The Impact Of Dollar Exchange Rate Volatility On Foreign Direct Investment In Nigeria

Okenyis S. Chukwudi
&
Stella Ifeoma Madueme,

Abstract

In the light of the importance of foreign direct investment (FDI) for the promotion of economic development, this study examines the impact of Dollar/Naira exchange rate volatility on FDI in Nigeria. Time series data was compiled from Central Bank of Nigeria Statistical Bulletin for a period of 39 years. The study built an ARCH based measure of nominal exchange rate volatility and found that exchange rate volatility as a result of depreciation of the currency of the host country, Nigeria, attracts FDI, while volatility as a result of appreciation of the host country's currency discourages FDI. Results obtained suggest the need to avoid over-valuation of the exchange rate and to maintain stable and flexible exchange rate in order to attract FDI inflow to Nigeria.

KEYWORDS: Exchange rate, volatility, foreign direct investment

Introduction

Exchange rate volatility has acquired a special interest in the research works on international trade and investment. Given the central role of exchange rate in an economy generally, and its importance to international trade and investment in particular, the national government has increasingly felt the impact of this volatility on their own policies towards the achievement of macroeconomic objectives.

Exchange rate volatility refers to the erratic fluctuation in exchange rate, which could occur during periods of domestic currency appreciation or depreciation. Exchange rate changes may lead to a major decline in future output if they are unpredictable and erratic. The exchange rate is therefore an important relative price as it has influence on the external competitiveness of the domestic economy.

Volatility of Dollar exchange rate may also affect developing countries through its effect on foreign direct investment inflows. It has been identifies that greater exchange rate volatility of the Dollar currency against Naira increases uncertainty over the return of a given investment in Nigeria. Potential investors will invest in a foreign location only as long as the expected returns are high enough to cover for the currency risk.

There are several channels through which volatility of Dollar may affect developing countries. Some of the variables often mentioned as being influenced by this volatility are; trade flows, foreign direct investment, currency crises, debt servicing cost, portfolio

composition and commodity prices. This study will concentrate on the impact of the Dollar-Naira exchange rate fluctuation on foreign direct investment in Nigeria.

THEORETICAL ISSUES

There is a widespread presumption that volatility on the exchange rate of developing countries is one of the main sources of economic instability around the world: for example, Volker and Soros cited in Allaire (1999) noted that the impact of the global economy on emerging countries is driven significantly by swings among the currency of the economic power. Darby et al (1999) explains two important but opposing positions in their work. First, the authors established a number of sufficient conditions under the orthodox view, which increasing exchange rate uncertainty could cause investment to decrease, hold more importantly, the study also shows that the converse could hold, given the second set of conditions, increasing uncertainty could actually lead to increase in investment. Evidence from economic theories show, that uncertainty could affect foreign direct investment (Lucas, 1967, Nickel 1974; 1978). This orthodox view on the relationship between exchange rate volatility and foreign direct investment maintains that exchange rate instability has a negative impact on foreign direct investment. That is if potential foreign investors are risk averse, (or even risk neutral), larger exchange rate volatility may reduce overall foreign direct investment inflow.

A number of empirical research works confirm the strong impacts of exchange rate on FDI. Froot and Stein (1991) investigated the impact of real exchange rates on FDI from industrialized countries to the United States by using annual data covering 1974-87 periods. Breaking total FDI inflows to thirteen separate industries, they found that all of the thirteen coefficients on the exchange rate present negative signs, five of which were statistically significant. Froot and Stein (1991). They also performed country regressions for the inflows of the United States, the United Kingdom, West Germany, Canada and Japan. The estimated coefficient of exchange rate presents negative and statistically significant signs in the United States and West Germany.

The similar relationship was confirmed by Klein and Rosengren (1994). Bayomi and Lipworth (1998), Goldberg and Klein (1998), Ito (2000), Sazanami and Wong (1997) and Sazanami, Yoshimura and Kiyota (2001). Klein and Rosengren (1994) analyzed FDI from Canada, Japan, and several European countries to the United State for the 1979-91 periods, while Bayoumi and Lipworth (1998), Goldberg and Klein (1998), Ito (2000), Sazanami and Ching (1997) and Sazanami, Yoshimura and Kiyota (2001) examined the impacts of exchange rate on Japanese FDI for different periods. These empirical studies revealed that the appreciation of the home currency vis-avis the host currency encouraged FDI from the home country to the host country.

