FOREIGN EXCHANGE MARKET LIQUIDITY DETERMINANTS IN DEVELOPING ECONOMIES: EVIDENCE FROM NIGERIA

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ABSTRACT

This study studied factors that determine foreign exchange market liquidity in Nigeria from 1970 to 2022. The study adopted ex post facto design. The secondary data was sourced from Central Bank of Nigeria CBN statistical bulletin of various issues. The econometric tools used in the study include the Augmented Dickey Fuller test to test for unit root, the Auto regressive Distributive Lag ARDL to test for co -integration among the variables and the Granger causality test. Results established that balance of payments (BOP), balance of trade (BOT), foreign exchange demand, foreign exchange supply, gross domestic product, and money supply are the determinants of foreign exchange liquidity in Nigeria while inflation and lending rate are not. This implies that if the high inflationary and lending rates in the country are not checked immediately, FEM illiquidity will be triggered and this will adversely affect the exchange rate of the domestic currency against other trading partners. The recommendations are that government should review policies to check the soaring rate of inflation; and also allow the forces of demand and supply to determine the lending rate as contrasted to indirect interference by way of fixing the rate.
Keywords: Commonality market, foreign exchange market, foreign exchange market liquidity

JEL CLASSIFICATION: F3, F31, G15

INTRODUCTION

Foreign exchange market (FEM) encapsulates short-term international money market (IMM) where foreign exchange is bought and sold. It provides a mechanism that brings together the buyers and sellers of national currencies. Anyanwu (1993) sees foreign exchange (forex, or fx) as "the means of payment or instrument of short term credits for various countries having distinct currencies in view of purchase and sale against the national currency or their holding of reserves". The FEM can be described as a commonality market since the market and its competitors or the participants in the same industry are involved; produce similar goods and offer similar services.

The Balance of Payments (BOP) theory for the rate of exchange determination asserts that the balance of payments of a country determines the exchange rate. A liquid FEM is synonymous with a favorable BOP and exchange rate appreciation. Conversely unfavorable BOP triggers illiquidity of the market. Liquidity in the strictest sense connotes "readily and easily convertibility to cash without loss in value and time". For any asset to be regarded as being liquid, it means that it has the capacity of full or near -full value in the shortest time period. It entails low or no transaction cost.

The United Nations Conference on Trade and Development (UNCTAD, 2007) asserts that the FEM assists international trade and investments by enabling currency conversion. However this can be feasible when the market is liquid. An illiquid FEM on the contrary impedes such laudable and important function. The functions of the FEM include transfer of purchasing power or international clearing; credit function; and hedging.

Ovwielefuoma (1988) posits that since the functions of the FEM include transfer of purchasing power or international clearing. It facilitate multilateral trade exchange among countries. Trade thrives when the clearing takes place on multilateral basis. Thus, when the special credit facilities of the FEM are used, the foreign department of a bank or the bill market of one country or the other will be called upon to extend the credit.

FEM liquidity is technically, the difference (surplus) between the foreign exchange sources (foreign exchange supply) and the uses (foreign exchange demand) of a country. The sources of forex according to Central Bank of Nigeria (CBN, 2008) include export of goods and services, non official borrowing abroad, foreign aid and foreign direct investment. The uses include import of goods and services. Foreign exchange can be in the form of notes, cheques, bills of exchange, bank balance and deposits in foreign currencies.

Foreign exchange supply (FxS) is the aggregate local currency at the reach for non nationals to exchange for their own (foreign) currency. The supply of foreign currency is depicted in the credit side of the BOP and according to CBN, (2011) equates to payments made by foreign countries to local economy for goods and services bought from the country plus loans paid and investment made in the country. Increased FxS stimulates increment in FEM liquidity.

Foreign exchange demand (FxD) connotes foreign currencies within the reach of nationals for exchange. The demand of foreign exchange is shown in the debit side of the BOP. It is in equality with the sum of disbursements made to foreign nationals for transactions in goods and services procured from it in addition to loans and investments made abroad. Increased FxD reduces FEM liquidity position.

FEM is liquid when the supply of foreign exchange exceeds the demand for foreign exchange. Conversely, there is FEM illiquidity when supply of foreign exchange is less than demand for foreign exchange. However in the case of equality of both, we have the FEM equilibrium. However, establishing drivers of FEM liquidity remains a challenge. Studies on FEM exists, yet little is known about factors that determine FEM. Better understanding of factors that either positively or negatively drive FEM liquidity will propel economic policy decision-makers to initiate or review and implement policies that stimulate FEM liquidity.

