

THE ELASTICITY OF DEMAND FOR FOREIGN EXCHANGE AND THE EXCHANGE RATE OF THE NAIRA*

Introduction:

Successive governments in Nigeria have devised and implemented a wide array of restrictive trade and foreign exchange control policies aimed at minimizing the economy's deteriorating balance of payments position.¹ For example, besides the imposition of "advance deposit payments" on imports², stipulation of specific import licence on merchandises that were hitherto imported under open general licence and the introduction of pre-shipment inspection on imported goods, the policymakers have further sought to influence the level of imports by total prohibition of selected commodities, hiking of duties on imports and prescription of advance payment of duties on all imports. However, notwithstanding these stringent ad hoc policy mix, the broad objectives of Nigeria's trade policy, especially the reduction of imports, diversification of the non-oil sector of the economy and maintenance of an equilibrium balance of payments have not yet been realized. Consequently, it is necessary to examine whether an alternative policy measure such as exchange rate adjustment could be more effective than the present measures.

In this study, the policy issue specifically examined is whether devaluation is a more effective and simpler policy measure for reducing the level of imports or pressure on the foreign exchange budget in the Nigerian economy. In other words, would devaluation represent an effective and efficient alternative to the present maze of ad hoc trade and exchange regulations? The answer to this question is dependent largely on the elasticity of demand for foreign exchange in the Nigerian economy. Foreign exchange elasticity means the relative responsiveness of the amount of a foreign currency (e.g. U.S. dollar) demanded, as a result of exogenous changes (devaluation/revaluation), in the units of another currency (e.g. the naira). In other words, the term "elasticity" basically measures the percentage change in some other variable(s). Thus the demand for foreign exchange in the Nigerian economy would be considered price elastic if the percentage decline in the amount of foreign exchange demanded is *greater* than one in response to a 1 per cent rise (depreciation) in the exchange rate of the naira. It is price inelastic if the percentage decline in the amount of foreign exchange demanded is *less* than one in response to a 1 per cent. rise in the exchange rate of the naira.

¹The full evolution of Nigeria's trade and exchange control regulation policy is found in a paper written by O.K. Anifowose – "The Relevance of Exchange Control In Nigeria's Balance of Payments Adjustment Process", *Economic and Financial Review*, Central Bank of Nigeria Vol. 21, No.3 (September, 1983), pp.34-35.

²This practice is now discontinued. However, while it lasted, it required importers to make mandatory interest free deposit of between 10-250 per cent of the value of raw materials and consumer/luxury goods with the Central Bank of Nigeria.

Theoretical Framework

While Nigerian policymakers have always been eager to experiment with ad hoc and unorthodox trade and exchange regulations in their quest to reduce the level of imports, they have consistently been very reluctant to adopt the policy of devaluation which is a generally accepted policy measure in most developed economies. It has been claimed that the reasons for this policy stance include, among others, the now familiar argument concerning the mono-culture structure of the Nigerian economy, and particularly, the price in-elasticity of demand of Nigeria's imports.

While a few empirical studies such as Essien (1984) and NISER (1983), have examined and found Nigeria's imports to be price inelastic, no study has yet examined the elasticity of demand for foreign exchange in the economy. The need to fill this vacuum cannot be over-emphasized – in view of the fundamental interrelationship between foreign exchange elasticity and import elasticity which the former underlies.

In fact, some of the economic variables that may be essential for the determination of the elasticity of demand for foreign exchange in an open economy have already been identified in the literature. For example, in a largely normative work, Ellsworth (1950) noted that the demand and supply of foreign exchange are not ordinary "homogeneous schedules, each capable of being described in terms of a single elasticity like the demand and supply for a commodity". On the contrary, he opined that "each of the schedule is highly composite, being made up of many different goods and services." Evidently, Ellsworth was essentially corroborating the views earlier expressed by Machlup (1940) and Robinson (1947) who had postulated that the elasticity of demand for foreign exchange depends upon: (1) the elasticity of home demand for imports; (2) the elasticity of foreign supply of imports, and (3) the elasticity of substitution of import competing goods. While the aforementioned variables do not necessarily exhaust the determinants of elasticity of foreign exchange demand, they are however very relevant in gauging the elasticity of demand for foreign currency in the Nigerian economy. Thus, following Machlup and Robinson, the important elasticities that have direct theoretical and policy relevance in this study are: the price elasticity of home demand for imports, and the elasticity of substitution of import-competing goods.

Interestingly, despite the paucity of country specific studies, the conventional wisdom in the Nigerian case is that the price elasticity of imports, and the elasticity of substitution of import-competing goods are negative and insignificant respectively. This heuristic assertion is based on the fact that most of Nigeria's imports are either classified as "essential" commodities, or capital goods, which are not obtainable in sufficient quantities and at reasonable prices locally.

