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Impact of Monetary Policy on Capital Inflows in Nigeria

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Abstract: Foreign capital flows depends on the prevailing monetary forces as supported by capital flows theory and the mechanism linking these two variables is that contraction of net domestic assets through an open market sale of bonds will place upward pressure on domestic interest rates. Higher interest rates attract foreign funds, generating a capital inflow which relieves the pressure on domestic interest rates. Has this actually happened? It is against this backdrop that the present study investigated the impact of monetary policy on international capital inflows in Nigeria for a period of 22 years (1994-2015) using time series data. The autoregressive distributed lag technique revealed that the short-run and long-run significant determinants of foreign capital inflows are largely from broad money supply, nominal exchange rate, inflation rate and interest rates spread except inflation rate that is insignificant in the long-run. This outcome upholds theoretical prediction. Long-run equilibrium relationship was found between the dependent variable and the regressors. Further examination of the short run dynamics of the model showed that the speed of adjustment coefficients ECM (-1) to restore equilibrium have a negative sign and statistically significant at 1% level, ensuring that long-run equilibrium can be attained and about 89% of the short-run deviation from the equilibrium (long-run) position is corrected annually to maintain the equilibrium. Since the empirical evidence revealed that monetary aggregates such as broad money supply, nominal exchange rate, inflation rate and interest rates spread influence foreign capital inflows, it is therefore recommended that government should continue to pursue expansionary monetary policy and foreign exchange policies that would ensure competitiveness of the economy in order to attract the much needed foreign capital inflows that would engender economic growth.

Keywords: Capital flows; Monetary policy; Foreign exchange rate; Nigeria.
JEL Codes: E22; F21; F31; C20; N47.

1. Introduction

The Nigerian economy aspires to become one of the twenty largest economies in the world by 2020 and the 12th largest economy by 2050. Indeed, it is the aim of Vision 20:2020 to transform the Nigerian economy into one of the largest in the world within the shortest possible time as well as achieving a sound, stable and globally competitive economy, with GDP of not less than US$900 billion and a per capita income of $4,000 per annum (Central Bank of Nigeria, 2009). One of the surest ways to achieve these goals is through the attraction of foreign capital inflows that has become important source of augmenting the saving-investment gap in most less developed countries like Nigeria. However, foreign capital flows depends on the prevailing monetary forces. This position is supported by Kouri and Porter (1974) that monetary policy is an important source of capital flows. The mechanism linking the two variables is that contraction of net domestic assets through an open market sale of bonds will place upward pressure on domestic interest rates. Higher interest rates attract foreign funds, generating a capital inflow which relieves the pressure on domestic interest rates. Has this actually happened? This is an empirical question that this study seeks to answer. The literature identifies five main channels through which monetary policy affects economic activity: prices, interest rates, asset prices, exchange rates, and credit expectations channels.

Nigeria, like most developing countries has benefited immensely from capital flows. Various incentives as well as policy measures were adopted towards attracting these inflows. Good example is the financial liberalization policy stance–one of the key components of Structural Adjustment Programmes adopted by countries within the sub-region at different dates in the 1980s, accession to different regional groupings and other physical measures that are aimed at attracting the influx of foreign capital flows. However, Nigeria's share in global capital flows is a miniscule when compared to the net private capital flows for developing countries worth US$491.0 billion in 2005 (World Bank, 2006). In the 1960s, and 70s, most capital flows to Nigeria were directed to governments in the form of overseas

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development assistance (ODA) or to the private sector through the banking system. This situation changed in the 1980s and capital flows took the form of foreign direct investment (FDI) and foreign portfolio investment (FPI). While portfolio investment has been a notable feature of developed economies, it is becoming a very important component of the balance of payments of many emerging economies, such as China, Hong Kong, India, Singapore, Taiwan, Brazil, South Africa etc. (Obadan, 2004). In the last few years, Nigeria has experienced a phenomenal increase in private inflows. Key triggers included the increased tempo of reform which led to a more stable financial system and better macroeconomic environment. More fundamentally, financial developments at the world stage might also have played quite an important role. For instance, capital flows to the Sub-Sahara Africa (SSA) increased from about $10 billion in 2000 to over $50 billion in 2007. Nigeria received nearly 30% of the FDI component of the inflows (International Monetary Fund, 2008). World Bank (2016) notes that capital inflows in the region have slowed. In the case of Nigeria, capital inflows fell by 55 percent in the first quarter of 2016 while outflows more than doubled. Overall, total new capital inflows have remained higher in the last five years relative to the past. Motivated by the data, this paper attempts to examine the impact of monetary policy on foreign capital inflows in Nigeria.

