Abuja Journal of Economics & Allied Fields, Vol. 8(4), Dec., 2018
Print ISSN: 2672-4375; Online ISSN: 2672-4324

Investigating the Impact of Exchange Rate Volatility on Foreign Direct Investment in Nigeria

Frank Iyekoretin Ogbeide[1], Hamid Adebayo Muili[2], Oluwafemi Mathew Adeboje[3]

[1]*Research, Policy and International Relations Department, Nigeria Deposit Insurance Corporation (NDIC), Abuja*
[2]*Department of Economics and Statistics, University of Benin, Benin City*
[3]*Department of Economics, University of Ibadan, Nigeria*

Abstract

This study examined the impact of exchange rate volatility on FDI in Nigeria from 1981 to 2016, employing ARDL. The study finds exchange rate volatility to have mixed effect on FDI: exchange rate volatility coefficient was negative in the short-run, but positive in the long-run, suggesting proficient adjustment to exchange rate gyration. Financial reform significantly spurs FDI, both in the level and dynamic model. Also, the significant long-run impact of real GDP on FDI affirming that output size matters in FDI equation. Availability of natural resources was positively significant only in the dynamic equation, but interest rate was significant and negative in both models. The study recommends the need to ensure credible policy for stabilizing exchange rate, maintaining of low interest rate, infrastructural development, and derived diversification of the economy and adoption of a well-structured financial reform strategy with the view to supplying optimal funds for investment and growth of the real economy.

Keywords: *Foreign Direct Investment, Exchange Rate Volatility, Financial Reform, Nigeria*
JEL Codes: E59, F23, O19

1. Introduction

The significance of savings to investment is so crucial that it was emphasized in the Harrod-Domar growth model as a pre-requisite for capital formation which steers investment towards achieving a sustainable economic growth. However, the savings rate in most developing countries is so low to an extent that it is often adjudged too insignificant to spur any meaningful investment that will promote sustainable industrialization and economic growth. In order to solve the problem of low investment consequent upon the deficiency in our savings and for the realization of vision 20:2020 of being among the top twenty (20) largest global economies by year 2020, there is a dire need to promote investment by allowing foreign investors to invest in our economy. The promotion of this investment will create employment opportunities for myriads of youths; ameliorate our balance of payment disequilibrium through provision of import substitution goods, technical development and poverty reduction, among others.

In the past, when the communist ideology was still extant, the radicals view the MNEs (multinational enterprises) as an imperialist tool for exploiting the host countries. Hence, no country should embrace FDI. However, after the collapse of the communist ideology, the perception of countries towards MNEs changed and they all embraced FDI. The economic benefits of attracting FDI are generally twofold, according to Sghaier and Abida, (2013). Firstly, countries with low domestic savings to spur expansion in the real economy may harness FDI as a source of external finance. This line of thoughts may particularly be in the case of developing and emerging economies. Secondly, presence of foreign companies is associated with positive externalities/ spillovers.

Kosteleton and Liargovas (2000), explained that the outflow of capital in the world grew at an average rate of almost 30% which was more than three times the growth rate of world's export in the 1980s and four times as fast as the growth of GDP, with further growth experienced in the 1990s. Despite the increase in the flow of FDI to developing countries,

the FDI inflow to Nigeria in terms of growth rate has remained relatively low (Wafure and Nurudeen,2010).

Given the significant role of FDI in developing countries, several studies have tried to ascertain the factors that influence FDI inflow into these economies. One of such factors that have recently become the source of debate is exchange rate volatility. Exchange rate volatility refers to the rate at which a country's currency in terms of others, adjust intensely to changes in market conditions or policies from time to time in line with changing broad based macroeconomic fundamentals.

However, the impact of exchange rate volatility is not straightforward as it seems. This is because researchers dissent on the true impact of exchange rate volatility on FDI. Some researchers, for example, believed that exchange rate volatility has a positive impact on FDI. This researchers justified their stand by saying FDI is a form of export-substitution. This group is known as the production flexibility theorist. On the other hand, the risk aversion theorist posited that the exchange rate volatility exerts a negative impact on FDI. This view was pioneered by the irreversibility literature of Dixit and Pindyck (1994) as cited in Osinubi and Amaghionyeodiwe (2009). Also some researchers believed that, exchange rate volatility does not have any significant impact on FDI. To this end, the impact of exchange rate volatility on FDI remains inconclusive.

This paper is poised to ascertain empirically, the effect of exchange rate volatility on FDI using time series data of Nigeria. The study also improves on extant literature by including variable to capture policy of financial sector reform as a crucial determinant of FDI. This is because financial reform process, through its effects on financial sector, removes constraint to availability of credit required by businesses for productive activities. Finance, through its interface with the real economy enters the equation as a determinant of FDI. Researchers like, McKinnon (1973); Shaw (1973); and King and Levine (1993) contended that well-functioning financial system promotes overall efficiency because it mobilizes savings, transfer resources from traditional (non-growth) sectors to modern growth-inducing ones, and also enhances entrepreneur response to opportunities. In fact, researches have accepted that, lack of/ or access to credit for would-be entrepreneurs remain a binding constraint to development in developing countries (OECD, 2014). Hence, financial sector through policies of financial reform helps to mobilize savings, and thus, provide fund-seekers with the required credits for investment, thereby improving aggregate demand and supply conditions, which in turn support innovations and entrepreneurial development (Mullineux and Murinde, 2014). It has also been suggested that foreign investors highly value a host country's financial system that is able to allocate capital efficiently, monitor firms, ameliorate, diversify and share risk, and ultimately mobilize savings. In addition, efficient domestic financial system greatly facilitates the establishment and growth of domestic suppliers of the foreign firms (Kinoshita and Campos, 2008). Furthermore, the study tends to answer some questions such as, Does the market size of Nigeria (RGDP) really attracts FDI? Also, does the presence of natural resources, particularly oil, drives FDI influx in Nigeria?