Most of these studies examined the relationship between exchange rates and overall FDI with the exceptions of Froot and Stein (1991) and Sazanami, Yoshmuva and Kiyota (2001). Froot and Stein (1991) focused on FDI to the United States between 1974 and 1987 and investigated the impacts of real exchange rate by disaggregating national-level FDI into industry-level flows. They found the strongest exchange rate impact in manufacturing industries. Especially in chemical, though some industries presented expected but insignificant signs. Sazanami, Yahimora and Kiyota (2001) examined Japan's FDI at industrial level from 1978 to 1999. Focusing on four machinery industries, their study

revealed that the real exchange rates had stronger impacts on FDI in electronics and general machinery industries than in precision or transportation industries. In sum, these two studies found that the depreciation of the host currencies against home currencies promoted FDI from home to host Countries but the degree of the effects were different across industries.

Cushman (1985, 1988) and Goldberg and Kolstad (1995) noted the positive impacts of exchange rate volatility on FDI in their works. Cushman (1985) investigated FDI from the United States to Canada, France, Germany, Japan and the United Kingdom between 1963 and 1978 while Cushman (1988) analyzed FDI from Canada, France, Germany, Japan and the United Kingdom to the United States for the period, 1963 to 1986. The various measures of the volatility were used in his analyses and all estimated coefficients of the exchange rate volatility were positive. Goldberg and Kolstad (1995) examined the impact of exchange rate volatility on bilateral FDI from Canada, Japan, and the United Kingdom to the United States for the 1978 – 99 periods using quarterly data. The exchange rate volatility is measured by standard deviation of the real exchange rate over the 12 quarters, prior to and inclusive of each period.

Unlike the studies reviewed above, the negative impact of exchange rate volatility on FDI was discovered by Benassy, Fontagne and Lahreche (2001) and Urata and Kawai (2000). Benassy, Fontagne and Lahreche (2001) investigated the impacts of exchange rate volatility, which was measured by coefficient of variation of exchange rate over five years period, in their study of Japanese firms decision on the location choice. By analyzing a firm-level panel data covering 1980-94 for 117 countries from four manufacturing industries in Japan, they also found that high exchange rate volatility discouraged FDI while the depreciation of host country's currency increased Japanese FDI to those countries.

(2008), in his paper offers evidence that real exchange rate volatility can have a significant impact on the long-term rate of productivity growth, but the effect depends critically on a country's level of financial development. For countries with relatively low levels Aghion of financial development, exchange rate volatility generally reduces growth, whereas for financially advanced countries, there is no significant effect. He also offers a simple monetary growth model in which real exchange rate uncertainty exacerbates the negative investment effects of domestic credit market constraints. His approach delivers results that are in striking contrast to the vast existing exchange rate literature, which largely finds the effects of exchange rate volatility on real activity to be relatively small and insignificant.

Ogunleye (2008) did an extensive work aimed at providing a comprehensive analysis of the exchange rate volatility-FDI nexus in SSA by examining nine countries in the region, with the countries cutting across different exchange rate and FDI policies and arrangements. Both country specific time-series and panel model estimation techniques were employed. The study found that exchange rate volatility generally constrains FDI inflow to SSA.

Osunubi et al (2009) investigated the effect of exchange rate volatility on foreign direct investment (FDI) in Nigeria, using secondary time-series data from 1970 to 2004. the results suggest among others, that exchange rate volatility need not be a source of worry by foreign investors. Also the study further reveals a positive relationship between real inward FDI and exchange rate.

Busse, Hafeker and Nelgen (2010) used a comprehensive data set with bilateral direct investment flows and establish the influence of the de-facto exchange rate regime for

FDI flows. They found a strong and significant effect from fixed rates on bilateral FDI flows in developed economies, but no significant effect for developing countries. There is thus no general and uniform impact of stable exchange rates on FDI. We provide several possible explanations for this difference.

Interestingly, Pain (2003) reports a change in the effects of exchange rate volatility on FDI over the period from 1981. While high real exchange rate volatility has a significant positive influence on inward investment from Germany into other European countries during the early and late 1990s, greater exchange rate volatility discouraged FDI over the remaining periods. This could be a possible reason for the divergent results reported in various studies concerning the effect of ex change rate volatility on FDI.