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Nevertheless, inspite of severe data limitations, the heuristic assertion that Nigeria's imports are price in-elastic and that the elasticity of substitution of import – competing goods is insignificant have been either confirmed or implied in the empirical studies by NISER (1983) and Essien (1984). Consequently, the elasticity of substitution of import competing goods and the price elasticity of Nigeria's imports will be largely assumed as given in this study. These assumptions are in consonance not only with the findings in the literature, but also intuitively appealing, as they confirm the practical fact of economic life in Nigeria, where locally-made goods are few, expensive and of inferior quality, and imported products are in great demand but command prohibitive prices.

But in order to lead directly into the empirical analysis, it is perhaps necessary to make some behavioural assumptions as to the factors that may influence the demand for foreign exchange and the level of foreign exchange budget in the economy. Generally, the demand for foreign exchange is essentially a "derived" demand – in this case, the demand for imports. Therefore, it will be assumed that the supply of imports to Nigeria is infinitely elastic and that the goods generally imported from her trading partners are homogenous, such that the "law of one price" obtains. Based on these assumptions, it will follow that any variation in the foreign price (P^*) of imported goods (Q), that may necessitate an increase or decrease in the demand for foreign exchange by importers will only result from fluctuations in the naira rate of exchange. This relationship which explains the demand-side behaviour can be represented thus

$$PQ = eP^* \dots\dots (1)$$

where e is the exchange rate – specifically, the number of units of naira per a unit of U.S. dollar ($\text{₦}/\text{\$}$), and P is the local price of imports.

It will further be assumed that all the foreign exchange receipts of the economy are completely monetized, such that a linear relationship exists between the rate of domestic money growth, and the rate of growth in the domestic foreign exchange budget.³ Thus, an increase in money supply, without a corresponding increase in foreign exchange receipts that will be used to finance imports – will not only trigger domestic inflation, but will also bring pressure to bear on the foreign exchange budget.

Hence, an equilibrium in the economy's foreign exchange budget will require that:

$$X^d = X^b \dots\dots (2a)$$

$$\text{and } M^d = M^s \dots\dots (2b)$$

where X^d , is defined as the annual amount of foreign exchange demanded, specifically, in U.S. dollar, X^b , is the annual foreign exchange budget; M^d , is the annual stock of money demanded; and M^s , is the annual stock of money supply.

It should be remarked that the level of the annual foreign exchange budget in Nigeria is generally predicted on external factors such as the projected price and level of demand of crude oil in the international markets, while variations in the exchange rate and money supply are by and large influenced

³ While a foreign exchange budget existed in principle during the period covered by this study, in actual practice, annual foreign exchange expenditures of the economy have actually outstripped the provisional annual foreign exchange budgets.

by the amount of foreign exchange receipts, price of imports; domestic fiscal policy and developments in the real domestic sector.

It follows that, based on the assumptions implied in equations (1) - (2^b) above, it would appear that devaluation per se, may not necessarily represent an effective demand management policy measure. The reason is that, given the fundamental inelasticity of the economy's imports, the demand for foreign exchange will monotonically increase or decrease with the rise or fall in the prices of imports and money supply on one hand, and the increase or decrease in the economy's foreign exchange budget on the other. Put differently, a deliberate policy to increase the units of naira per unit of dollar, may not likely lead to a significant reduction in the amount of U.S. dollar demanded by both the private and public sector importers (users of foreign exchange), who appear to have increasing external obligations, due mainly to global inflation.

Methodology

The time frame (1975-82), and the annual time series data used in this study were specifically selected in order to minimize the bias arising from unsatisfied foreign exchange demand (backlog), attendant upon excessive trade and exchange regulations, and quantitative import restrictions that later became quite severe in the economy. All things considered, the period 1975-82 is relatively speaking, the years during which the demand for foreign exchange in the economy reflected actual "effective demand" in the sense that the domestic foreign exchange market was largely characterized by "free market" conditions. Moreover, the period was also chosen because, unlike other periods, it experienced a discernible depreciation of some 9.3 per cent in the nominal $\text{₦}/\text{\$}$ exchange rate quotations.