This paper is divided into five sections. Following this introductory part, Section two reviews the relevant literature, while methodology employed is discussed in section three. Data presentation and analysis is presented in Section four, while discussion of empirical findings and recommendation is contained in the last section.

2. Review of Related Literature

Stylized Facts on FDI in Nigeria

Prior to the mid-20th century, the major motivating factor that influences the flow of capital was the expansion via colonization or establishment of oversea subsidiaries (Iyoha and Itsesde, 2003). However, due to civilization and recent development in the world, the motives for FDI have changed. See Ajayi (2006) for a survey of the evidences on FDI in Africa, and elsewhere.

Dunning (1993) posited that, foreign investor's investment in the host countries is based on either, resource- seeking, that is, seeking for available cheap labour and natural resources, market-seeking which has to do with securing market shares and sales growth, efficiency-seeking takes advantages of favourable policies, market structures and economic system while the strategic-asset seeking FDI has to do with the acquisition of resources and capabilities that enhances enterprise competitiveness both regionally and globally.

FDI in Nigeria can be said to have gone through series of phases at each point in time. FDI and volatility in exchange rate in Nigeria seems to have a history with SAP as this policy had great effect on the behaviour of the two macroeconomic variables. Prior to SAP, FDI inflow to Nigeria from 1981 to 1985 was relatively low owing to the Nigerian Enterprise Promotion Decree of (1972) as amended 1977, which inclined towards increasing the participation of Nigerians in the industrial sector. Also during this period exchange rate was relatively stable. However, the introduction of SAP in 1986 marked a paradigm shift as the exchange rate become highly volatile due to the adoption of floating exchange rate regime. Moreover, the FDI inflow during this period increased consequent upon the SAP policy which allows foreign investors to invest in any sector of the economy. Thus, as the exchange rate becomes volatile, the FDI inflow increases. The reversal of SAP in 1994 led to the fall in FDI by 25% from the preceding year's level. During this period, the value of Naira becomes stable at ₦21.8/$1 from 1994 to 1998. However, due to the economic problem caused by the policy of regulating the economy, it was later replaced by guided deregulation. Following the adoption of guided deregulation, the exchange rate continues to fluctuate and it reached the peak in 1999. Up till date, the value of Naira to other currencies continues to fluctuate.

It can therefore be deduced from the above analysis that exchange rate volatility and FDI are inversely related at some point and later become positively related. The graph below confirmed the negative relationship between FDI and exchange rate volatility in the short run and positive relationship in the long run.

Theoretical Review

Aliber (1970) was the first person to investigate the impact of exchange rate variation on FDI flow. His logic was that, countries with weak money rate with the goal of increasing purchasing power may apply for attracting FDI. In other words, home country with strong currency tends to promote FDI flow to host country with weak currency. This hypothesis was known as the Aliber's hypothesis. In spite of Aliber's primary logic, the explanation was not popular until the end of 1980's and early 1990's. In fact it was this time the topic on exchange rate was seriously introduced as a major determinant of FDI as cited in Renani and Mirfatah (2012).

Sequel to the collapse of Bretton woods agreement in 1971 and the adoption of free floating exchange rate regime, the exchange rate of countries in the world is now being determined by the forces of demand and supply. Moreover, this phenomenon has led to high rate of instability in exchange rate which has propelled many researchers to look into the effect of exchange rate volatility on FDI. Theoretically, the impact of exchange rate volatility on FDI can be categorized into two broad groups. Production flexibility theorist who posits that exchange rate volatility has a positive impact on FDI, and the risk aversion proponents who believes that exchange rate volatility exerts a negative impact on FDI. Although, some researches does not find any significant impact of exchange rate volatility on FDI. The theoretical frame for studies of this nature is often drawn from the eclectic theory of Dunning (1980) that states: country with locational advantages attracts more FDI which may include availability of resource, socio-economic, institutional and political factors. Hence, one of the most important factors that is considered in this study is exchange rate volatility. The two theories that explain the mystery behind the effect of exchange rate volatility on FDI are the production flexibility theory and the risk aversion theory.

Production flexibility proponents who believe that exchange rate volatility has a positive impact on FDI viewed FDI as export substitution. Hence, increase in exchange rate volatility between the host country and the home country will induce the multinationals to serve the host country through local production facility rather than boosting export thereby insulating against currency risk (Cushman, 1985).

The risk aversion theory which was pioneered by the literature written by Dixit and Pindyck (1994) as cited in Osinubi and Amaghionyeodiwe (2009), posits that exchange rate volatility exerts a negative impact on FDI. In other words, a direct investment in a country with high rate of exchange rate volatility will have more risk stream of profit. Thus, as long as this investment is partially irreversible, there is some positive value to holding off on the investment to acquire more information. Gorg and Wakelin (2001), reported that there is no correlation between the fluctuations in exchange rate and FDI flow from USA to 12 developed countries.

Empirical Review

Crowley and Lee (2003) conducted a research on the impact of exchange rate volatility on FDI in 18 OECD countries using a quarterly bilateral data on capital inflows and outflows between USA and other countries from 1980 to 1988. The study finds impact of exchange rate volatility on FDI to be weak, when movements in exchange rate is small, but strong when exchange rate becomes excessively volatile. Udoh and Egwaikhide (2008) findings revealed that exchange rate volatility exerts a negative impact on FDI and also inflation uncertainly equally has a deleterious effect on FDI. Infrastructural development and real GDP also proves to be a major determinant of FDI.