Barrel et al (2003) also provided a finer grained picture by reporting that an increase in the volatility of the sterling – Dollar real exchange rates lowers FDI from the US to UK relative to euro areas, whereas greater volatility of Euro-Dollar exchange rate increases the UK share. Furthermore, the authors find that greater sterling-Dollar volatility has a significant positive impact on absolute amounts of FDI in the United Kingdom, while greater Euro-Dollar volatility has a significant negative impact on the absolute levels of US FDI in both the United Kingdom and the Euro area.

An Overview of FDI Inflow to Nigeria reveals that Nigeria is one of the Sub-Saharan African (SSA) countries that has attracted most foreign direct investment flowing into the region. Consistently, FDI inflows to the country have been very high compared to most other countries (UNCTAD, 2007). In 1970, the country attracted a total FDI inflow amounting to $205 million, second only to South Africa. FDI inflow has been relatively stable and has grown steadily over the years (Ogunleye, 2008). This is evidenced from the fact that, while the country recorded a mean annual FDI inflow of $319 million in the 1970s, the figure increased to $434 in the 1980s, with a further rise to $1.5 billion in the 1990s. The annual FDI inflow that was only $205 million in 1970 increased to $3.4 and $6.28 billion in 2005 and 2007 respectively, with mean annual inflows of about $1.2 billion between 1970 and 2007 (UNCTAD, 2007). See Table 1 below.

Table 2: FDI profile in Nigeria 1970-2005

Year	FDI Inflows (Million $)	FDI Outflows (Million $)	FDI Stock (Million $)	FDI Inflow Per Capita ($)	FDI Stock Per Capita ($)	FDI Inflow as % of GDP	FDI Stock as % of GDP	FDI Stock as % of GFKF
70-79	319.62	N/A	N/A	5.27	N/A	0.63	N/A	N/A
1980-89	434.00	88.04	4 426	5.00	53.75	0.63	5.19	54.44
1990-99	1 494.06	317.06	15 527	13.89	141.55	3.05	31.46	40.744
2000-05	2 054.85	177.19	28 573	15.27	213.99	2.54	36.58	60.049

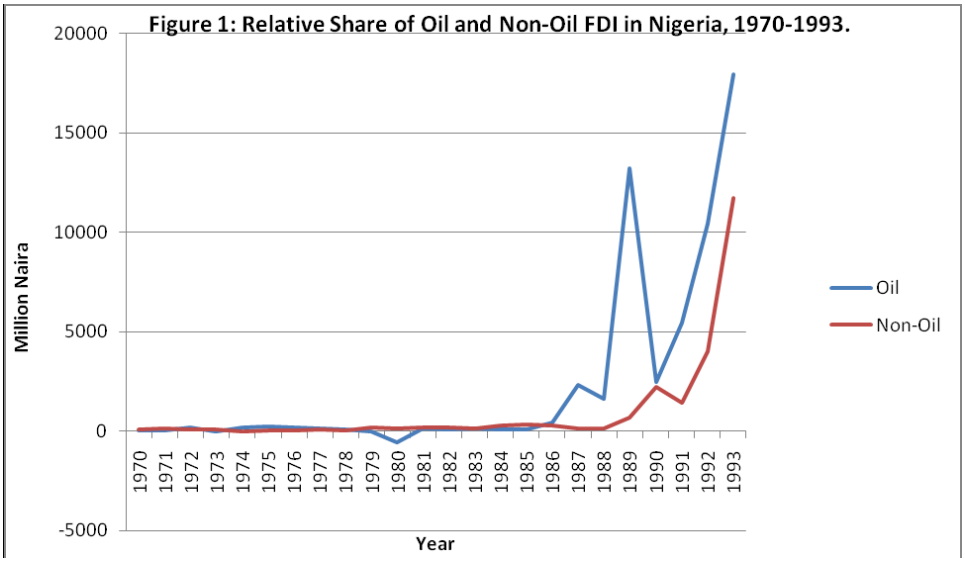
2000	1 309.67	168.94	23 786	10.50	190.64	1.94	35.31	65.413
2001	1 277.42	93.88	25 064	9.98	195.75	2.01	39.51	56.815
2002	2 040.18	172.16	27 104	15.53	206.37	3.08	40.93	69.588
2003	2 171.39	167.32	29 275	16.13	217.40	2.77	37.32	61.399
2004	2 127.09	260.76	31 402	15.41	227.55	2.42	35.75	56.696
2005	4978	200	34 806	35.21	257.36	4.38	30.68	36.7
2006	13956	228	50337	96.43	347.82	10.51	37.9	88.5
2007	12454	261	62791	84.09	423.99	8.230	37.6	69.6