The entire data were obtained from the Central Bank of Nigeria (CBN), *Annual Report*, and *Economic and Financial Review* for the various years. However, the annual aggregate foreign exchange expenditures on visible imports for the various years were processed using the per country "currency of invoice ratio" in order to separate the amount specifically denominated in the U.S. dollar. Overall, it was found that throughout the entire period, the dollar was used in financing approximately 70 per cent of Nigeria's global visible imports. Foreign exchange outflows associated with payments for invisible services such as loans and interest repayments, and unrequited transfers during the time frame were largely ignored because of their relative insignificance in the aggregate foreign exchange disbursement during the period under review, as well as their inherent insensitivity to exchange rate adjustments. Using predetermined variables, we shall now attempt to ascertain if the elasticity (Θ) of demand for foreign exchange in the Nigerian economy is

$$\Theta > 1$$

$$\Theta < 1$$

$$\Theta = 1$$

Generally, an inverse relationship exists between the price and the quantity demanded of any "normal" good. Consequently, while an elastic demand schedule, would imply that a percentage rise (depreciation), in the units of naira per unit of dollar will result in a greater percentage decline in the amount of dollar demanded, an inelastic demand curve, would imply otherwise. However, a unit elasticity, means that a percentage change in the naira

exchange rate quotation and the quantity of U.S. dollar demanded are precisely equal. In other words, a unit elasticity expresses the willingness to purchase foreign exchange at any quoted rate of exchange.

In order to test this hypothesis, it is essential that the analytical model be behavioural. Thus, it is hereby stated in an explicit functional form, and it is assumed to take a log linear relationship:

$$\Delta \log X^d = a + b \Delta \log(E) + c \Delta \log(P^*) + d \Delta \log(M^s - M^d) / P + e U_t \quad (3)$$

*1 < 0; b > 0.

Where ΔX^d is defined as changes in the amount of foreign exchange denominated in U.S. dollar, ΔE is the changes in the units of naira per unit of dollar, ΔP^* is changes in the import price index; $\Delta (M^s - M^d) / P$, are changes in real money supply and demand respectively, and U_t is the error term.

As indicated above, the parameters (*1), which gauges the effect of naira exchange rate variations, and (*2) which measures the influence of real money growth on the foreign exchange budget, are expected to take negative and positive signs respectively. This implies that whereas a rise (i.e. depreciation) in the nominal exchange rate will reduce the pressure on the foreign exchange budget; a rise in real money growth will increase it.⁴

Results and Conclusion

Table 1 below contains the results of the analytical model. It could be readily observed that both the signs and magnitudes of the regression co-efficients are correct and very suggestive. In fact, it is apparent from the result that a downward adjustment in the nominal exchange rate of the naira could actually result to a minimal reduction in the demand for foreign exchange denominated in the U.S. dollar. However, the effect of exchange depreciation on the foreign exchange budget is not statistically significant – implying that

the demand for foreign exchange in the economy may be inelastic in the short-run. Consequently, whether the economic advantage that would be derived from this minimal reduction of pressure on the foreign exchange budget is preferred to the attendant inflationary pressures that a steep devaluation will surely transmit into the domestic price level in the short-run, is a policy question that needs to be carefully resolved by the policymakers. However, it should be pointed out that the relative inelasticity of demand for foreign exchange in the economy underscores the serious diseconomy and futility associated with the use of exchange rate as an anti-inflationary instrument – in view of the fact that persistent over-valuation will among other things, reinforce the economy's dependence on imports for consumption and production.

The effect of real money supply (*2), in triggering the demand for foreign exchange in the economy is also transparent in the result. In fact, it depicts the futility of any attempt by the policymakers to reduce the pressure on the foreign exchange budget in the face of rising real money supply.

Overall, based on the results, it would seem that government objective to reduce the level of imports in the economy would be faster (though not economically), accomplished in the short-run by continuation of the present ad hoc trade and exchange regulations, rather than by the orthodox policy measure of exchange rate devaluation per se.

Finally, it would appear that the persistent pressure on the economy's foreign exchange budget (craze for imports), will be greatly reduced if a serious reappraisal of the monetary/ fiscal policy regime of the economy is carried out.

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TABLE 1
THE RELATIONSHIP BETWEEN CHANGES IN NAIRA EXCHANGE RATE QUOTATIONS,
REAL MONEY SUPPLY AND THE FOREIGN EXCHANGE BUDGET

Dependent Variable	Exchange Rate (*1)	Real Money Supply (*2)	R ²	D.W.
log X ^d	-0.28 (-0.18)**	0.46 (4.40)*	0.79	2.5

** statistically insignificant.

* statistically significant at 1 per cent level.

⁴ It was found in an unpublished CBN investigation that for every ₦1 of new money supply in 1983, approximately 68K was spent in the financing of imports. Furthermore, in an unpublished paper "An Alternative Choice For Managing Nigeria's Exchange Rate: And the Impact of over-priced Naira On The Balance of Payments" by O.J. Nnanna and G.C. Osaka, it was also discovered that the demand for imports – particularly, consumer goods are usually greater in the era of naira exchange rate appreciation.

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