The Currency Substitution Phenomenon: Is the Nigerian Economy Immune?

Lionel Effiom and Ubi Peter Samuel
Department of Economics, University of Calabar, Calabar, Nigeria

Abstract: This study empirically examines the vulnerability or immunity of the Nigerian economy to Currency Substitution (CS), a phenomenon characterized by the preference and use of foreign currency (in this case the dollar) by domestic agents side by side the local currency for economic transactions, particularly as a store of value. Using a Vector Error Correction Mechanism (VECM) for empirical explorations with exchange rate and US treasury bills rates variables as proxies for CS, it is shown that with persistent inflation and depreciation of the naira occasioned by exchange rate instability and monetary policy inconsistency. CS has been a dominant yet silent feature of the Nigerian economy with far reaching macroeconomic implications. The fundamental problem is that domestic agents perceive loss of purchasing power from holding the home currency be it from inflation risk, exchange rate risk or political instability. Consequently, there is a loss of seignoriage revenue to Nigerian government since its citizens prefer to hold foreign currency to naira, thus creating revenue in the process to foreign monetary authorities. Second, since firms, multinational companies and the elite class transact business with a preferred foreign currency, the phenomenon obscures financial transactions, reduces the cost of enterprise theft and facilitates corruption and rent seeking. This weakens the government's ability to command real resources from the private sector and deepens fiscal deficits. It advocates that monetary authorities should pursue inflation and exchange targeting, among other measures, to lesson volatility pressures on the economy.

Key words: Seignoriage, currency substitution, stationarity, dollarization, reintermediation, Nigeria

INTRODUCTION

A distinction has been made in the literature between currency substitution and dollarization. The term dollarization, according to Calvo and Vegh (1992), denotes the usage of foreign currency as a unit of account and a store of value but not necessarily as a medium of exchange while currency substitution primarily indicates the replacement of domestic currency by foreign currency in everyday transaction, i.e., the use of foreign currency as a medium of exchange.

The penetration of a foreign currency into a domestic economy has been identified to be a two-stage process: first, is dollarization and then CS follows. Movchan believes that if a country has only one legal tender, it cannot reach the stage of CS, at least officially because foreign currency is not allowed as a medium of exchange. Thus, it is dollarization that gives birth to CS-both are sequential terms.

On the whole, it is obvious that the terms dollarization and currency substitution are largely defined based on their relatedness to the three major functions of money. More specifically, CS has been delineated as a subset of dollarization, when Fiege and Dean defines dollarization as the process of substituting foreign currency for a domestic currency to fulfill the essential functions of money as a medium of exchange (currency substitution) and/or as a store of value (asset substitution). In this vein, dollarization is composed of both currency substitution and asset substitution, both being related to medium of exchange and store of value functions of money, respectively. For the purpose, however, the researchers shall use these terms interchangeably, the one implying the other.

Dollarization or CS has been known to be the official policy of some governments. In such circumstance, the foreign currency thus becomes the authorized transaction medium, the store of value and the unit of account. In the absence of sanctions, firms and individuals have been known to voluntarily substitute a foreign currency for the domestic currency as a means of payment and/or choose to hold foreign rather than domestic denominated monetary assets as stores of value. When this happens the CS process is described as unofficial, spontaneous or de facto to dollarization.

Unofficial or spontaneous CS is essentially the rational response of economic agents to a loss of confidence in the domestic economy, often resulting from episodes of inflation, currency devaluations and/or currency confiscations. It may also be related to the

---

Corresponding Author: Lionel Effiom, Department of Economics, University of Calabar, Calabar, Nigeria

growth of underground or unrecorded economic activities since currency, particularly foreign currency is often the preferred medium of exchange for such transactions.

Currency substitution which represents a revealed preference for holding foreign currency as a means of reducing the risks of domestic inflation and exchange rate devaluations does, however, have some salutary consequences. These include efficiency gain from portfolio diversifications, reduced tendencies for inflationary finance, as well as capital flight. Other benefits include the possibility of enhancing the opportunity for reintermediation and promoting financial deepening in economies that have experienced long periods of high and variable inflation and unfavourable macroeconomic conditions.