Chukwudi and Madueme (2010) shows that volatility in dollar exchange rate has a positive and significant impact on FDI. Hence, volatility resulting from appreciation of host currency reduces FDI inflow, while volatility resulting from depreciation in host country's currency attracts FDI inflow. Elahi (2011); Renani and Mirfatah (2012) and Ullah, Haider and Azim, (2012) shows that exchange rate volatility has a negative impact on FDI in the short run, but turns positive in long run. Jeon and Rhee (2008) and Kyereboah-Coleman and Agyire-Tettey (2008) showed that, volatility of the real exchange rate has a negative influence on FDI inflow. Both Brahmasrene and Jiranyakul (2001) and Dewenter (1995) observed no statistically significant relationship between the level of the exchange rate and FDI inflows. Elbadawi and Mwega (1997) find economic growth to be an important determinant of FDI. Also depreciation in real effective exchange rate has a positive and significant impact on FDI, Walsh and Yu (2010) and Anyanwu and Erhijakpor (2004) concluded that, greater financial development in African countries leads to less FDI inflows.

Studies by Abiad, Oomes and Ueda, (2008); Galindo, Schiantarelli and Weiss, (2007) found that financial sector reform lead to more efficient allocation of investments. Seck and El Nil, (1993) and Gelb, (1989) results suggest that interest rate deregulation has a positive effect on investment efficiency and quantity, while Fowowe, (2011) and Laumas, (1990) found a positive impact of interest rate liberalisation on private investment and economic growth, respectively. Rajan and Zingales, (1998); Beck, Demirguc-Kunt and Maksimovic, (2005) associates financial reform to greater freedom of domestic firms to undertake cross-border commercial borrowing, because it helps firms to grow faster and enable them overcome financing constraints. Findings from Galindo, Schiantarelli and Weiss (2002) suggests that, for most countries, the introduction of financial reform raised the share of investment going to firms with a higher marginal return to capital/ level of efficiency. Rajan and Zingales, (2003) also argued that financial reform may be an important strategy to raise the size of domestic savings channelled through the formal financial system for investment purposes.

On their part, Demirgüç-Kunt and Detragiache, (1998); Kaminsky and Schmukler, (2002) found financial liberalisation to make financial system more fragile, raising the possibility of macroeconomic instability and so may not enhance investment and long-term economic growth.

3. Methodology

Research Design

This paper used the annual data for Nigeria, covering the periods 1981-2016, taken from the CBN, NBS, and World Bank. All the right-hand side variables are in natural log form except for the transformed variable (exchange rate volatility). Taking natural log of time series makes interpretation more robust and it also reduce the possibility of heteroskedasticity in the model. As a result of non stationarity of the majority of time series variables, the estimated co-efficient from such regression will be inconsistent and the regression result will be spurious (Engle and Yoo, 1987). However, if two or more variables are non-stationary, the linear relationship among them can still be stationary if these variables are found to be cointegrated. This study will Autoregressive distributed lag model ARDL methodology proposed by Pesaran and Shin (1999) and further extended by Pesaran, Shin and Smith (2001) will be employed in analyzing the data set for the model. Other test used in the estimation includes, unit root test, co-integration test, Error correction model and granger causality test. The ARDL approach has the advantage that it does not require all variables to be I(1) as the Johansen framework and it is still applicable if we have I(0) and I(1) variables in our set.

Theoretical Framework and Model Specification

The theoretical foundation for this study is hinged on the theory of firm in production possibility

framework. This study follows the framework of Bolling, Shane and Roe (2007) in establishing the theoretical relationship between exchange rate volatility and FDI. In a simple and straight forward manner, a production possibility framework explains the shifts of production between locations (countries) as a result of input due to foreign exchange volatility. It is assumed that the firm has two production facilities in two locations (countries), a Nigeria operation and a foreign affiliate. We also assume that the same technology is adopted by the firm in the two locations with a fixed firm-wide resource allocated to the two locations. This resource, which can be some firm-specific resource or firm-specific capital is represented as:

$$X = x_{NIGERIA} + x_{FDI} \quad 3.1$$

Equation 3.1 shows that the firm-specific resource is a combination of the local resource ($x_{NIGERIA}$) and the foreign resource, in form of foreign direct investment (x_{FDI}). So, the firm is faced with the problem of maximizing production from the two operation facilities given the constraint on capital. It is also note-worthy that the model employed assumes that the firm is a profit-maximising with Cobb-Douglas production function and any random combination of resource or input can be employed by the firm along the input line.

Given the above assumptions of two sources of input and profit maximisation, the firm is faced with the problem of the choice of $x_{NIGERIA}$ and x_{FDI} to maximise the production value subject to a capital constraint:

$$Max: \pi = p_{NIGERIA}\, \chi_{NIGERIA}^{\beta} T_{NIGERIA}^{1-\beta} + Ep^{*}\,(X - x_{NIGERIA})^{\beta} T_{FDI}^{1-\beta} \quad 3.2$$

where x_i = capital investment in country *i*, T_i= other input (s) used in production of the good in country *i*, *E*= exchange rate= ₦/*foreign currency*, P_i= real food price in country *I* and *X* assumes the value in equation (1).

From (3.2), the first-order conditions from the implied Lagrangian function are:

$$d\pi/d\chi_{NIGERIA} = \alpha p_{NIGERIA}\, \chi_{NIGERIA}^{\beta-1} T_{NIGERIA}^{1-\beta} - \beta Ep^{*}\,(X - x_{NIGERIA})^{\beta-1} T_{FDI}^{1-\beta} = 0 \quad 3.3$$

The rearrangement of (3.3) yields:

$$\alpha p_{NIGERIA}\, \chi_{NIGERIA}^{\beta-1} T_{NIGERIA}^{1-\beta} = \beta Ep^{*}\,(X - x_{NIGERIA})^{\beta-1} T_{FDI}^{1-\beta} \quad 3.4$$

By substituting (1) into (4), we have:

$$\alpha p_{NIGERIA}\, \chi_{NIGERIA}^{\beta-1} T_{NIGERIA}^{1-\beta} = \beta Ep^{*}\,(X_{NIGERIA} + \chi_{FDI} - x_{NIGERIA})^{\beta-1} T_{FDI}^{1-\beta} \quad 3.5$$

Therefore, (3.5) becomes:

$$x_{FDI}^{\alpha-1} = \frac{P_{NIGERIA} x_{NIGERIA}^{\alpha-1} T_{NIGERIA}^{1-\alpha}}{Ep^{*} T_{FDI}^{1-\alpha}} \quad 3.6$$

Solving for x_{FDI} yields:

$$x_{FDI} = \left[\frac{P_{NIGERIA} x_{NIGERIA}^{\alpha-1} T_{NIGERIA}^{1-\alpha}}{Ep^{*} T_{FDI}^{1-\alpha}} \right]^{1/\alpha-1} \quad 3.7$$

Equation (3.7) thus shows that FDI is dependent on exchange rate variations. This is the fundamental equation for this study. Other variables added as control were obtained from extant literature on related subject matter.