The connection between monetary policy and international capital flows is an important and open question. From the literature, three main classes of models have been used to answer similar questions, i.e., to analyze the connection between monetary policy and international capital flows in a number of countries, especially, for some Latin America and Asian countries. They are the multi-equation model; Vector Auto-regression (VAR) and simple linear model. Each of these has its strengths and weaknesses. Studies which are based on VARs and other multi-equation models typically endogenize capital flows (see (Dahlhaus and Garima, 2014)) and other variables that may not in reality belong to the system (Glick and Hutchison, 2000; Kwack, 2006). Besides, these models require lengthier data points to accommodate more degrees of freedom. Problem of multicollinearity easily creeps in, in multi-equations models particularly if foreign asset and a measure of sterilization are included – both are often highly correlated. Due to these limitations, it is therefore germane to employ appropriate estimators in order to overcome these problems. The paper will contribute significantly to the literature by providing new and sturdy evidence on the connection between monetary policy and international capital flows in Nigeria. In the present study, the Autoregressive Distributed Lag (ARDL) bounds test developed by Pesaran *et al.* (2001) which is robust in dealing with small sample observations was adopted. This method to the best of our knowledge goes clearly beyond the existing literature on the subject in Nigeria. Thus, this study added to the literature by varying on the period covered, methodology adopted, variables used, and frequency of data among other factors to examine the empirical linkage between monetary policy and international capital flows in Nigeria and through that assess whether monetary policy spurs international capital flows. This helps to validate past findings or bring forth new issues on the subject for further research.

Following the introductory section, the rest of the paper is structured as follows: Section two focused on the review of related literature, Section three described the data and empirical method, the empirical results were reported in Section four while Section five concluded the paper.

2. Literature Review

2.1. Conceptual Issues

Capital flows refer to the inflow and outflow of capital from one country to another country. It is important to state that capital flows do not relate to movement of goods or payment for exports and imports between countries. It is basically the transfer of capital, mainly, from the developed countries to the developing countries in the form of portfolio and direct investment to argument the two gap models vis-à-vis: the savings gap and the foreign exchange gap thereby making these countries to achieve their economic potentials (Iyoha, 2004; Obadan, 2004). These flows in the form of portfolio and direct investments can either be inflows or outflows. According to Obadan (2004) capital flows are mainly from foreign private investment, official development finance, private and government capital and worker's remittances.

Monetary policy is concerned with discretionary control of money supply by the monetary authorities in other to achieve stated or desired economic goals. Central Bank of Nigeria (CBN) has the primary responsibility of formulating monetary policy and has enjoyed a good deal of independence in doing so, although the final authority for the policy rests with the Federal Executive Council. Anyanwu (1993) defined monetary policy as a measure designed to regulate and control the volume, cost, availability and direction of money and credit in an economy to achieve some specified macroeconomic policy objectives.

2.2. Theoretical Literature

Over the years an extensive literature has grown up dealing with the role of monetary policies in the short run determination of international capital movements. Of particular importance to this study is the monetary theory of the balance of payments and capital flows model developed by Kouri and Porter (1974).

2.2.1. Monetary Theory of Balance of Payments

The monetary theory of the balance of payments derives its essential features from the classical specie flow mechanism, where an exogenous increase in the money stock in a country causes the price level to rise. The increase in price level diverts the demand abroad, leading to a deficit in the balance of trade. The trade deficit is financed

through net monetary outflows, leading to a fall in the money stock and therefore prices, until international competitiveness is restored. As the prices return to their original level, the money stock also returns to its original level, implying that the increases in the money supply have flowed abroad. In its simplest form, as described above, the specie flow mechanism seems to depend on two rather restrictive assumptions. First in identifying a trade deficit with an outflow of money, it assumes no international capital mobility. Second, the assumption that an outflow of money will lead to a fall in the domestic money stock implies that the same currency is used for both domestic and international transactions. Bijan and Mohsin (1978) have tested the monetary approach to the balance of payments model for 39 developing countries, and, drawing their highly significant results on a cross section basis, they maintain that the mechanisms underlying the monetary approach to the balance-of-payments theory holds equally strongly for both the developed and less developed countries.

