

Bounds Test Approach to Co-Integration and Causality between Foreign Investment Inflows and Exchange Rates Dynamics in Nigeria.

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Abstract: This study was commissioned to investigate for long run and causal relationship between foreign investment inflows and exchange rate dynamics in Nigeria. Foreign capital is decomposed into foreign direct investment (FDI) and foreign portfolio investment (FPI) to enable us look at both the real and financial sectors of the economy. Results established that there exists a long run association between exchange rates dynamics and foreign capital inflows to Nigeria. This was evident by the values of bound test F-Statistic of 61.82058 and 33.18053 for foreign direct investment and foreign portfolio investment models respectively. The coefficients of error correction terms lagged one period in the short-run models of FDI and FPI are negative and statistically significant at 1% level, meaning that in the both models, the independent variables jointly and significantly cause FDI and FPI respectively at least in the short run. Furthermore, this study has established that, for Nigeria, exchange rate ranks as one of macroeconomic fundamental that exact significant influence in moderating foreign direct investment (FDI) flows, while its effect on foreign portfolio investment (FPI) movements appears to be inconsequential, meaning that exchange rate should not be contemplated as instrument for moderating foreign portfolio inflows in Nigeria.

Key words: Foreign investments, exchange rates, external debt sustainability, interest rates, Nigeria

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I. INTRODUCTION

As the world gets figuratively smaller (globalization concept), the transactions and corporations between and among nation have intensified and becoming increasingly indispensable. This has led to increasing rate of economic integration, financial markets liberalization and technological advancement and development of policies, tended towards increasing the rate of “*Ease of Doing Global Businesses*”. The areas of corporation include but not limited to trade and investment. The most critical indicator of a developing economy is shortage of capital which has been adjudged to be the life wire of production. This suggests that any nation that wallops in prolonged scarcity of capital will remain backward and poor. However, since the early 1990s, there has been an upsurge in foreign capital flows to developing economies, particularly into emerging markets, and one of the views argued that capital inflows do help to increase efficiency, a better allocation of capital and fill up the investment-saving gap (Rashid & Hussain, 2010).

The scarcity of capital identified with developing economies presents the clear indication of income inequality between the developing/underdeveloped and developed economies. For instance as at the year 2000, the per capita GNP of Bangladesh was USD200 while that of Ethiopia stood at USD100, but on the other hands, the GNP per capita of Switzerland was USD44320 while in the case of Japan this stood at USD37850 for developing and developed countries respectively (World Development Report, 2000). This disparity was further elucidated by the same report which reveals that in the year 2000 the total world production was put at more than USD31 trillion and that out of this, a whopping sum of USD25 trillion came from the developed countries, while only USD6 trillion was attributed to the developing countries of the world, meaning that 80% of World's income had been produced by the rich countries of the World where just about 15 % of World's population resides. Whereas 85% of World's population is producing just 20% of World's output.

Relying on the above scenarios, the importance of the need to provide solution to the problem of world imbalance cannot be overemphasis. This would involve movement of capital from the developed to the developing economies through foreign investment channel.

With the collapse of the Bretton Woods system in the early 70's resulting in the switch to floating exchange rates in 1973, great attention has been paid on how exchange rate affects the level of trade and

investment (Dimitrios & Nicholas, 2012). The investigation of relationship between exchange rate as well as its volatility and macroeconomic variables including foreign capital inflows got significant importance in last few decades, particularly after the collapse of Bretton woods in 1971 as this saw to majority of the countries switching to the flexible/floating exchange rate system which in turn resulted in huge fluctuation in the value of their domestic currencies (Ghulam, Syed & Mohammad, 2012).

This informs the need for us in this study to investigate the effect of exchange rate variation on developing open economy, putting Nigeria economy in perspective. In relative term, Nigeria can be classified as an open economy judging from available statistics to this effect, which show that within the period under review, the total trade-GDP ratio ranged from 9.8 percent in 1985 until 2016 when it recorded 19.6 percent, reaching an all time high of 64.7 percent in 1996 and all time low of 7.8 percent in 1986 (CBN STABULL, 2016).

The Nigerian economy advanced 1.4 percent year-on-year in the third quarter of 2017, accelerating from an upwardly revised 0.72 percent growth in the previous period. It is the second consecutive quarter of expansion due to a rise in oil production. GDP Annual Growth Rate in Nigeria averaged 3.91 percent from 1982 until 2017, reaching an all time high of 19.17 percent in the fourth quarter of 2004 and a record low of -7.81 percent in the fourth quarter of 1983. In another spectrum, the Gross Domestic Product (GDP) in Nigeria expanded 8.97 percent in the third quarter of 2017 over the previous quarter. GDP Growth Rate in Nigeria averaged 1.44 percent from 2010 until 2017, reaching an all time high of 10.59 percent in the third quarter of 2010 and a record low of -13.98 percent in the first quarter of 2016.

In terms of GDP per capita, the Gross Domestic Product per capita of Nigeria was last recorded at 2457.80 US dollars in 2016. This was equivalent to 19 percent of the world's average. GDP per capita in Nigeria averaged 1648.26 USD from 1960 to 2016, reaching an all time high of 2563.10 USD in 2014 and a record low of 1089.10 USD in 1968 (tradingeconomics.com/Nigeria/indicators). The above statistics provide substantial justification for classification of Nigeria as a developing economy.