Model Specification

The theoretical link between exchange rate volatility and FDI is quite complex as the literature reviewed in the previous section. A multiple regression model will be adopted on the time series data to test for the null hypothesis proposed for the study. The model claimed that FDI is a function of exchange rate volatility, inflation, infrastructural level, real GDP and financial sector reform, natural resources availability, secondary school enrolment and trade openness. To measure domestic financial reform in this study, we obtained financial reform data developed by Abiad, Detragiache, and Tressel, (2010), captured by taking a simple arithmetic average of the 5 dimensions of policies on financial reform, excluding capital account liberalisation and securities market policy. These include credit controls and excessively high reserve requirements, interest rate controls, entry barrier, state ownership in the banking sector, and lastly, prudential regulation and banking supervision. Thus, this study explores the effect of domestically-induced policy of financial reform on FDI to Nigeria.

Mathematically,

LFDI = f(VEXCHR, FINREF, NATURES, INFRA, INTR, RGDP) 3.8

$LFDI = \beta_0+\beta_1 VEXCHR +\beta_2 LNATURES +\beta_3 LINFRA +\beta_4 LINTR + \beta_5 LRGDP + \beta_6 LFINREF + \mu_t$ 3.9

The independent variables were logged, except the coefficient to represent the volatility of exchange rate, which is in deviation form.

A priori Expectation

$\beta_1 > 0$ or < 0; $\beta_2 > 0$; $\beta_3 > 0$; $\beta_4 < 0$; $\beta_5 > 0$; $\beta_6 > 0$.

Our estimated ARDL Model is of the form represented in equation 3.10

$$\Delta LFDI=\alpha_0+\beta_1 \sum_{i=1}^{k} \Delta LFDI_{t-i} + \psi_2 \sum_{i=1}^{k} \Delta X_{t-i} + \varphi_1 LFDI_{t-i} + \varphi_2 \sum_{i=1}^{k} X_{t-i} + Ut \quad 3.10$$

The β_i and ψ parameters in equation 3 represents the short run dynamics of the model, while the sum of the φ_i in the equation represents the long run relationship. The Ut represents the stochastic error term.

Measurement of Volatility

The approach employed in measuring the volatility in exchange rate is the quadratic moving average standard deviation (QMASD) as used by Marco (2011).

$$\text{Standard Deviation}(X_i) = \sqrt{\left[\frac{(X_i - X_{i-1})^2}{2}\right]}$$

Where i = Years of observation

$STANDEV(X_i)$ = standard deviation of observation X in year i.

Description of Variables

FDI = Foreign direct investment into Nigeria annually in million Naira.

VEXCHR = Volatility in exchange rate calculated using second-order moving average standard deviation approach.

RGDP = Real gross domestic product of Nigeria in million. This represents the market size of the country (Brahmasrene and Jiranyakul, 2001; Nnadozie and Osili, 2004; Chowdhury and Mavrotas, 2006; Jeon and Rhee, 2008; Kyereboah-Coleman and Agyire-Tettey, 2008).

NATURES=Natural resource availability. This is proxy by the ratio of oil export to total export in percentage (That is, oil export/total export). This could also indicate the level and extent of diversification of the host country's economy, the higher the value, the less diversified the country's economy (Leite and Weidmann, 2002; Dupasquier and Osakwe, 2006; Mohamed and Sidiropoulos, 2010; Kurronen, 2012; Asiedu, 2002, 2013).

INTEREST RATE: The interest rate is represents the cost of capital and therefore reduces incentives to accumulate more capital. High interest rate reflects cost of funds which is expected to have a negative effect on FDI following the neo-classical tradition. It is proxy by monetary policy rate (MPR). However, Hussain, Mohammed and Kamier, (2002) pointed out that, the effect of the real interest rate on investment will depend on whether the real interest rate is below or above the equilibrium rate.

INFRASTRUCTURE: This usually deals with the government's provision of physical structures, including road, bridges, electricity, and telecommunications. It is proxy with government's total capital expenditure and expected to have positive impact on FDI (Musila and Sigue, 2006; Dupasquier and Osakwe, 2006; Botric and Škuflic, 2006; Ramiraz, 2006; Kersan-Skabic and Orlic, 2007).

FINANCIAL REFORM: Financial reform is expected to have a positive impact on FDI inflow, through its role in deepening the financial sector (Nasser and Gomez, 2009; Hussain, Mohammed and Kamier, 2002). It was obtained from the data base on financial reform developed by IMF.

4. Empirical Results of Regression Estimation

Firstly, we computed the descriptive statistics of data included in the model see table 4.1.