2.2.2. Model of Capital Flows

This model initially developed by Kouri and Porter (1974) argued that monetary policy can be an important source of capital flows. The approach is based on a simple model, which combines a money demand function with a portfolio balance model expressing demand for domestic assets. The model assumes the exchange rate is pegged, and takes the current account as given. It yields the following well-known equation for capital flows:

$$KF = -\alpha\Delta NDA - b\Delta i^* - cCA + d\Delta F + \varepsilon \quad (1)$$

Where *KF* denotes capital flows (the financial account plus errors and omissions); i^* denotes world interest rates; *NDA*, the net domestic assets of the Central bank; *CA*, the current account; and *F* represents a collection of other variables which influence capital flows. Among other things, *F* includes factors which affect money demand, such as the level of economic activity. The key coefficient in this equation is α, the offset coefficient, which measures the independence of monetary policy as well as the impact of monetary policy on capital flows as Kouri and Porter show that $0 \leq \alpha \leq 1$.

This equation does not provide a complete determination of capital flows, since it treats the current account as exogenous. Nevertheless, it produces some important insights into the nature and determinants of capital flows.

From Equation 1, movements in international interest rates can generate capital flows. This is a major conclusion of empirical work to date. The equation also shows that movements in net domestic assets are a potential source of capital flows. The mechanism linking the two variables is as follows. A contraction of net domestic assets through an open market sale of bonds, for example will place upward pressure on domestic interest rates. Higher interest rates attract foreign funds, generating a capital inflow which relieves the pressure on domestic interest rates. The size of the inflow depends on the degree of substitutability of domestic and foreign assets. If assets are close substitutes, a small rise in domestic interest rates will generate a large capital inflow, and the offset coefficient will approach one in value. At the other extreme, if the degree of substitutability is low, the capital inflow will be smaller, and the offset coefficient will approach zero. The offset coefficient thus measures the size of the impact of movements in net foreign assets on capital flows.

Using the balance of payments identity CA + KF = Δ NFA, Equation 1 can be rewritten as:

$$NFA = -\alpha NDA - b\Delta i^* + (1-c)CA + d\Delta F + \varepsilon \quad (2)$$

This equation illustrates the limits placed on monetary policy by capital flows; once again, the offset coefficient is the key parameter. When α = 1, a reduction of net domestic assets to lower the monetary base will attract an equal and opposite capital inflow, raising net foreign assets and completely offsetting the initial monetary contraction. In this case, the Central bank will be unable to control monetary aggregates. When α < 1, the offset will be incomplete and the Central bank will retain some monetary control.

Equation 2 demonstrates a major concern central banks faced during the capital inflow episode. As capital inflows rise, driven by falling world interest rates or movements in the elements of *F*, the resulting expansion in net foreign assets threatened to derail monetary targets. Central banks often emphasized monetary targets as a means to control final targets, such as output growth or inflation. In this way, increasing capital flows complicated the task of central banking. By implication, capital inflows increase result in overheated domestic economy, they feed inflation and thus call for a monetary contraction.

2.3. Empirical Issues

Bond (1998) examined impact of monetary policy on capital flows in two Asia countries of Indonesia and Thailand. The study regress capital flows measured by financial accounts plus errors and omissions on interest rates, net domestic assets of the Central bank and real domestic output using ordinary least squares and the two stage least squares methods of analysis. Empirical results showed that tight monetary policy was an important source of inflows to Indonesia and Thailand in recent years, and that the independence of monetary policy decreased during the inflow period.

Cavoli and Rajan (2005) examined capital inflows problem in selected Asian economies in the 1990s: the role of monetary sterilization. The study employed data on net foreign assets, interest rates, prices, output, exchange rate and money supply using ordinary least squares and granger causality tests. The study developed a simple model to examine the reasons behind the capital inflow surges into selected Asian economies in the 1990s prior to the

financial crisis of 1997–98. The analytical model showed that persistent uncovered interest differentials and consequent capital inflows may be a result of complete monetary sterilization, perfect capital mobility, sluggish response of interest rates to domestic monetary disequilibrium, or some combination of all three. Using the model as an organizing framework, the paper undertakes a series of related simple empirical tests of the dynamic links between international capital flows, the extent to which they are sterilized and uncovered interest rate differentials in the five crisis-hit economies (Indonesia, Korea, Malaysia, the Philippines and Thailand) over the period 1990:1–1997:5.