Extant literature Oresotu and Mordi (1992), Miles (1984) and Arize (1989) suggests that very limited empirical study has been done on the CS trend in Nigeria. The Nigerian economy has witnessed tremendous changes, especially since the return of the country to democratic rule. Policies have come in various shades and forms and thus there is the need to reevaluate the CS phenomenon in the light of current economic realities. Again, previous studies on the subject indicate a limited robustness in methodology employed. Specifically, the stationarity properties of time series data used were not ascertained, a situation which could lead to spurious results.

The present effort aims at correcting these methodological issues by using more robust econometric techniques and situating the CS issue in a more relevant orbit. It considers the dynamic long-run relationships that exist among the variables.

MATERIALS AND METHODS

Analysis and discussion of results are based on Ordinary Least Squares (OLS) technique. Generally, the researchers use the econometrics dynamic modeling technique, such as cointegration analysis to establish the order of cointegration in the data, since they are time series in nature.

The concept of cointegration has been especially developed to overcome the problems of spurious correlation often associated with non-stationary time series data. It creates a link between integrated processes and the concept of steady state equilibrium. Adebiyi (2005) maintains that although, two different time series may not themselves be stationary, some linear combination of them may indeed be stationary with the generalization to more than two series. The guiding rule is that variables of different orders cannot be cointegrated, otherwise their linear combinations will be stationary. The

theory of cointegration arises out of the need to integrate short-run dynamics with long-run equilibrium. The traditional approach to the modeling of short run disequilibrium is the partial adjustment model. However, an extension of this in the cointegration technique is the Error Correction Mechanism (ECM) (Granger and Newbold, 1977; Engle and Granger, 1987)

Cointegration technique is superior to the traditional partial adjustment model for the following reasons. First, it is central to econometric modeling of integrated variables as well as investigation of long-run relationships among those variables. Secondly, it assists to overcome spurious or nonsense regression. Thirdly, data consistency is achieved shown that the model variables would be of the same order of integration. Lastly, information is greatly enhanced since both short-run changes in variables and long-run relationships in levels are included in the ECM specification.

Based on the merits of the cointegration technique, the first step is to determine the order of integration of the variables. This means, the researchers test whether they are stationary in their levels or whether they have to be differenced once or more before they become stationary. The researchers use an Augmented Dickey-Fuller (ADF) test to carry out test for unit roots. The calculated values of these statistic tests are compared with their critical values. Accepting H_0 would mean that the data are non-stationary and thus using them for estimation would lead to misleading results. Therefore, the researchers have to examine if their first difference is stationary or not. However, if H_0 is rejected for the series, it implies that there is a possibility that the variables in levels might have a cointegrated or equilibrium relationship (Adebiyi, 2005).

Theoretical model and specification: Keynes believed that the transactions demand for money was primarily interest inelastic but income elastic. But Baumol (1952) in his Portfolio Balance Model shows that the transactions demand for money is interest elastic.

The PBM is based on the holding of an optimum inventory of money for transaction purposes by a firm or individual. He affirms that a firm's cash balance can usually be interpreted as an inventory of money which its holder stands ready to exchange against purchases of labour, raw materials, etc.

Cash balances are held because income and expenditure do not take place simultaneously. However, there is an opportunity cost attached to tying large amounts of capital in the form of cash, since that money could otherwise be used profitably elsewhere in the firm. It could be invested profitably in securities. Consequently, the alternative to holding cash balances is

bonds which earn interest. A firm would always keep minimum transactions balances in order to earn maximum interest from its assets.

The higher the interest rates on bonds, the lesser the transactions balances which a firm holds. According to De Nicolo *et al.* (2003), the PBM follows the aggregative tradition of postulating money demand functions that depend positively on a scale variable, such as income or wealth and negatively on the return of each alternative asset.

It does not specify any particular feature of money so as to make it distinguishable from other assets (Calvo and Vegh, 1992; Girton and Don, 1981; Cuddington, 1989). Since the demand for domestic currency may depend negatively on the expected exchange rate depreciation through both substitutability in relation to the foreign currency (currency substitution) and substitutability vis-à-vis the foreign bond (i.e., capital flight), followers of the PBM have claimed that a negative influence of an expected exchange rate depreciation in the money demand is not necessarily evidence of currency substitution (Cuddington, 1989).