Source: UNCTAD Foreign Direct Investment Database, 2008

Although both the flow and stock of FDI in Nigeria can be viewed as high and rising from the table 1 above (from 88 and 434 million$ in the 1980s to 261 and 12454 million$ in 2007 respectively) and figure 2 below, Oduh (2008) and column 5 and 7 of the above table show that the share of FDI inflows in GDP and inflows per capita are very low. Throughout 1970s and 1980s, mean annual FDI ratio to GDP was less than 1%. A slight improvement was experienced, however, with the share increasing beyond less than a single digit in recent times to reach 3% in 2005, 10.51% and 8.23% in 2006 and 2007 respectively. With a mean annual value of a single digit during the 1970s and 1980s, FDI inflows per head increased to $24 in 2005 (From table 1 and Ogunleye, (2008)).

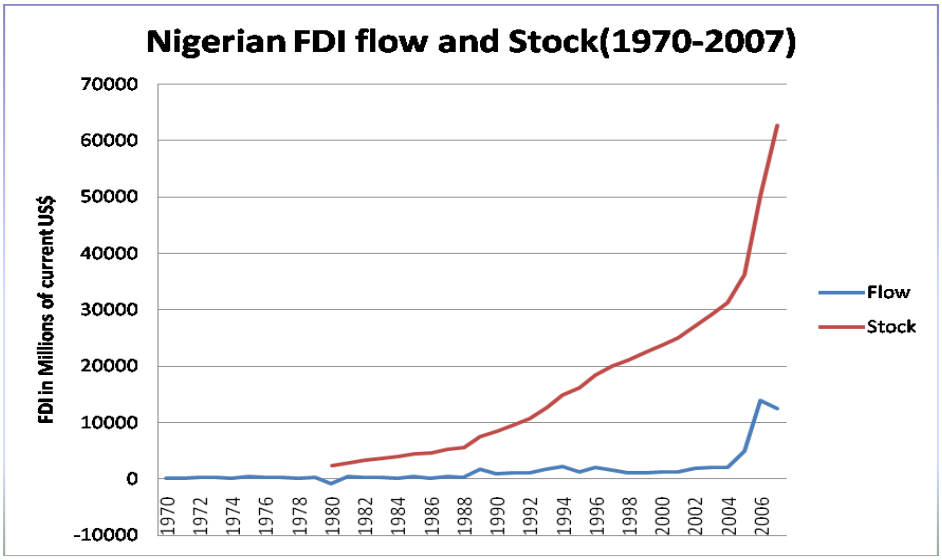
The first possible explanation for these phenomena is the fact that FDI inflows have been concentrated on the oil sector. This will be X-rayed in figure 1 which is a graphical view of the relative shares of oil and non-oil FDI in total FDI inflows in Nigeria. Initially, FDI was concentrated in the non-oil sector even long after the discovery of oil in commercial quantity. In 1970, for instance, non-oil FDI was N93.6 million, representing about 73% of total FDI inflows. This trend was generally maintained until about 1985 except for some few years. However, from 1986, onwards, this trend was completely reversed. By 1987, the total FDI inflow to the oil sector was $2.3 billion, representing 94% of total FDI inflows for the year. Henceforth, the gap between oil and non-oil FDI has widened considerably. This is shown in figure 1 as contained in Ogunleye, (2008).

Ogunleye (2008) further said that another important fact about FDI in Nigeria is the nature of the oil sector. He said that the oil sector is an enclave without sufficient forward and backward linkages with other sectors of the economy. Despite this fact, FDI consistently represented a great percentage of total GDP. With a modest mean annual average of 5.2% in the 1980s, the total share of FDI stock in GDP rose to about 41% in 2002, with a mean annual average of 34.5% throughout the entire period of 2000 to 2007.



Source: Based on data obtained from the Central Bank of Nigeria's *Statistical Bulletin*, Vol 17, 2006 as contained in Ogunleye, (2008).