Gordillo (2012) examined the effects of United States monetary policy on the capital flows to the Latin America countries using single ordinary least squares regression in order to see the interaction between the long and short term interest rate holding other things constant. The study employed data on capital flows captured by ratio of capital flows to GDP, international interest rate, risk aversion measured by volatility index VIX developed by the Chicago Board Options Exchange (CBOE), global liquidity proxied by growth of the monetary stock (M2) and vector of pull factors such as domestic real interest rate, domestic/foreign GDP relationship, domestic/foreign stock market indicator, country riskiness as measures of political, economic, and financial conditions and privatization as a dummy variable that signal when one country made privatization. The analysis indicated that the US Monetary Policy has been having a role on the determination of the capital flows to the Latin America Countries (LAC). However, these external push factors have been less important than the pull factors from Latin America. In the model, the push factors reflected to have had influence on the total capital flows, especially through the global liquidity proxies measured by the growth of the monetary stock in the AC. Holding all other things constant, one percent increase in the monetary stock in the US will generate capital flows to the LAC for an amount between 0.47 to 1.71 percentages of GDP. Finding also indicated that there is pre-eminence of the pull (domestic) over the push (external) factors. This means that the LAC have been pursuing actions such as political stability, sound and consistent economic policies, and more market oriented policies that are attracting capital flows by themselves.

Cohen-Colen and Morse (2013) in a study titled monetary policy and capital regulation in the US and Europe model an economy that leveraged on regulated financial sector. The study employed data on nominal interest rate, consumer price index and physical capital using simulated GMM. The study found rules consistent with a pro-inflationary reaction during financial crises and a standard output-inflation mandate for the central bank. Results also support pro cyclical regulation not because of adequacy concerns, but instead due to the impact on monetary policy.

Dahlhaus and Garima (2014) examined the impact of U.S monetary policy normalization on capital flows to emerging market economies using a vector autoregressive (VAR) model that explicitly accounts for market expectations of future monetary policy. The vector of endogenous variables comprises seven variables such as the federal funds rate, the spread between the U.S. 10-year Treasury yield and the federal funds rate, the federal funds futures contracts at the 36-month horizon, U.S. inflation, U.S. industrial production growth, the level of the implied U.S. stock market volatility index (or VIX), and the common factor of capital flows. Results indicated that the impact of this shock on portfolio flows as a share of GDP is expected to be economically small. Further, there is also a strong association between the countries that are identified by the study model as being the most affected and the ones that saw greater outflows of portfolio capital over May to September 2013.

Curcuru *et al.* (2015) analyzed the impact of unconventional monetary policy announcements on capital flows using event-study regression in England. The study used daily fund flow data provided by Emerging Portfolio Fund Research (EPFR) and measures of monetary policy shocks that allows for examination of the asymmetric effects of both policies easing as well as announcements which are less accommodative than expected. In addition, both standard measures of flows as well as a measure of active portfolio reallocation discussed in Tille and Wincoop (2010) were used. Finding showed that the effect of monetary policy on capital flows is asymmetric across unexpected tightening and easing, and is generally associated with inflows into developed market funds, particularly equity funds.

Kiendrebeogo (2016) examined the connection between unconventional monetary policy and international capital flows. The study utilized descriptive statistics and ordinary least squares and generalized method of moments (GMM) with variables such capital flows data captured by foreign residents' portfolio holdings of U.S. securities and U.S. residents' portfolio holdings of foreign securities, expressed in nominal U.S. dollars, Fed's monetary policy, the one year- ahead futures rate and the Federal funds rate and financial openness data. The results suggested that unconventional monetary policy by the Federal Reserve has been associated with increased net portfolio flows to developing countries and, to a lesser extent, non-unconventional monetary policy to advanced economies. An exit from unconventional monetary policy is likely to cause capital flow reversals in U.S. capital-importing countries. Countries with greater exchange rate flexibility, stronger fiscal and current account positions, and higher capital mobility are likely to fare well following an exit from unconventional monetary policy in the U.S.