This study questioned determinants of FEM liquidity in Nigeria. The paper is comprise five sections. Following the introduction in section 1 is Literature review in section 2. While section 3 delves into the method and methodology, section 4 is the result and discussion, and is concluded in section 5 with the summary, conclusion and recommendation.

LITERATURE REVIEW

Determinants of FEM Liquidity

An in-depth understanding of FEM liquidity is important because it is the world's largest financial market having over 5.3 trillion dollars trading per day as at 2013. FEM guarantee efficiency and arbitrage conditions in other markets, including bonds, stocks and derivatives. So, what happens in FEM has far reaching effect on other markets.

FEM liquidity is affected by funding constraints. This may arise due to "global financial crises." Vayanos and Gromb (2011) and Brunnermeier and Pedersen (2009) suggest that liquidity of FEM reacts to exogenous shocks; which may be long- or short-term in nature. The commonest of the factors that affect FEM include inflation, interest rate, current account balance and BOP, public debt, terms of trade, political stability, recession, and speculation. In the case of Nigeria, the factors that appear to drive FEM liquidity more, include BOP, BOT, interest rate, inflation, money supply, gross domestic product (GDP), foreign exchange supply, and foreign exchange demand.

The dependent variable is foreign exchange liquidity represented by FxL. It is the difference between foreign exchange supply and foreign exchange demand. It may be positive or negative. If foreign exchange supply is greater than foreign exchange demand it is positive while it is negative where foreign exchange supply is less than foreign exchange demand. Positive FxL stimulates and improves the foreign exchange liquidity.

The explanatory variables are BOP, BOT, interest rate, inflation, money supply, GDP, FxS= foreign exchange supply, FxD= foreign exchange demand. Jhingan (2005) asserts that BOP is the systematic record of all economic transactions between residents of the reporting country and residents of foreign countries within a time period. It can be positive or negative. Positive BOP has a direct relationship with foreign exchange liquidity.

CBN (2011) opines that the BOT depicts receipts and payments for goods and services accruable to a nation over a period of time. Increased BOT is a favorable index that triggers positive FxL. Interest rate is the price paid for borrowed funds. Inflation is the rise in the general level of prices of goods and services in a country within a period of time. Rising domestic inflation usually has a negative effect on FEM liquidity.

Money supply (MS_2) is C+D+ T+S where C is the currency in circulation, D is the demand deposits, T is the time deposits, S is the savings deposits. High money supply stimulates the liquidity of the FEM. GDP is the sum of gross value added by resident producers in the economy plus any product taxes and minus any subsidy, not included in the value of the product. Depreciation is not taken into consideration in calculating the GDP. Higher GDP undoubtedly drives the FEM's liquidity. Foreign exchange supply (FxS) is the total local currency within the reach for non nationals to exchange for their own (foreign) currency. Increased FxS positively affects the FxL. The CBN (2018), in Nigeria foreign exchange supply is computed as – (up to 2004) from the current account of the Balance of payments, that is the aggregate of goods plus current transfers (net); FxD foreign exchange demand, from the current account of the BoP, aggregate of Income(net) plus services (net) plus the total capital and financial account; FxM or FxL foreign exchange mismatch (foreign exchange liquidity) is the difference between FxS and FxD or the net errors and omissions.

However from 2005 until date as stated by the CBN, FxS is calculated as the aggregate of goods plus current transfers (net) from the current account of the BOP; FxD is Income (net) plus services (net) plus the total capital and financial account; FxM or FxL foreign exchange mismatch (foreign exchange liquidity) is the difference between FxS and FxD, Foreign exchange demand (FxD) represents foreign currencies within the reach of nationals for exchange. The demand of foreign exchange is shown in the debit side of the BOP. High FxD is negatively related to FxL.

A *prori* expectation of the study is that explanatory variables should drive, stimulate and positively determine the dependent variable. In order words, FEM liquidity should be driven by these determinants.

Theoretical Review

This study is anchored on the BOP theory. This theory which is predicated under the flexible exchange rate regime posits that the rate of exchange of a currency in terms of the other currency or currencies is dependent on its balance of payments. A favorable BOP raises or appreciates the rate of exchange while an unfavorable rate of exchange depreciates or reduces the rate of exchange. Therefore the theory asserts that exchange rate is determined by the demand for, and supply of foreign exchange. The FEM is a market where the exchange rate of a currency is determined via the interplay of foreign exchange supply and demand.