In other words, domestic demand in an economy is a decreasing function of the expected exchange rate depreciation. The influence of exchange rate depreciation on the demand function comes in two directions: one, through currency substitution and two, via substituting foreign bond for domestic money or capital flight. Thus, it is averred that not every negative influence of expected exchange rate depreciation of domestic money demand is evidence of CS, since it may also be evidence of capital flight.

On this score, the researchers specify the model along the lines proposed by Cuddington (1989) and De Nicolo *et al.* (2003):

$$M_t = a_o + a_1R_t + a_2R^*_t + (a_2 + a_3) E_t + a_4Y_t + V_t$$

Where:

M = The log of real money balances
R = The nominal interest rate on domestic bonds
R* = The nominal interest rates on foreign bonds
E_t = The expected exchange rate depreciation
Y = The log of the domestic income
V = The stochastic error term which captures all other variables not included in the model

The model is augmented in Eq. 1 to included inflation and exchange rate volatilities, variables which define the stability of the macro economy and the external sector. It is the exchange rate that captures the currency substitution phenomenon. The researchers thus arrive at the following model for estimation. This is a log-linear relationship:

$$LPM_2 = do + d_1LGDP + d_2EXCHR + d_3INFLA + d_4TBR + u$$
$$(+) (-) (-) (-)$$

(1)

Where:
LPM_2 = Log of real cash balances
LGDP = Log of real income
EXCHR = Exchange rate in terms of US dollars
INFLA = Inflation rate
TBR = US Treasury bills rate

Annual time series data covering 1970-2008 have been used. The central series for this study are GDP, inflation, real money demand, exchange rate and US treasury bills. All data, except US treasury bills rate were obtained from Statistical Bulletin (a publication of the Central Bank of Nigeria). Treasury bills rates were obtained from the Board of Governors publication of the US Federal Reserve.

The exchange rate used is the nominal exchange rate between the naira and the dollar. This variable has become an important policy variable because the CBN sometimes engages in foreign exchange open market operations partly as a monetary policy tool and partly to accrue foreign reserves on behalf of the government. GDP entered the model in real terms.

RESULTS AND DISCUSSION

In determining the immunity or vulnerability of the Nigerian economy to CS, the approach proceeds in the following stages: first, the researchers test for unit roots to establish their stationarity, test for cointegration amongst the variables and then finally, based on the preceding test results run the overparamaterized and parsimonious regressions.

Stationarity test: The stationarity status of the series is established by considering the order of integration of each series using the Augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) classes of unit root tests.

The researchers use the PP approach to test for the stationarity of the variables because PP test statistics which is a modification of the ADF, takes the less restrictive nature of the error process into account. Moreover, this replaces the use of lags in the ADF test which has been criticized as being arbitrary. Table 1 shows the stationarity properties of the data.

Using the ADF approach, the results reveal that INFL and TBR are stationary at levels, devoid of unit roots, while EXCHR, GDP and M_2 all had unit roots but became stationary only after differencing them once and twice. The PP test results are consistent with that of the ADF approach.

Table 1: Stationarity test

Variables	ADF	Decision	Phillips Perron	Decision
EXCHR	-4.701541*	1(1)	-4.701541*	1(1)
GDP	-7.113017*	1(1)	-7.563734*	1(1)
INFL	-3.055272**	1(0)	2.957164**	1(0)
M_2	-8.023148*	1(2)	-8.060877*	1(2)
TBR	-3.418252***	1(0)	-6.611197*	1(0)

Cointegration test results: Having confirmed the stationarity of the data at their different levels, the researchers test for cointegration amongst them. Table 2 shows that there exist at least one cointegrating equation amongst the variables, thus establishing the existence of a long-run relationship amongst them.

Error-corrrection: Having determined the stationarity condition of the variables and that they are cointegrated, the researchers formulate an error correction model. The intuition behind the error correction model is the need to recover the long-run information lost by differencing the variables. The result from the Vector Error Correction Model (VECM) in Table 3 shows that there is a long-run relationship between the dependent variable, real money holdings and its explanatory variables. This result substantiates the finding of cointegration among the variables shown earlier. As expected the error correction term (ECM-1) bears the correct negative sign and is significant at the 1% level. It shows that about 38% disequilibrium errors which occurred the previous year are corrected in the current year. Thus to maintain a long-run equilibrium, it is important to reduce the existing disequilibrium over time.