However, as a developing nation, the achievement of exchange rate stability in Nigeria has remained elusive from the inception Structural Adjustment Program (SAP) in 1986. For instance, historically, the Nigerian Naira reached an all time high of 365 in August of 2017 and a record low of 0.53 in September of 1980, while as at 1960, NGN1 was being exchange for USD5.4902. These provide substantial evidence of persistence instability/pressure on the exchange rate of the naira. A country's exchange rate can be put under pressure when the demand for foreign currency is in excess of its supply.

In Nigeria, the need for substantial inflow of foreign capital to help bridge the savings-investments GAP, to ensure sustainable growth and development of the domestic economy, can never be overemphasized. It is to this extent and for the fact that exchange rate of the domestic currency is one of the major determinants of foreign investment inflows that this study is commissioned to investigate the would-be effect of exchange rate movements on inflow of foreign investments into Nigeria.

On the above note, this study is set to determine if there exist any significant effect of exchange rate variations on the flow of foreign capital into Nigeria and the direction of such an effect through the establishment of their causal relationship.

The study is founded on Nigerian Economy and to cover the period 1986 to 2017. This is to ensure that the study falls within the period Nigeria switched from fixed exchange rate regime to floating exchange rate regime courtesy of the introduction of Structural Adjustment Program (SAP) in 1985. The study is to look at both foreign direct investment (FDI) and foreign portfolio investment (FPI). Two models are therefore to be developed as follows: FDI was modeled as a function of exchange rate, market size, openness and interest rate, while FPI was to modeled as a function of exchange rate, external debt, GDP growth and foreign direct investment.

remainder of this paper is structured as following: Section II we present a Brief review of the related literature, providing critical evaluation of some empirical Studies on the concept of the relationship between foreign capital inflows and exchange rate dynamics, Section III discussed the methodology, discussing the employed data and developing the theoretical model for the estimation of the employed variables. In Section IV we presented the results of the estimations of the empirical model, while in Section V, we present the concluding remarks.

II. BRIEF REVIEW OF RELATED LITERATURE

Although a large number of studies have been conducted, which lead to identification of the determinants of foreign direct investment (FDI), there is yet, no consensus on a set of generally accepted explanatory variables that can be regarded as the correct determinants of foreign direct investment (FDI). The reasons for lack of consensus may not be farfetched bearing in mind the issues of Country specifics, differences in perspectives, markets, methodologies, sample-selection, and analytical tools used in the empirical estimations and analyses (Lily, Kogid, Mulok, Sang & Asid, 2014)

Foreign capital inflows and exchange rate nexus abound in theoretical literature but for this study, we identify with the two which appear to be the most influential in the 90s. The two theories that have gained consideration are those of Blonigen (1997) and Froot and Stein (1991). Froot and Stein employed imperfect capital markets approach to argue that exchange rates permeate through wealth to affect FDI. They argued that with the assumption of imperfect capital markets, external sources for borrowing are more expensive than a firm's internal cost of capital and to this extent therefore, a depreciation of the domestic currency is expected to have a positive effect on the inflow of foreign direct investment (FDI), as they were of the believe that depreciation of the domestic currency will automatically increases the wealth of foreign investor, thus allowing them to make higher bids for assets. On the part of Blonigen (1997), his argument which was predicated on the assumption of goods market segmentation, postulates that foreign and domestic firms have the same opportunity to buy, but different opportunities to generate returns on assets in foreign markets and to this effect, the profitability of all branches of a multinational firm may be increased after the acquisition of a foreign firm.

Ellahi (2011) empirically investigated if there exists any significant relationship between foreign direct investment (FDI) and exchange rate volatility for the Pakistan economy for the period of 1980 - 2010. The most robust and modern technique of autoregressive distributed lag (ARDL) and vector error correction model (VECM) approaches were employed in the data analysis to establish the existence or otherwise of a significant short run as well as the long run relationship amongst variables of interest. The study after indentifying long run relationship between the dependent and independent variables went further to develop a multivariate vector error correction model (VECM) to test for long run causality between the variables of interest. The hallmark results indicate that exchange rate volatility has negative impact on FDI inflow in short run, while in the long run, positive impact was identified, meaning that structural adjustment and liberalization program may have adverse effect in the short term, the long term result may be desirable for Pakistan economy.

However, some issues are identified with this study as follows: (i) In the methodology, the second reason adduced for the use ARDL for the data analysis violets the basic conditions required for use of ARDL model approach, which includes that the variables are not blessed with mutual order of integration with some at order zero $I(0)$ and order one $I(1)$ but not at order two $I(2)$ and above. (ii) The data validation test of unit root as shown in the study suggests that all the variables are stationary at order one $I(1)$. These results suggest that Johansen (1988) and Johansen and Juselius (1990) maximum likelihood test procedure would have been the most appropriate next step to determine the number of co-integration vectors, so that if co-integrating equation is identified, you proceed to develop and estimate VEC model and where no co-integration is identified, you develop and estimate VAR model. To this extent, the use of ARDL may be considered a wrong estimation procedure and inappropriate. Furthermore, the absence of fundamental determinants of FDI as interest rate and market size from the model may leave readers in doubt as to the credibility of the results of the study. The VECM estimation method as mentioned in abstract of the work is conspicuously absent in the work and the variable, error correction term lagged one period ECT (-1) which could have been used under ARDL approach to test for speed of adjustment to long run was never derived and estimated. Finally, the post estimation tests for the stability and non serial correlation of the models as CUSUM and LM tests respectively were carefully avoided by the researcher.