The theory assumes that there is a flexible exchange rate regime and that the balance of payments may always balance. This in some case is not feasible. The major criticism of the theory is that the BOP is independent of the exchange rate as the theory affirms that the BOP determines exchange rate. Critics argue that it is the changes in exchange rate that drives the BOP equilibrium. The criticisms notwithstanding, the theory provides the most acceptable and desirable explanation for the determination of the exchange rate. The exchange rate is the bane of the FEM liquidity; therefore the determinants of rate of exchange of a currency will no doubt drive the liquidity of the FEM. Therefore the application of the theory to the study will be pertinent to achieving the objectives, the hypothesis and solve the problem of this study.

METHODOLOGY

This study focused on ascertaining determinants of FEM liquidity. An ex post facto research design was adopted. Data was collected from different issues of CBN statistical bulletin. The study used data spanning from 1970 to 2022. The study adopted Ordinary Least Squares (OLS) statistic to analyze the time series data. The study also adopted the Augmented Dickey Fuller unit root test to ascertain if the variables have unit root, and to determine if the series have different order of integration, that is I(0) and I(1), different order. The Auto Regressive Distributive lag (ARDL) was performed to ascertain if the variables are cointegrated. Finally, the error correction model ECM was employed. The essence of the tools is that they remain veritable to rejecting or accepting the Ho.

The following augmented model is estimated

$$L\Delta\, LFxL = \beta_0 + \beta_1 LBOP + \beta_2\, LBoT + \beta_3 LR + \beta_4\, L\, Inf + \beta_5 LMS_2 + \beta_6\, GDP + \beta_6 FxS + \beta_6 FxD + t \qquad (1)$$

where, FxL is foreign exchange liquidity, BOP is a proxy for the balance of payments, BOT represents balance of trade, R depicts interest rate, Inf is the proxy for inflation, MS_2 is used to depict money supply, GDP represents the national income or the gross domestic product, FxS depicts foreign exchange supply, and FxD represents the foreign exchange demand $_L$ = log, β_0 = constant, β_1, β_2 = explanatory power of the variables, t = stochastic error term.

To econometrically ascertain the driving factors determining the foreign exchange liquidity in Nigeria, we employ - Augmented Dickey Fuller ADF unit root test URT, The auto regressive distributive lag ARDL and the Granger causality error correction model ECM. First we perform the Augmented Dickey Fuller ADF unit root test URT to ascertain if the variables have unit root. This is to avoid the simultaneity bias associated with the time series data. The OLS time series is usually associated with spurious data. Augmented Dickey Fuller method is adopted to test for unit root test URT. Also the ADF will depict if the series are of the same order or different order of integration. If some of the variables have different integrating order we now test for co integration (for long run relationship) using the auto regressive distributed lag.

In the time series domain, ARDL co integration bounds can be used to find the long run relationship among variables which are mixed such as some are stationery at level and some are stationery at first difference. Pesaran and Shin (1990) and Pesaran et al. (2001) opines that "the ARDL co-integration technique is used in determining the long run relationship between series with different order of integration". The re - parameterized result gives the short run dynamics and long run relationship of the considered variables. This implies that ARDL is pertinent in forecasting and disentangling long run relationships from short run dynamics. By long run relationship we mean that some time series are bound together due to equilibrium forces even though the individual time series might move considerably.

The ARDL is a model for time series data in which a regression equation is used to predict current values of a dependent variable based on both the current values of an explanatory variable and the lagged (past periods) values of the explanatory variable. Cromwell et al (1994) opine that "in statistics and econometrics, a distributed lag model is a model for time series data in which the regression equation is used to predict the current values of the dependent variables."

The starting point of for a distributive lag model is an assumed structure of the form

$$Y_t = \alpha + W_0 \chi_t + W_1 \chi_{t-1} + W_2 \chi_{t-2} + \ldots + W_n \chi_{t-n} + \in \quad (2)$$

Alternatively, the distributive lag model is

$$Y_t = \alpha + W_0 \chi_1 + W_1 \chi_{t-1} + W_2 \chi_{t-2} + \ldots + \in \quad (3)$$

where, Y_t is the value at the time period t of the dependent variable y, α = the intercept term to be estimated, W_0 is the explanatory powers of the variables, χ_t = explanatory variable, W_1,W_2 are the lag weight, $\in$ = the error term

In the first equation, the dependent variable is affected by values of the independent variables arbitrarily in the past, so the number of lag model weights is infinite and therefore the model is called the infinite distribution model. Conversely in the second and alternative equation there are only a finite number of lag weights, indicating an assumption that there is a maximum lag beyond which values of the independent variables do not affect the dependent variable. A model based on this assumption is called finite distribution lag model.