In addition to the disequilibrium effect, the results in Table 3 shows that real money demand is influenced by changes in its first lag, the contemporaneous and first lags of exchange rate, GDP and inflation.

Specifically, it is noted that in the short run a 1% increase in exchange rate will result in a reduction of real money demand of the domestic currency by 6 and 3%, respectively. It should be recalled that beginning 1979, the economy began to show signs of depression due largely to the collapse of the international oil market. By 1983, the economy was well into depression. Export earnings reduced from $22 billion in 1980 to $166 billion in 1981 and by 1986 it had gone down to $5.8 billion.

That same year the SAP was introduced to correct the macroeconomic imbalance. But unfortunately, the economic indices worsened. Domestic shortages, inflation, capacity underutilization, unemployment and the devaluation of naira through the instrumentality of SFEM took its toll on the economy.

Table 2: Cointegration test

Eigenvalues	Trace statistics	5% critical value	1% critical value	Hypothesized no. of CE(s)
0.581013	78.482	68.52	76.07	None**
0.446537	46.295	47.21	54.46	Atmost 1
0.319784	24.407	29.68	35.65	Atmost 2
0.203413	10.149	15.41	20.04	Atmost 3
0.045821	1.7354	3.760	6.650	Atmost 4

*(**) denotes rejection of the hypothesis at the 5% (1%) level. Trace test indicates 1 cointegrating equation (s) at both 5 and 1% levels

Table 3: Dependent variable: D (LM_2)

Variables	Coeff.	SE	t-statistics	Prob.
D (LM_2(-1))	0.82570	0.27873	2.962363	0.0092
D (LEXCHR)	-5.64860	0.86520	-6.528450	0.0000
D (LEXCHR(-1))	-3.23840	1.36920	-2.365220	0.0261
D (LGDP)	0.82570	0.27870	2.962360	0.0090
D (LGDP(-1))	2.53105	0.55980	4.521470	0.0000
D (LINFLA)	-0.10060	0.04200	2.393950	0.0240
D (LINFLA(-1))	-0.33260	0.30560	-1.088200	0.2860
D (LTBR)	-1.05135	0.05680	-18.499800	0.0000
D (LTBR(-2))	-0.49434	0.21730	2.274920	0.0370
ECM (-1)	-0.38330	0.13990	-2.740600	0.0110
C	0.63153	0.34820	1.813840	0.0817
Adjusted R^2	0.74038			
Durbin-Watson stat	2.071408			
F-ststistic	10.981300			
Prob.(F-statistic)	0.000001			

There were clear indications that the naira was overvalued before the introduction of SFEM, so that the issue at stake was the extent of overvaluation which should inform the indirect devaluation of the naira via (SFEM). The naira was pegged to a basket of German mark, the French franc, the Swiss Franc and the Dutch Guilder with a fixed relative purchasing power parity with weights attached to them (Agiobenebo, 1891). This method of determining the naira exchange rate as noted by Abdullahi (1987) had little or no relationship with the cycles of boom and recession of the Nigerian economy with implication for over valuation mirrored by the wide divergences between official and the black market rates.

Predictably therefore, the SFEM took off with a heavily depreciated rate of ₦4.6174 to $1.00 as at September 26, 1986, implying a depreciation of >193.5%. This rate further depreciated to ₦5.0585-1.00 during the second week of operation, implying a depreciation of rear 221.6%. All these occurred in the face of excess demand pressures. Little wonder then that economic agents sought financial and monetary refuge in the US dollar and other hard currencies whose rates were appreciating against the falling naira.

Real GDP is an increasing function of LM_2, thus confirming the theory that as real income increases, agents rationally respond by increasing their money holdings for transaction purposes. It should be stressed that real income reflects the state of wealth or the transaction motive for holding money. Another interesting finding is the negative correlation between

TBR and the dependent variable. An increase in returns on foreign bonds leads domestic agents to reduce the amount of domestic currency held as cash. Thus there is a substitution of foreign currency and foreign financial assets for the weak naira. This is also confirmed by the fact that inflation is a significant variable in the model. Inflation erodes confidence of both agents and firms in the domestic currency and hence, a hedge is found in any foreign currency that has a semblance of stability.