Okwuchukwu (2015) investigated the impact of exchange rate volatility and stock market performance on the inflow of foreign direct investment to Nigeria, using time series data from 1980 to 2013 and according the researcher, employing the ordinary least square technique and error correction mechanism in the estimations. The outcome of the estimation, suggested that exchange rate volatility has significant inverse relationship with the inflow of foreign direct investment to Nigeria in both long and short runs. The results further revealed that market capitalization as proxy for stock market performance showed evidence of significant positive direct relationship with FDI, which according to the researcher, provided an evidence that a stable and well developed capital market will attract foreign direct investment to Nigeria. The study further recommended that government should pursue sound exchange rate management system and policies that will lead to increase in domestic production of export commodities and the deepening of the capital market to provide the needed funds for investment, avoidance of dollarization of the economy to reduce the stress on foreign exchange earnings; and finally ensure sound foreign reserve management practices as measure of maintaining the value of the naira and reducing the impact of international capital shocks.

This study leaves one with some questions yearning for answers. For instance it appears that the researcher failed to understand that exchange rate movement (depreciation or appreciation) and exchange rate volatility, which may be defined as the risk associated with unexpected movements in the exchange rate are not the same. To this extent, the researcher completely failed to develop and estimate the required ARCH and/or GARCH model to enable the study investigate for the existence or otherwise of "ARCH EFFECT" in the exchange rate time series data used for the study. This process should have aided the researcher to derive the variable (indicator) for exchange rate volatility which should have been included as the fundamental

independent variable in the linear equation specified in section three of the study. In effect, it may be assumed that exchange rate volatility effect on FDI, which is the main objective of this study, is yet to be estimated. Therefore, among the results of the study which states that exchange rate volatility has negative effect on FDI inflow to Nigeria is not founded on any empirical investigation. In the same vein, the variable “stock market capitalization” found in the model should have been a better candidate for foreign portfolio investment (FPI) than FDI, meaning that there may be some elements misspecification bias in the estimated model. Finally, it is equally observed that the author stated in the abstract that the study OLS estimation technique which was never found in work. The researcher should be able differentiate OLS technique which is only applicable in estimating data that are stationary at level and least square (LS) technique which is of general application. It was also observed the recommendations of the study were not result based and thus insistent with the objectives of the study.

Nwosa & Ditimi, (2014) examined the causal effect and impact of foreign capital inflows on exchange rate in Nigeria for the period of 1986 – 2011, using granger causality and error correction modeling techniques respectively. The results of the causality estimates showed no significant causal link between capital inflows and exchange rate within the period under review. The long run regression estimate revealed that inflow of foreign direct investment had negative effect on exchange rate, while inflow of foreign portfolio investment had positive impact on exchange rate of the domestic currency even though the magnitude of the impacts appear to be inconsequential. The result of the short run result was similar to the causality result, indicating that neither foreign direct investment nor foreign portfolio investment had significant impact on exchange rate.

The effects of foreign capital on exchange rate of the naira may not be presenting any trait to the growth of the domestic economy because Nigeria as a developing economy is desirous of foreign capital inflows, but rather the problem that is of utmost concern should be investigating the effect of exchange rate movement on inflow of foreign capital to Nigeria bearing in mind the size of investment-saving Gap and the persistent depreciation of the domestic currency from 1986 until date. Furthermore, the measurement of trade openness as the ratio of total non-oil trade to GDP is grossly inadequate having in mind that about 80 percent of Nigeria’s foreign earnings come from oil. All these must have accounted for the all round “No-Effect” results obtained in the study.

Osinubi & Amaghionyeodiwe (2009) investigated empirically, the effect of exchange rate volatility on foreign direct investment (FDI) in Nigeria, using secondary time series data from 1970 to 2004. To effect this, the study utilized the error correction model as well as OLS method of estimation. Results emanating from the data analysis indicated, among others, that exchange rate volatility need not be a source of worry for foreign investors as the impact of exchange rate volatility appears to be inconsequential. The study further revealed that for Nigeria, a significant positive relationship exists between real inward FDI and exchange rate, meaning that, depreciation of the Naira increases real inward FDI. The results further indicated that the structural adjustment programme (SAP) introduced in Nigeria in 1986 had a negative impact on real inward FDI, which could be due to the deregulation that was accompanied by exchange rate volatility.

Some inconsistencies were identified in the methodology employed. For instance, since the variables in the model lacked mutuality in their order of integration comprising of 1(1) and 1(0), the ideal and appropriate modeling and estimation approach should have been Autoregressive Distributed Lag (ARDL) model rather than OLS and ECM as indicated. In the same vein, some fundamental determinants of FDI as trade openness and market size variables were conspicuously absent from the estimated model. All these amongst others are sufficient to doubt the reliability of the results. Furthermore, the finding that SAP had negative on FDI inflow to Nigeria appeared contracting since the first result showed that exchange rate depreciation significantly increase the inflow of FDI into Nigeria and it is SAP that begot depreciation of the domestic currency. This may not be unconnected to the above observations.

Ullah, Haider & Azim (2012) commissioned this study to investigate the relationship of Foreign Direct Investment (FDI) with exchange rate and exchange rate volatility. According to them, even though the set of the determinants of FDI can be very large, exchange rate is one of the weighty determining factors. However, with the introduction of flexible exchange rate regime, exchange rates have become extremely volatile due to its vulnerability to adjust to the changes in domestic and international financial markets. To this extent, time series data of foreign direct investment, exchange rate, exchange rate volatility, trade openness and inflation for the period 1980-2010 for Pakistan have been used to investigate the effect of the independent variables foreign direct investment, using econometrics techniques of cointegration and causality techniques. The results indicate that FDI is positively associated with Rupee depreciation and exchange rate volatility deters FDI. The results further reveal that trade openness significantly increases FDI while the premise doesn’t hold for inflation as the effect appears to be inconsequential. The results of Granger causality test suggested that exchange rate volatility granger causes foreign direct investment with causality flowing from exchange rate volatility to FDI.