Table 4.1: Descriptive statistics

Variables	Mean	Maximum	Minimum	Std. Dev.	Jarque-Bera	Prob	Observations
FDI	3703247	28679069	264.30	6577011	52.87	0.00	36
VEXCHR	76.59	253.49	0.61	72.04	2.62	0.27	36
INFRA	368141.6	1152796	4100.10	372323.9	3.89	0.14	36

Variables	Mean	Maximum	Minimum	Std. Dev.	Jarque-Bera	Prob	Observations
INTR	13.01	26.00	6.00	4.21	4.57	0.10	36
NATURES	95.89	98.72	91.16	2.16	2.98	0.23	36
RGDP	3175714	69023930	13779255.0	1815171	5.29	0.07	36
FINREF	12.89	18.00	5.75	4.61	4.28	0.12	36

Source: Authors' computation using EViews 2009

The descriptive statistics above showed that all the variables are positively skewed, except natural resources availability and financial reform that are negatively skewed. The Jacque-Bera statistics failed to reject the null hypothesis of normality for the entire variable, except FDI which was found not to be normally distributed. Other variables, like secondary school enrolment, trade openness and institutional variables were dropped from the model following preliminary statistical properties. Natural resource availability may collinear with institutional variables because dependence on natural resources, often breeds rent-seeking in governance, thereby undermining institutional quality and policy environment (North, 1990), hence natural resource availability can therefore closely capture the economic structure of countries.

Unit Root Test

Prior to our empirical analysis, we tested for stationarity in the data used in the econometric estimations. This is necessary for the purpose of ensuring consistency in subsequent econometric modeling and avoiding spurious regression which would be meaningless for policy formulation. The Augmented Dickey Fuller test in table 4.2 shows that all variables are stationary after first difference at 5% significant level, assuming the equation includes both trend and intercept. While real GDP is stationary at first difference, assuming only intercept. However, the other exchange rate volatility is stationary at level assuming intercept and trend while log interest rate is stationary at level assuming only intercept.

Table 4.2: Unit root (Non- Stationarity) Test

Variables	ADF t-statistics	ADF critical values	Order of Integration	Remarks
LFDI	8.169	3.5484	I(1)	Stationary
VEXCHR	4.0679	3.5484	I(0)	Stationary
LNATURES	6.2606	3.5484	I(1)	Stationary
LRGDP	3.2229	2.9511	I(1)	Stationary
LINFRA	6.0563	3.5484	I(1)	Stationary
LINTR	6.7405	3.5484	I(0)	Stationary
LFINREF	4.213	3.5484	I(1)	Stationary

Source: Authors' computation using EViews 2009

Given that the variables are not integrated of the same order and none of the variables is stationary at second difference, we employed the autoregressive distributed lag model (ARDL). The ARDL model deals with single cointegration and introduced originally by Pesaran and Shin (1999) with further extension by Pesaran, Shin and Smith (2001). The ARDL approach has the advantage that it does not require all variables to be I(1) as the Johansen framework.

Cointegration Test

We employed the ARDL bounds test method in conducting the cointegration test, due to the properties of the data.

Table 4.3: Cointegration Test : F-Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.928903	10%	1.99	2.94
K	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Source: Authors' computation using EViews 2009

Testing cointegration in ARDL modelling involves comparing the compound F-statistics with the upper critical bound (UCB) and lower critical bound (LCB) (Pesaran, Shin and Smith, 2001). The null hypothesis of no cointegration is tested against alternate of cointegration. The result of the estimation shows that the F-statistics of 4.9289 is higher than the lower critical bound of 2.27 and also higher than the upper critical bound 3.28 at 5% level of significance. Thus, we reject the null hypothesis and conclude that there is a long run relationship among the variables in the model.

Lag Selection Criterion

The selection of appropriate lag for the autoregressive representation of a cointegrated system is very crucial in cointegrated modeling (Ebiringa and Emeh, 2013).

Table 4.4: Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-143.31	NA	2.84e-05	9.394845	9.715475	9.501125
1	21.58	247.3545	2.19e-08	2.150908	4.715946*	3.001146
2	86.19	68.64527*	1.33e-08	1.175451	5.984897	2.769647
3	178.93	57.96363	4.3e-09*	-1.558412*	5.495442	0.779741*

** indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion;Source: Authors' computation using EViews 2009*

The lag selection result in **table 4.4** shows that almost all the selection criteria suggest lag 3 as the maximum lag. The study preferred to use AIC based on its efficiency in selecting the representation of cointegrated system through the selection of a model which minimizes estimated criterion value (Ebiringa and Emeh, 2013). Thus, the studies preferred lag 2 periods for the dependent variable and lag 3 periods for the independent variables. This is done with the aim of avoiding over-parameterization of the model which might result to high rate of insignificant parameters. However, limited lags can lead to loss of information. Our estimation procedure follows from the general to specific modeling to arrive at our acceptable model.

Autoregressive Distributed Lag Model

The result is presented in Table 5.5.

Table 5.5: Empirical ARDL Models

Dependent Variable: LFDI Method: ARDL Sample: 1981-2016 Included-Observation: 32 after adjustments				Dependent Variable: D(LFDI) Method :ARDL Sample : 1981-2016 Included-Observations: 32 after adjustments			
Variable	Coefficient	t-statistic	Prob.	Variable	Coefficient	t-statistic	Prob.
C	-130.26	-2.15	0.05	C	-0.08	-0.35	0.81
VEXCHR	0.01	0.62	0.54	D(VEXCHR)	-0.0228	-3.58	0.004
LFINREF	9.46	3.19	0.009	D(LFINREF)	6.4941	4.74	0.008
LINTR	-2.10	-2.41	0.03	D(LINTR)	-1.5062	-3.46	0.006
LNATURES	8.72	0.82	0.42	D(LNATURES)	11.0196	2.68	0.022
LRGDP	5.89	6.23	0.001	D(LRGDP)	-15.7751	-5.31	0.003
LINFRA	-1.35	-2.13	0.05	D(LINFRA(-1))	2.0752	5.91	0.001
				ECM(-1)	-0.9834	-8.18	0.000

Dependent Variable: LFDI				Dependent Variable: D(LFDI)			
Method: ARDL				Method :ARDL			
Sample: 1981-2016				Sample : 1981-2016			
Included-Observation: 32 after adjustments				Included-Observations: 32 after adjustments			
Variable	Coefficient	t-statistic	Prob.	Variable	Coefficient	t-statistic	Prob.
R-squared	0.994484			R-squared	0.868716		
AdjustedR-squared	0.982900			Adjusted R-squared	0.760599		
F-statistics	85.85106(0.000)			F-statistics	85.85106(0.000)		
Durbin-Watson	2.228601			Durbin-Watson (DW)	2.056204		