3. Empirical Model, Data and Estimation Technique

3.1. Model, Data and Model Justification

The main objective of this study is to examine the impact of monetary policy on international capital flows and through that assess the linkage between monetary policy and international capital inflows in Nigeria. For this purpose the model adapted for this study is predicated on the capital flows framework of Kouri and Porter (1974) and a modified model of Cavoli and Rajan (2005) and Gordillo (2012). The preferred model is represented as

$$KF = \beta_0 + \beta_1 BMS + \beta_2 EXR + \beta_3 INFR + \beta_4 IRS + \mu \quad (3)$$

where KF is foreign capital inflows measured by capital and financial account balance as % of GDP. BMS is broad money supply, EXR is the official exchange rate, INFR is inflation rate, IRS is interest rate spread, β_0 is the intercept or autonomous parameter estimate, $\beta_1 to \beta_4$ are parameter estimates representing the coefficient of BMS, EXR, INFR and IRS respectively, and μ is the error term (or stochastic term). The a priori expectations are determined by the principles of economic theory and refer to the expected relationship between the explained variable and the explanatory variable(s). It is expected that $\beta_1 to \beta_4 > 0.$ The study used secondary data that were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin various issues, National Bureau of Statistics and World Development Indicators for Nigeria (WDI). It covered the period from 1994 to 2015.

3.1.1. Justification of the Variables in the Model

Capital inflows (KF) are measured by the surplus on the financial account in the balance of payments, plus errors and omissions. The financial account equals the sum of net flows of foreign direct investment, portfolio investment (in debt and equity securities), and other investment, of which banking flows are an important element. Errors and omissions is a residual category which ensures that the balance of payments sum to zero; it is included in measures of capital flows under the assumption that movements in this category are more likely to represent unrecorded international asset transactions, rather than miss measurement of official reserve transactions or items on the current account. As in previous literature on the subject, capital inflow is measured by capital and financial account balance as % of GDP.

Broad Money Supply (BMS) measured as a percentage of GDP is one of the main factor of capital inflows, because the higher the amount, the larger the possibilities of capital inflows going abroad will be in order to find higher profitable investment opportunities, implying a direct relationship between this variable and the capital inflows (see (Gordillo, 2012)).

Exchange Rate (EXR) which we measure as the year on year change in exchange, where a positive change indicates depreciation and a negative change indicates an appreciation. We expect that the exchange rate should have a positive and significant effect on capital inflows. For instance, exchange rate regime determines the extent to which capital inflows will increase reserves. Under a purely floating exchange rate, in which the Central bank does not intervene in the foreign exchange market, a capital inflow will not be associated with an increase in reserves. In contrast, under pegged exchange rates, the Central bank will intervene to keep the currency from appreciating, and capital inflows will generally be associated with increases in reserves. This variable (EXR) has been previously used in investigating the impact of monetary policy on capital inflows (see (Bond, 1998; Cavoli and Rajan, 2005).

Inflation (INFR) this variable is expected to have positive and significant effect on capital inflows. Inflation variable has been previously used in investigating the impact of monetary policy on capital inflows (see (Bond, 1998; Cavoli and Rajan, 2005; Cohen-Colen and Morse, 2013; Dahlhaus and Garima, 2014).

Interest Rate Spread (IRS) this is the difference between the lending and deposit rates. Higher interest rates spread will attract foreign funds, generating a capital inflow which relieves the pressure on domestic interest rates (see (Bond, 1998)).

3.2. Estimation Technique

In order to investigate the relationship that exists between the dependent variable and explanatory variables, this study adopted the following procedures.

First, the time series characteristics of the variables were investigated using two traditional and one modern unit roots tests. The traditional tests deployed are the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). However, traditional tests for unit-roots (e.g. ADF and PP) have low power in the presence of structural breaks, and have a tendency to "detect" non-stationarity which does not exist in the data. To avoid invalid inferences, the study employed unit root test with structural break by Perron (2006) to determine the break points/dates as well as further investigate the properties of the time series employed. The unit root tests are followed by Autoregressive Distributed Lag (ARDL) bound test approach to cointegration proposed by Pesaran *et al.* (2001). This technique has a number of advantages over Johansen cointegration techniques. First, whereas the Johansen techniques require large data sample, a luxury that most developing economies do not have, the ARDL model is the most useful method of determining the existence of cointegration in small samples (Ghatak and Siddiki, 2001). The second advantage of ARDL approach is that while other cointegration techniques require all of the regressors to be of the same order, the ARDL approach can be applied whether the variables in the regression are purely of I(1) and/or purely I(0) or a mixture of both. This implies that the ARDL approach avoids the pre-testing problem associated with standard cointegration, which requires that the variables be already classified into I(I) (Pesaran *et al.*, 2001). Thirdly, the ARDL approach to cointegration is superior to Johansen approach because it avoids the problem of too many choices that are to be made in Johansen method. These include the treatment of deterministic elements, the order of VAR and the optimal lag length to be used. Finally, in the ARDL approach variables could have different lag length, whereas in the Johansen method this is not permissible.