In the same vein, Hosein & Maryam (2012) identified flows of foreign investment as among fundamental elements in the economic evolution of countries within the globalization process of economies. Earlier studies on exchange rate have equally established its critical roles in the flows of international trade and investment. They were of the view that investigation into exchange rate, FDI nexus abound, inquiries into the exchange rate volatility, FDI relationship remains scanty. It was on this note and considering the importance of exchange rate fluctuation determination of FDI flows; their study was founded on investigating the relationship between exchange rate volatility amongst other control variables and foreign direct investment putting Iranian economy in perspective for the period 1980Q2-2006Q3, using the Johansen and Juselius's cointegration system approach. The results indicate that gross domestic product, openness and exchange rate to have positive relationship with foreign direct investment but, world crude oil prices and volatility of exchange rate have negative relationship with foreign direct investment. These findings are in tandem with those of Sharifi-Renania & Mirfatah (2012) as they relate to exchange rate and exchange rate volatility. This suggests that exchange rate stability appear to be fundamental for increased FDI inflow to Iran.

Jones & Jacob (2016) on their part, observed that attracting foreign direct investments has posed a great challenge and have remained the wish of every host country just as no economy desires the loss of FDI. Abstracting from the importance they attached to the relevance of FDI to the growth of the domestic economy, they launched an investigation into the determinants of foreign direct investment (FDI) using data from Namibia for the period of 1984 – 2014 employing ARDL cointegration approach. The results indicate that in the short run, there exist positive relationship between exchange rate depreciation and the flow foreign direct investment to Namibia, just as was the case for inflation and GDP growth. The results further revealed that though population growth variable was found to exhibit positive association with FDI inflow to Namibia, such an association is insignificant, while exchange rate was negatively related to FDI in a short-run. Evidence cointegration among the variables was also confirmed. In the long run, while population growth was negatively impacting on the attraction of FDI inflow into Namibia during the period under study, the inflation coefficient indicated positive correlation.

The use of OLS in the estimation of long run relationship is considered misapplication of methodology because this approach is only advisable where all the variables employed in the study are stationary at level. The ARDL approach adopted is very ideal because of the non mutuality of the stationary levels and if appropriately specified, the model will contain both the short run and long run sections from where the long run effect would have been estimated.

From the above notes, it may appear that no clear consensus exists in the existing literature on the exchange rate effect of foreign investment inflows to host countries. A survey of past studies on this topic has indicated negative, positive, and even indeterminate effects. The desire of the searcher to contribute to this debate using economic data on Nigeria serves as the motivation for this work. Furthermore, the researcher is not yet aware of the previous studies reviewed that included market size as one of the determinants of foreign direct investment. Market Size refers to the number of individuals in a certain market who are potential buyers and/or sellers of a product or service and companies/investors are interested in knowing the market size before launching a new product or service in an area. As a matter of convention, before a business engages in marketing a product to another country, research is needed to ensure the market potential is high for maximum profitability. To this extent, we consider the omission of this variable from any FDI model as fundamental and therefore have chosen to include it in this study. Finally, the author is yet unaware of any study on Nigeria that considered FDI, FPI, exchange rate relationship and in view of this, the study is founded on exchange rate and capital movement across borders to enable us look at the inflows of both foreign direct investment(FDI) and foreign portfolio investment(FPI) into Nigeria.

III. DATA AND METHODOLOGY

The data used in the study are on foreign direct investment (FDI) proxy as the ratio of FDI to GDP, foreign portfolio investment (FPI) proxy as the ratio of FPI to GDP External Debt Stock (EXDSTOCK), External Debt Sustainability (EXDSUS) proxy as the ratio of total net exports to EXDSTOCK, interest rate (INT), exchange rate (EXR), Trade Openness (OPENESS) and Inflation Rate (INF). The data, on annual basis, cover a sample period of 1986-2016 for Nigeria. Data have been sourced from Nigeria Central Bank Statistical Bulletin, 2017. The Logs of all the variables were taken to make result interpretation more stout and meaningful, excepting for interest and inflation rates which are in percentages, and foreign portfolio investments with some negative values.

Foreign capital is decomposed into foreign direct investment (FDI) and foreign portfolio investment (FPI) to enable us look at both the real and financial sectors of the economy. Foreign direct investment (FDI) refers to such an investment in business in a host country, by a foreign investor, for which the foreign investor has controlling equity interest, which according to the Organization of Economic Cooperation and Development (OECD), must not be less than 10 percent of the total equity of the business. On the other hand,

any investment in foreign assets for which the value in equity is less than 10 percent is classified as foreign portfolio investment. This study is designed to model the two concepts separately based on the fact that their determinants appear not to be mutual and this will enable us obtain robust results on foreign capital inflow effect of exchange rate depreciation in Nigeria. To this extent, we adopt parsimonious multiple regressions modeling approach as indicated in functional notations below:

$$\text{FDI/GDP} = f(\text{EXR}, \text{EXDSTOCK}, \text{INT}, \text{OPENESS}) \quad (1)$$

$$\text{FPI/GDP} = f(\text{EXR}, \text{EXDSUS}, \text{OPENESS}, \text{INT}, \text{INF}) \quad (2)$$