Diagnostic Test

Residual Normality (Jacques Bera)	0.601413 (0.740295)
Breusch-Godfrey LM test	0.155756(0.8583)
Breusch-Pagan Godfrey heteroskedasticity test	0.940013(0.5703)
Ramsey-Reset Test	0.013795(0.9091)

**Probability value of Diagnostic test in parenthesis.; L represents Log*
Source: Source: Authors' computation using EViews 2009

The empirical result shows that all the explanatory variables explain 76.1% variation in FDI in the short run, while it explains 98.3% in the long run. The overall model was significant at 1% level. Furthermore, the Durbin-Watson statistics show absence of serial correlation in the models. The ECM term is correctly signed as significant at 1% with a speed of convergence to long run equilibrium of 98.3%. Thus, 98.3% disequilibrium in the long run is recovered annually.

All the variables in the long run conform to economic theory, except infrastructure. However, only real GDP failed to conform to economic theory in the short run. Table 4.5 presents the estimation result of both the long-run static model and the short run dynamic model, together with some diagnostic test to ascertain the validity of the model.

The results of the models revealed that exchange rate volatility (EXCHR) has a mixed effect on FDI to Nigeria, although not significantly in the long-run, but the coefficient of FDI was significant in the short-run dynamic model. Thus, a 1% increase in exchange rate volatility significantly reduces FDI by 0.022% in the short-run, while it increases it by 0.017% in the long-run. The availability of natural resources (ratio of oil export to total trade) has a positive and significant impact on FDI in the short-run, but the effect is positive and not significant at the conventional 5% level of significance in the long run..

Moreover, financial reform significantly increases FDI inflow both in the short- and long-run. The result confirmed conclusion by McKinnon (1973) and Shaw (1973) that, financial reform process lead, on average, to improvements in propensity to save, and ultimately stimulate both investment and economic growth. Furthermore, the availability of infrastructural facilities significantly increases FDI inflow in the short-run but reduces FDI inflow in the long-run, although not significant at the conventional level of significance. Coefficient of real GDP has a negative and significant impact in the short run; however, the effect turns positive in the long run. Interest rate has a negative and significant effect on FDI in both the short- and long-run.

Diagnostic Test

The model was subjected to series of diagnostic test to ascertain its validity and robustness. The Jacques-Bera statistic with P-value of 0.7403 failed to reject the null hypothesis of normality of the residual. Breusch- Godfrey LM serial autocorrelation test with P-value of 0.8583 shows non rejection of the null hypothesis of serial autocorrelation. Breusch-Pagan-Godfrey heteroscedasticity test with P-value 0.5703 fails to reject the null hypothesis of homoscedasticity. The Ramsey misspecification test with P-value 0.9091 provided no evidence of model misspecification.

Stability Analysis: Cusum and Cusum Square

The stationarity of variables cannot be said to mean its model stability. The stability of the parameters in the short-run unemployment model is examined using the plots of the Cumulative Sum of Recursive Residual (CUSUM) and Cumulative Sum of Squares of Recursive Residual (CUSUMSq). The test result in Figure 1 confirmed that the model is stable and usable for forecasting, since the CUSUM and CUSUMsq are within both critical lines of 5%

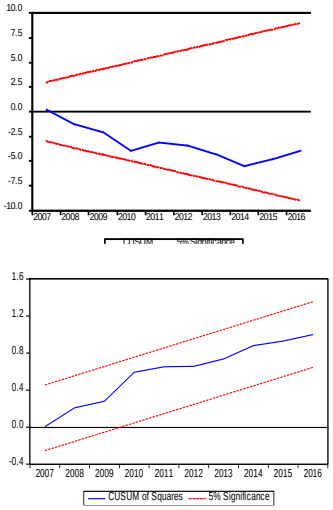

Figure 4.1: CUSUM and CUSUM Sq of Residuals

5. Conclusion and Recommendations

This study ascertains the impact of volatility in exchange rate on FDI inflow to Nigeria and whether financial reforms matter, using autoregressive distributed lag (ARDL) techniques on time series data from 1981 to 2016. The result presented includes both the long-run (level) model, and with the estimation of a dynamic short-run model for robustness check. The study shows that exchange rate volatility has negative, but significant impact on FDI in the short-run, and a positive impact in the long-run, although was not significant. This result suggests that while exchange rate volatility had a short run distortionary effect on FDI, its effect due to proficient adjustment mechanism by investors make the impact of exchange rate volatility and FDI influx to be in tandem. More so, in the long run, the increasing exchange rate fluctuation, especially incessant depreciation in local currency, may induce foreign investors to infact invest in the domestic economy to reap the ensuing export pricing differentials. In the short-run, the foreign investors hold back on their investment to ascertain the level of exchange rate volatility as investing in highly unstable economy might have a negative impact on their stream of income.

Furthermore, availability of natural resources, particularly oil, has a positive impact on FDI both in the short and long run, but coefficient was not significant. In addition, financial reform significantly increases FDI both in the long and short-run. Hence, the removal of access constraint to fund could drive FDI. Interest rate significantly reduces FDI in both the short-run and long run. High interest rate may favour influx of portfolio investment via carry-trade mechanism. Level of infrastructure significantly increases FDI inflow in the short run but effect was found to be negative in the long-run. This may indicate the inadequacy of sustained provision of infrastructural facilities in the country which may result in FDI withdrawal in the long-run. Real GDP significantly increases FDI in the long-run, but undermines it in the short-run, suggesting that short-term gyration in domestic output may act as a negative signal for foreign investment.