Figure 2



Source: Author's conceptualised relationship from UNCTAD Foreign Direct Investment Database, 2008

The percentage share of FDI stock in domestic capital formation in Nigeria was overwhelming and represented one of the highest in Sub-Saharan Africa (SSA) (See figure 2). From a very low average annual level of 54.4% in the 1980s, beginning from the 1990s, the share of FDI stock in domestic capital formation became very monumental, rising to 407% during this decade, with a further rise to a peak level of about 700% in 2002. This demonstrates the indispensable role of FDI in augmenting low domestic savings in SSA countries. FDI stock per head was also expectedly high in Nigeria. With a per capita FDI stock of $424 in 2007, the country had one of the highest FDI stock per capita in SSA, second only to South Africa (Ogunleye, 2008).

Limitation and Motivation for further study

The divergent opinion in the literatures reviewed seems to suggest that the study has become an important empirical debate among researchers and policy maker. It was experienced from the literature reviewed that the relationship between exchange rate volatility and foreign direct investment in developing economies has been a protracted dilemma. Some researcher believes that fluctuation on FDI is caused by exchange rate volatility while others see it the other way round.

Difference case studies and different methodologies tend to produce different results. Also, most studies on the impact of exchange rate volatility on FDI are cross-country evidence while the role of exchange rate volatility on FDI may be country specific. This laxity to note the divers case of countries may arose the possibility that the empirical findings could be distorted by heterogeneity biases affecting both exchange rate and FDI. The problem with the previous studies is that, there is no conclusion on how exchange rate volatility affects FDI inflows. In some studies exchange rate volatility affects FDI inflow positively. Other studies proved otherwise thus suggesting ambiguity on FDI inflows. According to Alaba (2003), in Nigeria, no study known to us has gone further to analyze the impact of Dollar/Naira exchange rate volatility on FDI in Nigeria, specifically for the period under review and with the application of EGARCH model Approach. This research was therefore structured to fill the gap that has been overlooked by literature on country-specific basis. In view of the above discussion, this paper sought to address the question which states, what is the impact of Naira/Dollar exchange rate volatility on foreign direct investment in Nigeria?

RESEARCH OBJECTIVE

The broad objective of this study is to determine the relationship between Dollar/Naira exchange rate volatility and foreign direct investment in Nigeria. Hence the specific objective is to capture the impact of Dollar/Naira exchange rate volatility on foreign direct investment in Nigeria.

RESEARCH HYPOTHESIS

The research hypotheses of this study is;

- Dollar/Naira exchange rate volatility has no impact on foreign direct investment in Nigeria.

SCOPE OF THE STUDY

This study covered the period 1970 – 2008, a sample size of 39. This is necessary to have enough observation for computation of EGARCH estimation and for the fact that most of the distortion in the variables of interest occurred within this period.

Theoretical Framework

Several measures of volatility have been employed in the literature. These can be broadly divided into (1) those that use various modifications of standard deviation and (2) the ones that use different versions of the ARCH and GARCH techniques. One of the major criticisms of the different variant of standard deviation as a measure of exchange rate volatility is that they ignore the stochastic process generating the exchange rates. they are conditional measures of volatility that ignore relevant information on the random process generating the exchange rate (Engle, 1982). This method is also arbitrary in choosing the order of the moving average and noted for underestimating the effects of volatility on decisions (Pagan and Ulloh, 1988).

Furthermore, standard deviation measure of volatility is characterized by skewed distribution. Exchange rates are typified by volatility clustering implying that future exchange rate changes are not independent of the past and current changes. To correct for these apparent deficiencies, the ARCH was introduced by Engle (1982) and later modified by Bollersleu (1986) as the generalized Autoregressive conditional Heteroscedasticity (GARCH). Euer since, different variants of the ARCH and GARCH models have emerged. One of the asserted superiority of the ARCH and its variants over the standard deviation measures is their ability to distinguish between predictable and unpredictable elements in the nominal exchange rate formation process, and are therefore, not prone to overstating volatility (Arize, et al, 2000); and Darrat and Hakim 2000). In line with the above findings, we choose to experiment with ARCH based measure of volatility

In practice the GARCH generalization is particularly useful as only fairly small values of the parameters as usually required but GARCH model according to Nelson (1991) has the following shortcomings. First the lack of asymmetric in the response of shocks, Secondly GARCH models imposes parameter restrictions to ensure positivity of the conditional variance. Finally, measuring the persistence is difficult. To overcome the above shortcomings of GARCH model in measuring volatility we applied exponential GARCH or EGARCH model developed by Nelson (19991).