For the purpose of estimation, we transform the functional notations to Log linear long run models as below:

$$\text{LFDI/GDP} = a_0 + a_1\text{LEXR}_t + a_2\text{LEXDSTOCK}_t + a_3\text{INT}_t + a_4\text{LOPENESS}_t + \mu_t \quad (3)$$

$$\text{LFPI/GDP} = a_0 + a_1\text{LEXR}_t + a_2\text{LEXDSUS}_t + a_3\text{LOPENESS}_t + a_4\text{INT}_t + a_5\text{INF}_t + \mu_t \quad (4)$$

A log-linear model is a mathematical model that takes the form of a function whose logarithm equals a linear combination of the parameters of the model, which makes it possible to apply linear regression.

DATA DISCUSSION

Some variables employed in this study that require explanation are discussed below.

Exchange Rate (EXR): Exchange rate refers to quantity of the domestic currency, the Nigeria Naira (NGN) that is exchanged for one unit of United States Dollar. External Debt Sustainability Index (LEXDSUS): This refers to ratio of Aggregate net exports to total external debt stock. Market Size which is proxy as Gross National Income (GNI) per capita has been seen to be the most robust Foreign Direct Investment determinant in econometric investigations (Artige & Nicolini, 2005) but this could not hold for this study as the variable failed completely to fit into our model, meaning that the assertion by earlier study that Foreign Direct Investment will normally flow in favor of countries with larger market size and greater purchasing power, because of the investors desire to receive a higher return on their investments (Jordan, 2004), may not hold in all cases as a result of country specifics. Interest Rate (INT): This refers to the lending rate applicable in the money market environment. Inflation rate (INF): This refers to a situation of a sustained increase in the general price level in an economy. Trade openness (OPENESS): This is a situation where total foreign trade (imports + exports) is expressed as a ratio of gross domestic product.

Estimation Procedure

(1) We established the integration order of the employed variables using Correlogram approach. This was necessary to ensure that the data employed were suitable for the purposes intended, by ascertaining the validity of the variables through establishing their order of integration. (2) The variables were found to be in the mixed order of 1(1) and 1(0) levels. With the establishment of the fact that the integration order of the variables of interest are not mutual but with none of them assuming the status 1(2), we considered appropriate to use the Autoregressive Distributed Lag (ARDL) model approach to co-integration in the analysis.

IV. EMPIRICAL EVIDENCE

In this section we provide the empirical assessment of the determinants of foreign capital inflow to Nigeria, decomposed into foreign Direct Investments and Foreign Portfolio Investment, with particular emphasis on the correlation between exchange rate depreciation and the capital inflows.

Unit Root Test

For the purpose of validating the data used for this study to ensure that they are fit for purpose intended, we test for their stationarity levels using the unit test. The unit root test was performed using correlogram approach. The results show that for equation (1), FDI/GDP, INT and OPENESS were found to be stationary at level 1(0), while EXR and EXDSTOCK were discovered to be stationary at first difference 1(0). For equation (2), FPI/GDP, INF, INT and OPENESS were established to be stationary at level 1(0), while EXR and EXDSUS became stationary after first deference 1(1). The above results suggest that for both equations, the integration levels of the employed variables were found not to be mutual and fall between 1(0) and 1(1). To this extent, we are advised to implement the Autoregressive Distributed Lag (ARDL) model approach to co-integration analysis, otherwise referred to as bound testing approach, in establishing the exchange rate effect of foreign capital inflows to Nigeria.

ARDL has been identified with three compensations in comparison with other traditional co-integration approaches. First, is founded on the fact that by applying the ARDL technique, we attain unbiased estimates of the long-run model (Harris & Sollis, 2003). Second, is that the ARDL does not require that the order of integration of all the variables under study must be mutual and thus can be applied when the underlying variables are integrated of order one, order zero or fractionally integrated and lastly, is that the Autoregressive Distributed Lag (ARDL) method of testing for cointegration is relatively more proficient in the case of small and finite sample data sizes (Belloumi, 2014).

Bound Test Approach to Co-integration

To enable us empirically examine the long-run relationships and short run dynamic relations among the variables under consideration, we adopt the autoregressive distributed lag (ARDL) cointegration technique as developed by Pesaran and Shin (1999) and Pesaran et al. (2001). To implement this, we opted for the automatic lag selection methodology (using the Akaike Information Criterion) with a maximum of 4 lags for the dependent and independent variables, using data on Nigeria for the period of 1986 - 2016. The choice of 1986 rather than earlier date as the commencement period is occasioned by the need to avoid the issue of structural break with recourse to the Structural Adjustment Program (SAP) which became operational in Nigeria in 1986. Out of the 2500 models evaluated, the procedure selected an ARDL lag structure of 4, 4, 4, 4, and 3 for the variables in equation (3) of LFDI/GDP, LEXR, LEXDSTOCK, INT, and LOPENESS respectively with LFDI/GDP as the dependent variable. Similarly, Out of the 2048 models evaluated, the procedure selected an ARDL lag structure of 1, 0, 3, 3, 3, 3 for the variables in equation (4) of LFPI/GDP, LEXR, LEXDSUS, INT, INF and LOPENESS respectively with LFPI/GDP as the dependent variable. The results of the bound test for existence of co-integration among the variables of interest in equations 3 & 4 are as presented below:

Table 1: Basic ARDL (4, 4, 4, 4, 3) Model (3) Estimation Results--
Dependent Variable: LFDI_GDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
FDI_GDP(-1)	-0.180239	0.082492	-2.184923	0.1168
FDI_GDP(-2)	0.284050	0.078419	3.622193	0.0362
FDI_GDP(-3)	-0.264464	0.091831	-2.879894	0.0635
FDI_GDP(-4)	-0.288581	0.109323	-2.639708	0.0777
LEXR	-0.073282	0.015843	-4.625599	0.0190
LEXR(-1)	0.053458	0.024217	2.207454	0.1144
LEXR(-2)	-0.004889	0.025349	-0.192887	0.8594
LEXR(-3)	-0.159020	0.030377	-5.234943	0.0136
LEXR(-4)	0.149330	0.027907	5.350917	0.0128
LEXDSTOCK	9.03E-05	0.000551	0.163927	0.8802
LEXDSTOCK(-1)	-0.003232	0.000835	-3.870325	0.0305
LEXDSTOCK(-2)	0.003031	0.000711	4.261241	0.0237
LEXDSTOCK(-3)	-0.001252	0.000582	-2.149908	0.1207
LEXDSTOCK(-4)	0.002727	0.000416	6.560510	0.0072
INT	1.606287	0.136346	11.78096	0.0013
INT(-1)	0.829807	0.134682	6.161210	0.0086
INT(-2)	0.038382	0.094279	0.407107	0.7112
INT(-3)	0.333074	0.134958	2.467980	0.0902
INT(-4)	-0.455417	0.092438	-4.926709	0.0160
LOPENESS	21.04541	5.376898	3.914043	0.0296
LOPENESS(-1)	20.76872	4.740562	4.381067	0.0220
LOPENESS(-2)	-3.494033	3.299864	-1.058841	0.3674
LOPENESS(-3)	-21.42133	3.142040	-6.817650	0.0065
C	-55.57435	10.40462	-5.341313	0.0128

Adjusted R-squared = 0.988054 Prob (F-statistic) = 0.001536
Durbin-Watson = 3.094934.

The estimated long-run and short run coefficients are presented in Table 1. The long run coefficient of LEXR and short run coefficient of LEXR (-3) are correctly negatively signed and statistically significant. The results indicate that depreciation of the domestic currency by 1% basis point will increase FDI inflow to Nigeria by 0.073% on the long run and 0.15% in the short run respectively. This is at variance with the finding of Jaratin, Mori, Dullah, Lim., & ozilee (2014) which indicated that the appreciation of the domestic currency has a positive impact on FDI inflows. The variance could denote evidence of country effect regarding the relationship between exchange rates and foreign investment inflows (Farrell et al. 2014). There is no consensus yet on the nature of this relationship between exchange rates and foreign direct investment.

The P-Value of the long run coefficient of external debt stock of 0.8802 means that, on the long run, the effect of external debt stock on FDI inflow to Nigeria is inconsequential. The coefficient of LEXDSTOCK (-1) is correctly signed and significant at 5% level. This suggests that a 1% increase in Nigeria's external debt stock will in the short run reduce capital inflow to Nigeria by 0.0032%. In the same vein, both the long run (INT) and the short run INT (-1) coefficients of interest rates are correctly signed and statistically significant at 5% level. This indicates that a 1% rise in interest rate will increase FDI inflow by 0.83% and 1.6% in the short run and long run respectively. Finally, the coefficients of trade openness show positive sign and statistically significant both in the short run and on short run. This suggests that relaxing some the stringent rules of international trade engagements and adoption of some global best practices in Nigeria's dealings with the external economies will boost the level of foreign direct investments (FDI) in flows to Nigeria. The Adjusted R-squared value of 0.988054 is substantial as it suggests that 98.81% of the variation in the dependent variable is explained by the independent variables. The probability of F-statistic of Prob (F-statistic) = 0.001536 indicates that the regressors jointly and significantly influence the regressand and the Durbin-Watson statistic value of 3.094934 clearly suggests the absence of first order autocorrelation.

Table 2: ARDL Bounds Test Results

NULL Hypothesis: No long-run relationships exist

Test Statistic	Value	K(No of variables)
F-statistic	61.82058	4
Critical Value Bounds		
Significance Level	1(0)	1(1)
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

The F-statistic value of 61.82058 is evidently greater than the 1(1) critical values bound. This suggests that we reject the null hypothesis that No long-run relationships exist, meaning that there exists a long run equilibrium relationship existing between the explanatory and the explained variables.

The error correction term (-1.44%) here is negative and statistically significant, meaning that the regressors jointly and significantly influence the dependent variable with causality run causality running from exchange rates, debtstock, interest rates and trade openness to foreign direct investment. It also confirms from the results that all the variables are co-integrated or have long run relationship. We can also say that about 144 percent gap between long run equilibrium value and the actual value of the dependent variable (FDI/GDP) has been corrected. The results further indicate that the speed of adjustment towards long run equilibrium, after a short term derailment, is 144 percent annually in correspondence with the annual data in use or put in another form; we can say that the system corrects its previous period disequilibrium at a speed of 144% annually. This speed of adjustment at 144% shows a sort of over adjustment or over correction and hence appears indicative of an unsustainable equilibrium. According to Narayan and Smyth (2006), an error correction term that lies between -1 and -2 means that the equilibrium is achieved in a decreasing fluctuating form. To this extent, since the lagged error correction term yielded a negative coefficient which is statistically significant at 1% level and falls between -1 and -2, suggests that the lagged error term generates dampened effect moving from the independent variables to foreign direct investments about the equilibrium path. Therefore, since the lagged error correction term in the short-run model yielded a coefficient of -1.44 indicates that instead of, in a sameness manner, converging to the equilibrium path directly, the error correction process fluctuated around the long-run value in a diminishing manner. However, once this process is complete, convergence to the equilibrium path will be rapid.