The ARDL approach requires two steps. In the first step, the existence of any long run relationship among the variables of interest is determined by using the F-test or bound testing approach. The second stage requires the estimation of the long run relationship between dependent and explanatory variables and to determine their values, thereafter the short run elasticity of the variables with the error correction representation of the ARDL model. The purpose of applying the ECM version of the ARDL is to determine the speed of adjustment to equilibrium. The augmented ARDL model provided by Pesaran *et al.* (2001) is given as:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 X_{t-1} + \sum_{i-1}^{i} \beta_{1i} \Delta Y_{t-i} + \sum_{i-0}^{j} \beta_{2i} \Delta X_{t-i} + \varepsilon_t \quad (4)$$

Incorporating our policy variables model into the ARDL model framework, we have

$$\Delta KF_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} KF_{t-i} + \sum_{j=0}^{n} \alpha_{2i} \Delta BMS_{t-j} + \sum_{k=0}^{o} \alpha_{3i} \Delta EXR_{t-k} + \sum_{l=0}^{p} \alpha_{4i} \Delta INFR_{t-l} + \sum_{l=0}^{q} \alpha_{5i} \Delta IRS_{t-l} + \alpha_6 BMS_{t-1}$$

$$+\alpha_7 EXR_{t-1} + \alpha_8 INFR_{t-1} + +\alpha_9 IRS_{t-1} + \mu_t \text{ ----------} \quad (5)$$

The first section of Equations 5 (that is: $\alpha_1, \alpha_2, \alpha_3, \alpha_4, and \alpha_5$) examines the short-run dynamic relationship while the second section (that is: $\alpha_{6,} \alpha_{7,} \alpha_8, and \alpha_9$) investigates the long-run relationship between monetary policy and economic growth. To test for the cointegration relationship using the ARDL approach based on the F-statistic or Wald statistic, we state null hypotheses of no cointegration against the alternative hypothesis of cointegration among the variables in the model as follows:

$$H_0: \alpha_6 = \alpha_7 = \alpha_8 = \alpha_9 = 0 \text{ and } H_{1:}\ \alpha_6 = \alpha_7 = \alpha_8 = \alpha_9 \neq 0$$

The acceptance or rejection of the hypothesis is based on comparison between the calculated F-statistic and the F-statistic tabulated by Pesaran *et al.* (2001) and for small samples by Narayan (2005). The tabulated F-statistic has both upper and lower bounds critical values and if the calculated F-statistic is higher than the upper bounds, the null hypothesis is rejected and the alternative hypothesis is accepted that there is cointegration relationship between the variables. But if the calculated F-statistic is lower than the lower bound critical value, the null hypothesis is accepted and the alternative hypothesis is rejected, meaning that there is no cointegration relationship between the variables. However, the test is inconclusive if the calculated F-statistic lies between the lower and upper bound critical values. Once a cointegration relationship is established between the variables, the study proceeds to examine the long-run effect and the short-run dynamics using ECT equation given as follows:

$$\Delta KF_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta KF_{t-i} + \sum_{j=0}^{n} \alpha_{2i} \Delta BMS_{t-j} + \sum_{k=0}^{o} \alpha_{3i} \Delta EXR_{t-k} + \sum_{l=0}^{p} \alpha_{4i} \Delta INFR_{t-l} + \sum_{l=0}^{q} \alpha_{5i} \Delta IRS_{t-l} + ECT_{t-1} + \varepsilon_t \text{ -----} (6)$$

Where;

ECT_{t-1} = lagged Error correction term

The ECT captures the output evolution process by which agents adjust for prediction errors made in the last period.

4. Empirical Results

4.1. Time Series Properties of the Variables

Econometric studies have shown that most financial and macro-economic time series variables are non-stationary and using non-stationary variables leads to spurious regression (Engle and Granger, 1987). Thus, the variables were investigated for their stochastic properties, using two traditional unit roots tests. The traditional tests deployed are the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The two tests were used to test for consistency and where conflicts exist, to decide on the most appropriate option (see (Hamilton, 1994)). The results of unit root tests are presented on Table 1.