METHODOLOGICAL FRAMEWORK.

Exchange Rate Volatility Measure.

Various researches have employed a number of different exchange rate volatility measures, although there is still no consensus on which one is the most appropriate (Clark et al 2004). The choice is driven by a number of factors including among others, the time horizon considered with respect to whether the study is for the short-run or long run. Hence as a test of robustness. The model that guided the study was the ARCH based measures of volatility based on nominal exchange rate. ARCH model was introduced to capture the volatility clustering of financial time series. The conditional mean of the shocks e_t in a basic ARCH model is a linear function of the squares of the previous shocks, e^2_{t-1} i.e

$e_t = \theta + \phi_i e^2_{t-1} + \text{----------} + \phi_p e^2_{t-p} + u_t$ ----------(1)

Where $e_t \geq 0$, $\theta > 0$, $\phi \geq 0$ and

e_t = conditional mean of the shocks

If $\phi_i = 0$, then e_t is a constant and the series e_t is now conditionally homoscdastic.

Considering ARCH (1.1) process.

$e_t = \theta + \phi_1 e^2_{t-1} + U_t$ ----------(2)

Equation (2) implies that a large shock in period (t-1) leads to a large (conditional) mean in period t. The subsequent impact of this large conditional expectation, ie

$E(e_t / e_{t-1}) = \phi e^2_{t-1} + u_t$ ----------(3)

For example, if $e_t = \theta_0 + \phi_1 e^2_{t-1} + U_t$----------(4)

Then a large shock in (t-1) leads to a large conditional mean in t. Its impact depending upon the magnitude of ϕ.

Equation (2) can not capture the required features of the empirical autocorrelation of the returned series at the same time. Thus to capture this one has to include additional lagged square shocks in the conditional mean function (Bollersev 1986, Frances and Dijk, 2006).

$e_t = \theta + \phi_1 e^2_{t-1} + \phi_2 e^2_{t-2} + \text{----------} + \phi_p e^2_{t-p} + u_t$----------(5)

Where $\theta > 0$ and $\phi \geq 0$ for all t=1, 2----------p

Equation (5) is an ARCH (p) process which can be transformed to ARCH (q) model for h^2_t.

$h_t = \theta + \beta_1 h^2_{t-1} + \beta_2$ and +--------+$\beta_q h^2_{t-q} + U_t$----------(6)

Where $\theta > 0$ and $\beta \geq 0$ for all t = 1,2……q, h_t = conditional variance of the shocks and h^2_{t-1} = square of the previous shocks.

To avoid long lag lengths in equation (6), we include the lag of the conditional variance, h_{t-I} to the ARCH model which gives Generalized ARCH (GARCH) model of order (1,1). Bollarsleu (1986).

$h_t = \theta + \phi_j e^2_{t-j} + \beta_i h^2_{t-i} + u_t$----------(7)

Where

$\theta > 0$, $\beta_i \geq 0$ and $\phi_1 > 0$, for h_i to be identified.

From above equations GARCH (P,q) model implies

$e_t = \theta + \phi_1 e^2_{t-1} + U_t$.....(8)

$u_t \sim$ iid N(0, h_t)

$$h_t = \theta_0 + \sum_{i=1}^{p} \beta_i h^2_{t-i} + \sum_{j-1}^{q} \phi_j e_{t-j} + \sum_{K-1}^{R} \alpha_k u_{t-k} \quad \text{----------(10)}$$

In practice the GARCH generalization is particularly useful as only fairly small values of P and q are usually required, but GARCH model according to Nelson (1991) has the following short comings. First the lack of asymmetric in the response of shocks. Secondly, GARCH mode imposes parameter restrictions to ensure positivity of the conditional variance. Finally, measuring the persistence is difficult.