In a bid to further validate our data, models and hence the results obtained in terms of the statistical behavior, we applied a number of post estimation diagnostic tests to the ARDL model (Table 1). The tests results indicate no evidence of autocorrelation in the disturbance of the error term, heteroskedasticity which suggests that the errors are homoskedastic and the regressors are substantially independent. Furthermore, the

errors are normally distributed as evidenced in the Jarque-Bera normality tests with the Jarque-Bera value of 3.078734 and probability value of 0,214517. In the same vein, the Ramsey RESET test indicates that the model is correctly specified. Some of the results of the diagnostic test are presented in table 3- 5 below.

Table 3: Breusch-Godfrey serial correlation LM Test

F- statistic	0.559810	Prob. F(2, 21)	0.4161
Obs*R-square	1.791924	Prob. Chi-Square (2)	0.1270

Given that the null hypothesis is that the residuals are serially uncorrelated, the F-statistic p-value of 0.4161 indicates that we fail to reject this null and therefore conclude that the residuals are serially uncorrelated.

Table 4: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F- statistic	2.020171	Prob. F(23, 3)	0.3107
Obs*R-square	25.36244	Prob. Chi-Square (23)	0.3319
Scaled Explained SS	0.539445	Prob. Chi-Square (23)	1.0000

Since the null hypothesis is that the residuals are homoskedastic, the F-statistic p-value of 0.3107 suggests that we fail to reject this null and therefore conclude that the residuals are homoskedastic.

Table 5: Ramsey RESET Test for Model Stability

Variable	Coefficient	Std. Error	t-statistic	Prob.
FITTED^2	0.053208	0,022711	2.342775	0.1439

The RESET F-statistic has a p-value of just over 14%, meaning that we cannot reject the null hypothesis that the functional form of the model is correctly specified and indicates that the issue of misspecification is ruled out from our model as estimated.

Table 6: Basic ARDL (1, 0, 3, 3, 3, 3) Model (4) Estimation Results

Dependent Variable: LFPI_GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LFPI_GDP(-1)	-0.618826	0.160684	-3.851206	0.0039
LEXR	-0.000297	0.025586	-0.011616	0.9910
LEXDSUS	9.361185	56.49430	0.165701	0.8721
LEXDSUS(-1)	102.6876	75.26217	1.364398	0.2056
LEXDSUS(-2)	-337.3266	67.30363	-5.012012	0.0007
LEXDSUS(-3)	252.2276	40.31070	6.257087	0.0001
INT	1.177919	0.361422	3.259124	0.0099
INT(-1)	-0.307035	0.236333	-1.299164	0.2262
INT(-2)	1.824970	0.251205	7.264868	0.0000
INT(-3)	-1.223425	0.240607	-5.084737	0.0007
INFL	0.168882	0.051922	3.252622	0.0100
INFL(-1)	0.076198	0.044440	1.714620	0.1206
INFL(-2)	-0.350887	0.045754	-7.668963	0.0000
INFL(-3)	0.088379	0.048120	1.836643	0.0994
LOPNESS	-13.82807	11.45107	-1.207579	0.2580
LOPNESS(-1)	78.86610	12.98483	6.073710	0.0002
LOPNESS(-2)	41.67210	9.677922	4.305894	0.0020
LOPNESS(-3)	-79.29350	14.85770	-5.336861	0.0005
C	-44.88169	10.00752	-4.484797	0.0015

Adjusted R-squared = 0.878461 Prob. (F-statistic) = 0.000336
 Durbin-Watson = 2.409613

The Adjusted R-squared value of 0.878461 suggests that 87.84% of the variation in the dependent variable is explained by the independent variables. The probability of F-statistic of Prob (F-statistic) = 0.000336 indicates that the regressors jointly and significantly influence the regressand and the Durbin-Watson statistic value of 2.409613 clearly suggests the absence of first order autocorrelation. The estimated long-run and short run coefficients are presented in Table 6. The long run coefficient of LEXR is correctly negatively signed and

statistically not significant, meaning that the effect of exchange rate dynamics on foreign portfolio investment inflow to Nigeria is inconsequential. The results further indicate that, in the short run, external debt sustainability index, LEXDSUS (-3) coefficient is correctly positively signed and highly significant even at 1% level, meaning that the more sustainable the external debt stock with recourse to total export revenue, the more confident the investors and the more the inflow of foreign portfolio investment to Nigeria. Therefore, the debt policy that will maximize external debt sustainability index should be vigorously pushed if Nigeria desires improvement in the inflow of foreign portfolio investments at least in the short run.