The ARDL decision rule is that if the computed F-statistic is greater than or above the upper band critical value, the null hypothesis (there is no co-integration among the variables) is rejected, (the variables are co-integrated). Conversely if the computed F-statistic is lesser than or below the lower band critical value, the null hypothesis cannot be rejected, (the variables are not co integrated). Also if the computed F-statistic falls within or between the upper band and lower bound critical value the result of the inference is inconclusive and depends on whether the underlying variables are of I(0) or I(1).

Granger Causality test- Pairwise Granger Causality Test

If it is discovered that series are co integrated, the standard Granger causality test is constructed. The test for Granger causality was performed by estimating equations in the form:

$$\Delta LMEI_t = \sum_{i=1}^{m-1} \beta \ \Delta LPCI_{t-1} + \sum_{i=1}^{m-1} \delta_j \Delta LMEI_{t-j} + \varepsilon_t \quad (4)$$

$$\Delta LFiD = \sum_{i=1}^{m-1} \beta \Delta LPCI_{t-1} + \sum_{i=1}^{m-1} \lambda_j \Delta LMEI_{t-j} + \mu_1 \quad (5)$$

Where:

$LFiD_t$ is the log of financial development , $LMEI$ is the log of macroeconomic indicators i.e. GPD, Inf, BOP, BoT, LR, MS_2 *FxS, FxD,* μ_1 is the white noise disturbance term, ε is also the white noise disturbance term.

The decision rule is thus- if the probability value is equal to, or greater than 0.05, we accept the null hypothesis that there is no causality (or that one variable does not Granger cause the other) between the variables, hence we reject the alternative hypothesis. However, if the p-value (the probability) is lesser than 0.05, we reject the null hypothesis that there is no causality (or that one variable does not Granger cause the other) between the variables hence we accept the alternative hypothesis that one variable Granger cause the other. Thus if probability = or > 0.05 , accept (do not reject) the null hypothesis, if probability < 0.05, reject (do not accept) the null hypothesis.

RESULTS AND ANALYSIS

Table 1: Unit Root test result

Variable	Intercept Only	Decision	Trend and Intersect	Decision
LFxL	2.9237	I(0)	3.5107	I(0)
	(-7.3466)*		(-5.8593)*	
LBOP	-2.9237	I(1)	-4.1614	I(1)
	(-2.4639)		(-3.3580)*	
LBoT	-2.9266	I(1)	-3.5063	I(1)
	(1.4900)		(-0.6036)*	
LR	-2.9314	I(1)	-3.5180	I(1)
	(-1.1808)		(-1.6175)	
LInf	-3.1830	I(0)	-2.9237	I(0)
	(-3.4061)*		(-3.4743)*	
LMS_2	-3.5207	I(1)	-2.9331	I(1)
	(3.8861)		(9.2701)*	
LGDP	-2.9266	I(1)	-1.9496	I(1)
	(3.1416)*		(7.2072*	
LFxS	-2.9251	I(1)	-3.5085	I(1)
	(1.6006)		(0.3070)*	
LFxD	-2.9266	I(1)	-3.5107	I(1)
	(8.5040)*		(7.0601)*	

*(**) *** Significant at 1% (5%) 10% level of significance
Source- Researcher's Computation

With regards to the results of the unit root the Augmented Dickey Fuller unit root test depicts that the variables have mixed integrated order. They are both integrated of I(0) and order 1, that is, I(1) at 1%, 5% and 10% level of significance respectively. As the variables are mixed where some are stationery at level and some are stationery at first difference, we employ the Auto regressive Distributive Lag ARDL. With respect to time series, ARDL co integration bounds is applicable in order to determine the long run relationship among variables which are mixed such as some are stationery at level and some are stationery at first difference. Therefore we proceed to employ the cointegration test procedures to test the co - integration among the variables.

Table 2: Autoregressive Distributive Lag ARDL

Variable	Value	Probability	Decision	Type
F-statistic	1002.011	0.0000	Rejected	Co- integrated
Akaike information	28.9961			
Schwartz criterion	29.5812			

Source- Researcher's Computation

The Pesaren critical value (2005) upper and lower bands at 1% are 5.250 and 4.068; that of 5% are 3.910 and 2.962; while at 10% the bands are 3.346 and 2.406 ; respectively. The calculated F-value is 1002.011 is higher than the bands. Therefore we cannot accept the null hypothesis and conclude that the variables are co integrated.