Table-1. Traditional Unit Root Test Results (Trend and Intercept)

Variables	ADF	Critical Values	Order of Integration	PP	Critical Values	Order of Integration
KF	-4.975	-4.498*	I(1)	-11.141	-4.498*	I(1)
BMS	-3.794	-3.658**	I(1)	-3.771	-3.771**	I(1)
EXR	-6.537	-4.498*	I(1)	-6.171	-4.498*	I(1)
INFR	-5.415	-4.533*	I(1)	-15.598	-4.498*	I(1)
IRS	-4.835	-4.533*	I(1)	-8.944	-4.498*	I(1)

Note: * Indicates stationary at the 1% level.
Source: Researcher's Computations Using E-views 9.5.

From Table 1, the traditional test of the ADF and PP indicates that all the variables tend to be stationary in first difference in both ADF and PP tests. However, these traditional tests for unit-roots (ADF and PP) have low power in the presence of structural breaks, and have a tendency to "detect" non-stationarity which does not exist in the data. Not allowing for multiple structural breaks can cause acceptance of the unit root null hypothesis by tests which incorporate only one break (Ben-David *et al.*, 2003). It is also crucial to have knowledge of break point because

accurately evaluating any programme intended to engender structural changes in the economy depends on it (Piehl *et al.*, 1999). To avoid invalid inferences, the study employed unit root test with structural break by Perron (2006) to determine the break points/dates as well as further investigate the properties of the time series employed. The results of unit root tests with structural break by Perron (2006) are presented on Table 2.

Table-2. Unit Root Tests with a Structural Break

	Innovational Outlier Model			Additive Outlier Model		
Variable	t-statistics	Break date	Lag	t-statistics	Break date	Lag
KF	-4.20649***	2009	0	-4.373685***	2009	0
BMS	-3.597110	2011	1	-4.666696**	2005	4
EXR	-3.690881	2007	0	-3.524327	2009	0
INFR	-4.220945***	2009	0	-4.318719***	2009	0
IRS	-3.652852	2009	0	-3.359900	2004	0
ΔKF	-8.059797*	2005	1	-5.593121*	2007	0
ΔBMS	-5.716436*	2010	0	-5.292702*	2010	0
ΔEXR	-8.677480*	2014	0	-7.191323*	2009	0
ΔINFR	-5.994671*	2009	1	-7.853911*	2002	0
ΔIRS	-6.624481*	2010	0	-6.618808*	2010	0

Note: *, ** and *** denote significant at the 1, 5 and 10 percent level.
Source: Researcher's Computations Using E-views 9.5.

On Table 2, the null hypothesis of a unit root is accepted for BMS, EXR and IRS in the innovational outlier model and EXR, IRS in the additive outlier model. In first difference however, all the series tend to be stationary. Both the IO and AO approach revealed that all the variables have quite diverse structural breaks that depend on key policy changes. The results revealed that majority of the variables have unit root at level but found to be stationary at first difference in the presence of various structural breaks. In addition, the results confirmed the argument of Perron (1989) that in the presence of structural break, the standard ADF test or PP tests are biased towards acceptance of the null hypothesis of unit root in the data.

4.2. Co-integration Test

The Autoregressive Distributed Lag (ARDL) bounds testing approach is used to determine whether a long-run co-integration relationship exists between monetary policy and foreign capital flows. The different order of integration of the variables necessitates the choice of the ARDL- Bounds testing approach to co-integration which is suitable for testing long-run relationship among variables that are of mixed order of integration. The result of the co-integration test is presented on Table 3 below.

Table-3. Result of ARDL Bounds Test for Cointegration

Null Hypothesis: No Long-run Relationships Exist		
Test Statistic	Value	K
F-Statistic	6.484317	4
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
5%	2.86	4.01

Source: Researcher's Computations Using E-views 9.5

The cointegration test result shows that the F-statistic is greater than the lower and upper bound critical value at the 5% significance level. Thus the null hypothesis of no long-run relationship is rejected at the 5% significance level. It can therefore be inferred that the variables are cointegrated.

4.3. Estimated Error Correction and Long-run Models

In view of the cointegration relationship between the dependent variable and the regressors, the study proceeds to estimate the error correction and long-run models. The results of the estimations are presented on Table 4.

