectively, the variables are significant at 5%. Going by the rule of thumb again, it must be emphasized that

once a t test failed at 5% it is obvious that it is going to fail at 1%. Confirming this, the t-tabulated at 1% is 2.750, which shows that the t is not significant for all the independent variables.

The F-ratio is an improvement over the t-ratio as a test of significant linear relationships between the independent variables taken together and the dependent variables. Whereas the t-ratio tests variable by variable in the equation, the F-ratio takes the whole independent variables in bulk and test, using the F test, the tabulated F is equal to F_{v_1, v_2} at 5% = 5.17 and as usual once the estimated F is greater than the tabulated F, we say the test is significant. And in this case, since our estimated F of 200.1399 is greater than 5.17, the test is significant and the independent variables put together are good and reliable indicators of the dependent variable.

The Standard Error of Regression (SER) is another test of goodness of fit and more important of reliability in prediction. The lower the SER, the better the predictive power of the equation. One important notice here is that, there is no clear-cut division between the small SER and large SER. However econometricians consider it necessary to examine the ratio of SER to the mean of the dependent variables. If the ratio is "small" we consider it acceptable. In our case here, the SER of 5.3066 is minimally small enough to confer high degree of predictability power on the model under discussion.

The Durbin-Watson test statistics is used to test for serial correlation or auto correlation in the data used to run a regression (Koutsoyiannis, 1977). The result which can be interpreted to mean that any regression with significance of autocorrelation means that the successive data in the series are dependent on one another and that some of the variables used in explaining the dependent variables are too related to the dependent variables. When such a thing happens, one of the assumptions of OLS is violated and the estimated parameters are found to be biased and a bad predictor. From the result the DW is 2.4718 and the tabulated $DW_{k,n,5\%} = 0.8152$ for lower value and 1.579 for upper value. And the test condition is such that if $D_L > DW$ there is evidence of positive first order serial correlation; if $D_U < DC < D_L$ there is inconclusive evidence and since D_L is less than the calculated DW, then there is no evidence of first order positive correlation and therefore the regression estimates are unbiased.

CONCLUSION AND COMMENTS

It was expected at the beginning of this paper that in the end, there would be positive correlation between exchange rate and macroeconomic variables in Nigeria. The end results for the various equations proved this expectation right since foreign exchange rate was found to contribute positively and significantly to all macroeconomic variables in Nigeria during the period under study.

It is hereby concluded that, foreign exchange rate deregulation has positive impact on the Nigerian economy. Flowing from the above, the following recommendations were made:

- (1) It can be observed that a fixed exchange rate system encourages inefficiency and makes movement towards short-term equilibrium difficult. On the other hand, a floating exchange rate system is usually unstable and inflationary. Thus, the two extremes may not be ideal for a developing economy like ours. To avoid the problems with the two systems and reap the advantages of both, exchange rate should be a lower and an upper hand of 5.0 percent.
- (2) There is the need to move the exchange rate towards an equilibrium level before fixing bank rates. This will remove the under valuation and depreciation in Naira.
- (3) The Central Bank of Nigeria should determine the price it wants to sell its foreign exchange and the

banks should be allowed to determine what they want to pay, subject to the 5.0 percent band.

- (4) Government should make frantic efforts to develop the non-oil export base in order to reduce reliance on the oil sector and raise the level of non-oil receipts. This will reduce the demand for foreign currencies and increase the supply of foreign exchange to the economy.
- (5) The issuance of stabilization securities should be considered within the wider framework of open market operations. Overall monetary policy stance should continue to be light. If credit ceiling is imposed, interest rates should be relaxed but liquidity ratio and cash reserve requirements could be raised, or vice versa.

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