To this end, the study recommends the need for policy makers to adopt effective currency stabilizing policy to safeguard the value of the domestic exchange rate, and prop up foreign investors' sentiments. Monetary authorities should continue with financial reforms measures since it removes constraint to credit and so boost resource allocation efficiency. There is also the need for interest rate to be gravitate to its optimal levels to remove any disincentive to investment.

References

Abiad, A., Detragiache, E., and Tressel, T. (2010). A new database of financial reforms. IMF Staff Papers, 57(2), 281-302.

Abiad, A, .Oomes, N. and Ueda, K (2008). The quality effect: Does financial liberalisation improves the allocation of capital? The Journal of Development Economics, 87(2), 270-280.

Ajayi, S.I. (2006). The determinants of foreign direct investment in Africa: A Survey of the evidence, in Ajayi, S.I. (ed.) Foreign direct investment in sub-saharan Africa: Origins,

targets, impact and potential, African Economic Research Consortium: Nairobi.

Aliber, (1970). A theory of direct foreign investment. In c.p Kindleberger (Ed), The International Corporation, As symposium Combrite MA. MIT Press In Renani .H.S. and Mirfatah .M.The Impact of Exchange Rate Volatility on Foreign Direct Investment in Iran. International Conference On Applied Economics (ICOAE), Procedia Economics and Finance (1), pp365 – 373

Anyanwu, J. C and Erhijakpor, A. E. O. (2004). Trends and determinants of foreign direct investment in Africa, West African Journal of Monetary and Economic Integration, Second Half, 21-44.

Asiedu .E. (2002). On the determinants of foreign direct investment to developing countries. Is Africa different? World Development, 30(1|), 107-11

Asiedu, .E. (2013). Foreign direct investment, natural resources and institutions. Working paper, Department of Economics, University of Kansas, International Growth Centre (IGC).pp1-38

Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2005). Financial and legal constraints to firm growth: Does size matter? Journal of Finance, 60, 137–177.

Bolling, C., Shane, M. and Roe, T. (2007). Exchange Rates and U.S. Foreign Direct Investment in the Global Processed Food Industry, Agricultural and Resource Economics Review, 36 (2), 230–238.

Botric V., and Škuflic L. (2006). Main determinants of foreign direct investment in the southeast European countries, Transition Studies Review, 13(2), 359–37

Brahmasrene T., and Jiranyakul K. (2001). Foreign direct investment in Thailand: What factors matter? Proceedings of the academy for international business, 1(2), 13.

Chowdhury, A.and Mavrotas, G. (2006). FDI and growth: What causes what? World Economy, 29 (1), 9-19

Chukwudi, .O.S. and Madueme, .S.I. (2010). The impact of dollar exchange rate volatility on foreign direct investment in Nigeria. International Journal of Research in Arts and Social Science, 2, 419-437.

Crowley .P. and Lee .J. (2003) Exchange rate volatility and foreign investment: International Evidence. The International Trade Journal, Vol. XVII(3), 227-252.

Cushman, D.O. (1985). Real exchange rate risk, expectations and the level of direct investment. Review of Economics and Statistics, 67(2), 297-308.

Demirguç-Kunt A., and Detragiache, E. (1998). Financial liberalization and financial fragility. IMF Working Paper WP/98/83, Washington: International Monetary Fund.

Dewenter K. L. (1995). Do exchange rate changes drive foreign direct investment? The Journal of Business, 68(3), 405-433

Dixit, A. and Pindyck, R. (1994). Investment under uncertainty. Princeton University Press: In Osinubi, T. S. and Lloyd A. Amaghionyeodiwe (2009).Foreign direct Investment and exchange rate volatility in Nigeria. International Journal of Applied Econometrics and Quantitative Studies, 6(2),1-13.

Dunning, J. H. (1980). Toward an eclectic theory of international production: Some empirical tests, Journal of International Business Studies, 11(1), 9-31

Dunning, J.H. (1993). Multinational Enterprises and the Global Economy. Addison-Wesley

Dupasquier C. and Osakwe P. N. (2006). Foreign direct investment in Africa: Performance, challenges, and responsibilities, Journal of Asian Economics, 17, 241–260

Ebiringa, .O.T. and Emeh, Y.C (2013). Determinants of foreign direct investment inflow: A focus on Nigeria. European Journal Business and Management. 5(24), 41-52

Elahi, N. (2011). Exchange rate volatility and foreign direct investment (FDI) behavior in Pakistan: A time series analysis with autoregressive distributed lag (ARDL) application. African journal of business management, 5(29), 11656-11661

Elbadawi, I. and Mwega, F.M. (1997). Regional integration and FDI in Sub-Saharan Africa". AERC Working Paper. African Economic Research Consortium, Nairobi.

Engle .R.F. and B.S. Yoo, (1987). Forecasting and testing in co-integrated systems. Journal of Econometrics 35:143-159.

Ezeoha. A.E. and Cattaneo .N. (2011).FDI flow to Sub-Saharan Africa: The impact of finance,

institutions and natural resources endowment: A paper submitted for CSAE conference 2011, Ecocnomic Development in Africa: Department of Economics and Economic history, Rhodes University, Grahamstown, South Africa.

Fowowe, B. (2011). Financial sector reforms and private investment in sub-Saharan African countries, Journal of Economic Development, 36(3), 79

Galindo, A., F. Schiantarelli and A. Weiss (2002). Does Financial Liberalization Improve the Allocation of Investment? Micro Evidence from Developing Countries. Inter-American Development Bank Working Paper 467.

Galindo, A., Schiantarelli, F. and Weiss, A. (2007). Does financial liberalization improve the allocation of investment? Micro evidence from developing countries, Journal of Development Economics, 83, 562–587.

Gelb, A.H., (1989). Financial policies, growth and efficiency, PRE Working Paper 202, World Bank, Washington, DC.

Gorg, H. and Wakelin K. (2001).The impact of exchange rate volatility on US direct investment. GEP conference on FDI and economic integration, University of Nottingham, June 29-30th, 2001.