Table-4. Results of Estimation of Error Correction and Long-run Models
Dependent Variable: KF
Selected Model: ARDL(ARDL(1, 3, 0, 3, 1)
Cointegrating Form (ECM)

Variable	Coefficient	t-Statistic	Prob
D(BMS)	-0.391*	-1.905	0.10
D(BMS(-1))	-0.545**	-2.744	0.03
D(BMS(-2))	0.202	1.476	0.19
D(EXR)	-0.120*	-2.017	0.09
D(INFR)	-0.076	-0.323	0.76
D(INFR(-1))	0.337	1.551	0.17
D(INFR(-2))	-0.581**	-2.847	0.02
D(IRS)	-1.979**	-2.541	0.04
ECM(-1)	-0.894***	-4.435	0.00
Long Run Coefficients			
BMS	-0.454**	-2.888	0.02
EXR	-0.134*	-2.205	0.07
INFR	-0.108	-0.328	0.75
IRS	-4.181**	-3.036	0.02
C	65.104**	2.769	0.03

Note: *, **, *** indicate significance at 10, 5 and 1 percent respectively. p-values are reported in square brackets.
Source: Researcher's Computations Using E-views 9.5

The estimated Error correction model showed that the short-run significant determinants of foreign capital inflows are largely from broad money supply, nominal exchange rate, inflation rate and interest rates spread. Similarly, significant determinants of foreign capital inflows in the long-run are broad money supply, nominal exchange rate and interest rates spread except inflation rate that is not significant.

The estimated ECM revealed that broad money supply negatively affects foreign capital inflows though significant at level and first period lagged. However, two periods lagged broad money supply was found to be directly related to foreign capital inflows during the study period. By implication, one unit change in broad money supply results in a 0.202 units change in aggregate foreign capital inflows measured by capital and financial account balance as % of GDP in the short run. This shows that monetary policy is an important source of inflows to the country in recent years. This finding is consistent with Bond (1998) who posited tight monetary policy was an important source of inflows to Indonesia and Thailand. The long-run effect of broad money supply on foreign capital inflows is negative and significant at the 5% level. This finding is not in conformity with theoretical prediction.

Nominal exchange rate is observed to negatively affect foreign capital inflows both in the short-run and long-run though significant at 10% conventional level. Similarly, the contribution of inflation rate is negative both in the short-run and long-run. However, one periods lagged inflation rate was found to be directly related to foreign capital inflows during the study period. By implication, one unit change in inflation rate results in a 0.337 units change in aggregate foreign capital flows measured by capital and financial account balance as % of GDP in the short run. This suggests that the impact of inflation rate on foreign capital inflows has lag effects.

Interest rates spread coefficient is indirectly related to aggregate foreign capital inflows both in the short-run and long-run though significant driver of foreign capital inflows in Nigeria. The contribution of interest rates spread is about -1.979 and -4.181 units both in the short-run and long-run respectively. This finding is not in conformity with theoretical prediction but this is justifiable in Nigeria because low deposit interest rate which is major part of interest rates spread makes savings unattractive as a sizeable proportion of income is spent on consumer goods.

The error correction term is as expected, negatively signed and highly statistically significant at 1 percent level. This is a further indication of the existence of long-run relationship between the dependent variable and the regressors. The absolute value of the coefficient lies between zero and 1, and it indicates that about 89% of the short-run deviation from the equilibrium (long-run) position is corrected annually to maintain the equilibrium. This shows high speed of adjustment to equilibrium. Bannerjee *et al.* (1998) asserted that a highly significant lagged error correction terms further prove the existence of long-run relationship between the variables.

5. Conclusion and Recommendations

The paper examined the impact of monetary policy on international capital inflows and through that assesses the linkage between monetary policy and international capital inflows in Nigeria using the Autoregressive Distributed Lag framework for robustness check. The study found that the short-run and long-run significant determinants of foreign capital inflows are largely from broad money supply, nominal exchange rate, inflation rate and interest rates spread except inflation rate that is insignificant in the long-run.

A long-run equilibrium relationship was found between the dependent variable and the regressors. Further examination of the short run dynamics of the model during the period showed that the speed of adjustment coefficients ECM (-1) to restore equilibrium in the dynamic model have a negative sign and statistically significant

at 1% level, ensuring that long-run equilibrium can be attained. The absolute value of the coefficient lies between zero and 1, and it indicates that about 89% of the short-run deviation from the equilibrium (long-run) position is corrected annually to maintain the equilibrium.

Since the empirical evidence revealed that monetary aggregates such as broad money supply, nominal exchange rate, inflation rate and interest rates spread influence foreign capital inflows, it is therefore recommended that government should continue to pursue expansionary monetary policy and foreign exchange policies that would ensure competitiveness of the economy in order to attract the much needed foreign capital inflows that would engender economic growth.

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