The diagnostic test results of the model look satisfactory. About 74% of variations in LM_2 are explained by changes in the explanatory variables. The F-statistic which tests the significance of the entire model is high and is confirmed by the low probability value. The Durbin-Watson stat of 2.07 indicates the absence of serial autocorrelation.

CONCLUSION

The objective of this study was to examine the vulnerability or immunity of the Nigerian economy to currency substitution, a phenomenon characterized by the preference and use of foreign currency (dollar) by domestic agents side by side the local currency for economic transactions and other purposes, particularly as a store of value. Using a Vector Error Correction Mechanism (VECM) for empirical explorations, it is shown that with persistent inflation and depreciation of the naira occasioned by exchange rate instability and monetary policy inconsistency, currency substitution has been a dominant feature of the Nigerian economy, with far reaching macroeconomic implications. The fundamental problem is that domestic agents perceive that there is a loss of purchasing power from holding the home currency, be it from inflation risk, exchange rate risk or political instability.

First, there is a loss of seignoriage revenue to Nigerian government, since its citizens prefer to hold foreign currency to naira, thus creating revenue in the process to foreign monetary authorities. Second, since firms, multinational companies and the elite class transact business with a preferred foreign currency, the phenomenon obscures financial transactions, reduces the cost of enterprise theft and facilitates corruption and rent seeking. This weakens the government's ability to command real resources from the private sector and deepens fiscal deficits. It advocates that monetary authorities should pursue inflation and exchange targeting, among other measures, to lesson volatility pressures on the economy.

REFERENCES

Abdullahi, S.A., 1987. Exchange Rate Adjustment in Nigeria: The Problem, the Solution and the Cost. In: The Nigerian Economy under Second Tier Foreign Exchange Market, Altehel, (Ed.). Ahmadu Bello University Press, Zaria, pp: 123-135.

Adebiyi, M.A., 2005. Financial Sector Reforms, Interest Rate Policy and the Nigerian Manufacturing Sector. The Nigerian Economic Society, Nigeria.

Agiobenebo, T.J., 1891. Foreign exchange policies in Nigeria: A Theoretical Perspective. In: The Nigerian Economy at the Cross Roads: Policies and their Effectiveness, Ndebio, J.E.U. and A.H. Ekpo (Eds.). University of Calabar Press, Calabar, pp: 61-79.

Arize, A.C., 1989. Exchange rates, foreign interest rates and the money demand function in an open economy: An empirical investigation in Korea. Sav. Dev., 12: 237-252.

Baumol, W.J., 1952. Transactions demand for cash: An inventory theoretic approach. Qual. J. Econ., 66: 545-556.

Calvo, G.A. and C.A. Vegh, 1992. Currency substitution in developing countries: An introduction. International Monetary Fund Working Paper, No. 92/40, pp: 73-95. http://ideas.repec.org/p/pra/mprapa/20338.html.

Cuddington, J., 1989. Review of currency substitution: Theory and evidence from Latin American. J. Money Credit Bank., 21: 267-271.

De Nicolo, G., P. Honohan and A. Ize, 2003. Dollarization of the banking system: Good or bad. World Bank Policy Research Working Paper No. 3116. pp: 18-35. http://ideas.repec.org/p/wbk/wbrwps/3116.html.

Engle, R.F. and C.W.J. Granger, 1987. Cointegration and Error Correction representations, estimation and testing. Econometrica, 55: 251-276.

Girton, L. and R. Don, 1981. On theory and implication of currency substitution. J. Money Credit Bank., 13: 12-30.

Granger, C.W.J. and P. Newbold, 1977. The Time Series Approach to Econometric Model Building. In: New Methods in Business Cycle Research: Proceeding from a Conference, Sims, C.A. (Ed.). Federal Reserve Bank of Minneapolis, New York.

Miles, M.A., 1984. Currency substitution: Reply. Southern Econ. J., 51: 1201-1203.

Oresotu, F.O. and C.N.O. Mordi, 1992. The demand for money function in Nigeria: An empirical investigation. Central Bank Nig. Econ. Fin. Rev., 30: 63-70.