Hussain, N.H, Mohammed, N., and Kamier, E.M. (2002). Resource mobilization, financial liberalisation and investment: The case of some African countries. Retrieved from http://tailieu.vn/doc/resource-mobilization-financial-liberalization-and-investment-the-case-of-some-african-countries-103262.html

Iyoha .M .A and Itsede .C.O (2003), Nigerian economy: Structure, growth and development. Mindex Publishing, Benin City.

Jeon, B. N. and Rhee S. S. (2008). The determinants of Korea‟s foreign direct investment from the United States, 1980-2001: An empirical investigation of firm level data, Contemporary Economic Policy, 26(1), 118-131.

Kaminsky, G.,and Schmukler, S.L. (2002). Short-term pain, long-run gain: The effects of financial liberalization. World Bank Working Paper 2912.The World Bank.Washington D.C.

Kersan-Skabic I. and Orlic E. (2007). Determinants of FDI in CEE, Western Balkan Countries (Is Accession to the EU Important for Attracting FDI?), Economic and Business Review, 9(4), 333-350.

King, R.G. and Levine, R. (1993). Finance, entrepreneurship, and growth: Theory and evidence, Journal Monetary Economics, 32(3), 513-42.

Kinoshita, Y. and Campos, Y. (2008). FDI and financial reforms: evidence from Eastern Europe and Latin America. *IMF Working Paper WP/08/26*. Washington, DC: International Monetary Fund.

Kosteletou .N. and P. Liargovas (2000). Foreign direct investment and real exchange inter linkages. Open Economies Review, 11, 135-148

Kyereboah-Coleman, A. and Agyire-Tettey K. F. (2008). Effect of exchange-rate volatility on foreign direct investment in Sub-Saharan Africa: the case of Ghana (Case study)" Journal of Risk Finance, 9(1), 52–70

Kurronen, S. (2012). Financial sector in resource-dependent economies, BOFIT Discussion Papers 6.2012.

Laumas, P. S. (1990). Monetization, financial liberalization, and economic development, Economic Development and Cultural Change, 38(2), 377-390.

Leite, C. and Weidmann, J. (2002). Does mother nature corrupt? Natural resources corruption and economic growth. In: Abed, G., Gupta, S. (Eds.), Governance, Corruption, and Economic Performance. IMF, Washington, DC

Marco .H. (2011). The Path of exchange rate and FDI inflows for EAC Countries, Is it a great worry for investors?. http://ssrn.com/abstract=1990265

Mckinnon, R.I. (1973). Money and capital in economic development. The Brookings Institution, Washington, DC.

Mohamed, S. E. and Sidiropoulos, M. G. (2010). Another look at the determinants of foreign direct investment in MENA countries: An empirical investigation, Journal of Economic Development, June, 35(2), 75-96.

Mullineux, A. W. and Murinde, V. (2014). Financial sector for enterprise development in Africa, Review of Development Finance, 4(2), 66-72.

Musila J. W. and Sigue S. P. (2006). Accelerating foreign direct investment flow to Africa: From policy statements to successful strategies", Managerial Finance, 32(7), 577-593.

Nasser, O. M. A. and Gomez, X. G. (2009). Do well-functioning financial systems affect the fdi

flows to Latin America? International Research Journal of Finance and Economics, 29, 60-75.

Nnadozie E. and Osili U. O. (2004). U.S. Foreign direct investment in Africa and its determinants. UNECA Workshop of Financial Systems and Mobilization in Africa, Nov 2nd 2004

North, D. (1990). Institutions, institutional change and economic performance. New York: Cambridge University Press.

OECD (2014). All on board: Making inclusive growth happen. The OECD multidimensional initiative on inclusive growth Project with Ford Foundation, OECD Publishing, Paris.

Osinubi, T. S. and Lloyd A. Amaghionyeodiwe (2009). Foreign direct Investment and exchange rate volatility in Nigeria. International Journal of Applied Econometrics and Quantitative Studies, 6(2), 1-13.

Pesaran, M. H. and Shin, .Y, (1999). An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis: In Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium (Vol. 11). Cambridge: Cambridge University Press.

Pesaran, M. H., Shin, .Y, and Smith, .R. J, (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326.

Rajan, R.G., and Zingales, L. (2003). The great reversals: The politics of financial development in the twentieth century, Journal of Financial Economics, 69, 5–50.

Rajan, R.G., and Zingales, L. (1998). Financial dependence and growth. American Economic Review, 88(3), 559-586.

Ramiraz M. D. (2006). Economic and institutional determinants of foreign direct investment in Chile: a time series analysis, 1960-2001, Contemporary Economic Policy, 24(3), 459-471.

Seck, D. and El Nil, Y.H. (1993). Financial liberalization in Africa, World Development, 21(11), 1867-1881.

Sghaier, I. M. and Abida, Z. (2013). Foreign direct investment, financial development and economic growth: Empirical evidence from North African Countries, Journal of International and Global Economic Studies, 6(1), 1-13.

Shaw, E.S. (1973). Financial deepening in economic development. New York: Oxford University Press.

Udoh, .E. and Egwaikhide .F.O. (2008). Exchange rate volatility, inflation uncertainty and foreign direct investment in Nigeria. Botswana Journal of Economics, 5(7), 14-31.

Ullah .S, Haider .S.Z. and Azim .P. (2012). The impact of exchange rate volatility on foreign direct investment: A case study of Pakistan. Pakistan economic and social review, 50(2) 121-138

Wafure .O.G. and Nurudeen .A. (2010). Determinant of foreign direct investment in Nigeria: An empirical analysis. Global journal of human social science, 10(1), 26-34.

Walsh, J. P. and Yu, J. (2010). Determinants of foreign direct investment: A sectoral and institutional approach, IMF Working Paper, WP/10/187, Washington D.C: IMF.