The long run effect of external debt sustainability variable on foreign portfolio investment appears to be inconsequential as indicated by P-Value of its coefficient 87.21%. The results further indicate that both the long run coefficient of interest rate (INT) and the short run coefficient of interest rate INT(-2) are correctly positively signed and significant at 1% level, meaning that while high interest rates may discourage domestic investment, it may on the other hands increase the inflow of foreign portfolio into the domestic economy. The results further indicate that in the short run, there exist an inverse relationship between inflationary trend and foreign portfolio investment in Nigeria. This is clearly evident in the negative coefficient of INFL (-2) and statistically significant at 1% level. The long run relationship clearly indicates positive association. Finally, the coefficients of trade openness show positive sign and statistically significant even at 1% level in the short run, LOPENESS (-1), but this positive effect fizzles out and sleeps into negativity on the long run, even though such effect appears to be insignificant. This suggests that in Nigeria, an increase in the level of exposure of the domestic economy to the global economic environment will temporarily be beneficial with respect to foreign portfolio investment inflow. This supports views of Monica & Neha (2017) that, while the investors of developed country invest in portfolios of different countries to diversify the risk and earn more returns, foreign portfolio investors generally go for short-term investment to reap the benefits of good economic conditions and they tend to withdraw their investments during the period of recession.

The error correction term coefficient, in the short-run model, of -1.618) is negative and statistically significant at 1% level, meaning that the regressors jointly and significantly cause foreign portfolio inflow, with causality running from exchange rates, EXDSUS, interest rates, inflation rates and trade openness to FPI. We also confirm from the results that all the variables are co-integrated or have long run equilibrium relationship. The results further indicate that the speed of adjustment towards long run equilibrium, after a short term derailment, is 162 percent annually in correspondence with the annual data in use or rather we can still say that the system corrects its previous period disequilibrium at a speed of 162% annually. This speed of adjustment at 162% shows a sort of over adjustment or over correction and hence appears indicative of an unsustainable equilibrium. However, according to Narayan and Smyth (2006), an error correction term that lies between -1 and -2 means that the equilibrium is achieved in a decreasing fluctuating form. To this extent, since the lagged error correction term yielded a negative coefficient which is statistically significant at 1% level and falls between -1 and -2, suggests that the lagged error term generates dampened effect moving from the independent variables to foreign direct investments about the equilibrium path. Therefore, since the lagged error correction term in the short-run model yielded a coefficient of -1.618 means that instead of, in a sameness manner, converging to the equilibrium path directly, the error correction process fluctuates around the long-run value in a diminishing manner. However, once this process is complete, convergence to the equilibrium path will be rapid (Narayan and Smyth, 2006).

Table 7: ARDL Bounds Test Results

NULL Hypothesis: No long-run relationships exist

Test Statistic	Value	K(No of variables)
F-statistic	33.18053	5
Critical Value Bounds		
Significance Level	1(0)	1(1)
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

The F-statistic value of 33.18053 is evidently greater than the 1(1) critical values bound. This suggests that we reject the null hypothesis that No long-run relationships exist, meaning that there exists a long run equilibrium relationship between the explanatory and the explained variables.

Table 8: Breusch-Godfrey serial correlation LM Test

F- statistic	1.741274	Prob. F(2, 14)	0.2112
Obs*R-square	5.577640	Prob. Chi-Square (2)	0.0615

Given that the null hypothesis is that the residuals are serially uncorrelated, the F-statistic p-value of 0.2112 indicates that we fail to reject this null and therefore conclude that the residuals are serially uncorrelated.

Table 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F- statistic	0.716308	Prob. F(18, 9)	0.7392
Obs*R-square	16.48976	Prob. Chi-Square (18)	0.5584

Since the null hypothesis is that the residuals are homoskedastic, the F-statistic p-value of 0.7392 suggests that we fail to reject this null and therefore conclude that the residuals are homoskedastic. Furthermore, the errors appear to be normally distributed as evidenced in the Jarque-Bera normality tests with the Jarque-Bera value of 0.249115 and probability value of 0.882887.

V. CONCLUSION

This study was commissioned to investigate for long run and causal relationship between foreign investment inflows and exchange rate dynamics in Nigeria. Foreign capital is decomposed into foreign direct investment (FDI) and foreign portfolio investment (FPI) to enable us look at both the real and financial sectors of the economy. Pre-estimation preliminary tests showed a mixture of stationary levels of the employed variables. On the strength of this, we deployed Autoregressive Distributed Lag (ARDL) model in our data analysis. Results established that there exists a long run association between exchange rates dynamics and foreign capital inflows to Nigeria. This was evident by the values of bound tests F-Statistic of 61.82058 and 33.18053 for foreign direct investment and foreign portfolio investment short run models respectively. These values are higher than the upper bounds critical values of the bounds tests and statistically significant at 1% level, meaning that there exists long run equilibrium or steady state relationships between exchange rate variations and foreign capital inflows to Nigeria. The coefficients of error correction terms lagged one period in the short-run models of FDI and FPI are negative and statistically significant at 1% level, meaning that in the both models, the independent variables jointly significantly cause FDI and FPI respectively at least in the short run.

Hallmark results from the study are: the identification of the positive and significant association between interest rates and foreign portfolio investment. This suggests that increase in interest rates tended towards a drop in inflationary pressure via reduction in money supply may at the same time increase the inflow of foreign portfolio investment. This by implication indicates that the gain from lowering interest rates to increase domestic investment may be crowded out by the value of foreign portfolio investment outflows. According to Monica & Neha (2017), foreign portfolio investors generally go for short-term investment to reap the benefits of good economic conditions and they tend to withdraw their investments during the period of recession (unfavorable economic condition).

Furthermore, this study has established that, for Nigeria, exchange rate ranks as one of macroeconomic fundamental that exact significant influence in moderating foreign direct investment (FDI) flows, while its effect on foreign portfolio investment (FPI) movements appears to be inconsequential, meaning that exchange rate should not be contemplated as instrument for moderating foreign portfolio inflows in Nigeria.

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