Table 3: Pairwise Granger Causality Result

Null Hypothesis	F- statistic	Probability	Decision	Type of causality
LBOP≠> LFxL	5.1314	0.0101	Rejected	Causality
LFxL≠ > LBOP	2.4340	0.1000	Not Rejected	No Causality
LBoT ≠> LFxL	11.5460	0.0001	Rejected	Causality
LFxL≠> LBoT	3.6008	0.0360	Rejected	Causality
LFxD *≠> LFxL*	31.2829	0.0005	Rejected	Causality
LFxL≠> LFxD	49.6143	0.0009	Rejected	Causality
LFxS ≠> LFxL	54.4881	0.0002	Rejected	Causality
LFxL≠ > LFxS	70.6813	0.0004	Rejected	Causality
LGDP ≠> LFxL	60.7861	0.0001	Rejected	Causality
LFxL≠> LGDP	254.804	0.0003	Rejected	Causality
LInf ≠> LFxL	0.2429	0.7554	Not Rejected	No Causality
LFxL≠> LInf	0.4056	0.6691	Not Rejected	No Causality
LR≠> LFxL	0.2210	0.8027	Not Rejected	No Causality
LFxL ≠> LR	0.5170	0.6003	Not Rejected	No Causality
LMS_2≠> LFxL	7.8740	0.0015	Rejected	Causality
LFxL ≠> LMS_2	31.6316	0.0002	Rejected	Causality

Source- Researcher's Computation

From Table 3 above, the probability values of Balance of payments, balance of trade, foreign exchange demand, foreign exchange supply, gross domestic product, and money supply are less than 0.05. This indicates that these variables are determinants of the foreign exchange liquidity in Nigeria. There is a unilateral causality between balance of payments and foreign exchange liquidity while the rest of the variables indicate bidirectional or feedback causality. However the is no causality for both inflation and lending rate as their probability values are greater than 0.05 respectively.

SUMMARY, CONCLUSION AND RECOMMENDATION

This study investigates the factors that drive the foreign exchange market liquidity in Nigeria within the period spanning from 1970 to 2022. The main finding of the study is that the Balance of payments, balance of trade, foreign exchange demand, foreign exchange supply, gross domestic product, and money supply are the determinants of foreign exchange liquidity in Nigeria while inflation and lending rate has no effect nor drive the liquidity of the foreign exchange market. The finding is expected to arm the economic policy makers with yet another policy tool towards strengthening the liquidity of the foreign exchange market in Nigeria. The finding is expected to trigger the economic policy makers to review the present macroeconomic policies towards engendering financial sector development.

While efforts should be geared towards improving and sustaining the successes recorded in the Balance of payments, balance of trade, foreign exchange demand, foreign exchange supply, gross domestic product, and money supply in providing liquidity in the FEM, much more attention is to be given to inflation and

lending rate in Nigeria. High rate of inflation no doubt triggers the price of domestic currency to fall in terms the foreign currencies and explains why inflation could not drive liquidity in the FEM. This implies that domestic illiquidity caused by high inflation has also deterred liquidity in the FEM. This should be of serious concern to the economic policy makers. In the same vein, high lending rate discourages domestic investment and thereby triggers illiquidity in the FEM. The government should review the high lending rate by the commercial banks seriously.

This study investigates the determinants of the foreign exchange liquidity in Nigeria within the period spanning from 1970 to 2022. The study ascertained the forces and variables driving foreign exchange liquidity Nigeria from 1970 to 2022. In order to circumvent the OLS spurious bias, we employed the unit root test. Also to test the co integration among the variables the auto regressive distributive lag co - integration test was adopted while the error correction method Granger causality test was used to ascertain the variables determining foreign exchange liquidity in Nigeria.

The study recommends that government should review the lending rate by the commercial banks. The forces of demand and supply should determine the lending rate instead of the Central bank fixing of rate. Lending rate has far reaching implications on the exchange rate of any particular currency. High lending rates reduce capital accumulation and investment. This has negative and adverse effect on the exchange.

Also the inflation rate is to be monitored to ensure single digit inflation. High rate of inflation implies much local currency buying lesser goods and services thereby reducing the value of the currency. It is synonymous with depreciation of the domestic currency in terms of the other currencies. Therefore inflation rate management should form a focal policy initiative of the government. Finally present economic policies on Balance of payments, balance of trade, foreign exchange demand, foreign exchange supply, gross domestic product, and money supply should sustained and equally improved upon to continue to harness their positive drive on the FEM liquidity.

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