In view of the above short comings, and in order to ensure that the conditional variance are positive. We then modify the variance equation employing the exponential GARCH or EGARCH model developed by Nelson(1991) which has the following variance equation.

$$\log(h_t) = \theta_o + \sum_{j-1}^{q} \alpha_j \left| \frac{u_{t-1}}{\sqrt{h_{t-j}}} \right| + \sum_{j-1}^{q} \eta_j \frac{u_{t-1}}{\sqrt{h_{t-j}}} + \sum \beta_i \log(h_{t-1}) + \sum_{k-1}^{k} \mu_k e_k \text{.....(11)}$$

Where θ, α, η, β and μ are parameters to be estimated. Since the left hand side is the logarithm of the variance series, the leverage effect is now exponential instead of quadratic. As a result the estimates of the conditional variance are guaranteed to be nonnegative.

The Objective Model

The main objective of this study is to determine the relationship between Dollar/Naira exchange rate volatility and foreign direct investment (FDI) in Nigeria controlling for other conventional FDI determinants (such as interest rate, Inflation rate, and Trade openness). Based on economic theories and the literature review, the model for our FDI can be specified as

FDI = F ($v^{₦/\$}$, IR, INF, OPN)

Where

FDI = Foreign direct investment

$v^{₦/\$}$ = Exchange rate Volatility of Naira against Dollar.

IR = Interest rate

INF = Inflation rate

OPN = Trade openness.

Model (1)

FDI models becomes

$$FDI = \lambda_0 + \lambda_1 v^{N/\$} + \lambda_2 IR + \lambda_3 INF + \lambda_4 OPN + U_t \ldots\ldots\ldots(12)$$

Where λ is the coefficients of the variables and U is the error term

Model (1) above will be estimated using OLS, to determine the relationship between Exchange rate volatility and foreign direct investment.

ANALYSIS OF THE RESULTS

Unit Root Tests

Unit root test on the variables of interest dollar exchange rate (DEXR), foreign direct investment (FDI), inflation rate (INF), interest rate (IR) and trade openness (OPN). is necessary before regression takes places in every economic analysis. This is so because ordinary OLS regression estimates with non-stationary time series data are usually unacceptable, the reason being that time series data are basically for forecasting and in an event of non-stationary such data will produce biased result. This section tests for the unit root (stationary) of the data with the aid of augmented Dickey-Fuller (ADF).

This test for stationarity compare the ADF statistics value (t-value) with the critical value. In absolute term if the ADF statistic is less than the critical value, this implies nonstationary (accept the null hypothesis). If the ADF statistic is greater than the critical value in a absolute term, this implies stationary (reject the null hypothesis) Gujarati, (2006).

Table 2: Unit root test using ADF

SUMMARY OF THE VARIABLE STATIONARITY TEST						
		Critical value				
Variable	**Lag**	**1%**	**5%**	**ADF statistics**	**Order of integration**	**Conclusion**
DEXR	0	-3.615588	-2.941145	-0.117972	Level	Accept null hypothesis
	9	-3.689194	-2.971853	-4.354306	1st Difference	Reject null hypothesis
FID	0	-3.615588	-2.941145	-2.611860	Level	Accept null hypothesis
	1	-3.626784	2.945842	-4.084639	1st Difference	Reject null hypothesis

INF	4	-3.639407	-2.951125	-2.126494	Level	Accept null hypothesis
	1	-3.626784	-2.611531	-5.992066	1st Difference	Reject null hypothesis
IR	1	-3.621023	-2.943427	-1.058918	Level	Accept null hypothesis
	1	-3.626784	-2.945842	-3.793508	1st Difference	Reject null hypothesis
OPN	1	-3.621023	-2.943427	-1.758635	Level	Accept null hypothesis
	1	-3.626784	-2.945842	-5.367631	1st Difference	Reject null hypothesis

See appendix

The result of the unit root test as shown in table 2 above indicates that the variables to be used in our analysis were non stationary in the level form. The difference of the series were taken and tested for unit root. The result obtained show that at 1% and 5% level of significance, all the variables were stationary after being differenced. E-view 5.0 was used to run the unit root test and the results were confirmed by a session on: E-view 3.1. The null hypothesis for unit root for all the variables at level form was accepted while the null hypothesis of unit root after differencing was rejected. The implication of this is that all the variables are integrated of order one and thus, are likely co- integrated. Hence, despite being individually integrated, the series can be used for the model estimation without it being spurious.

Volatility Test

Having confirmed that the variables of interest are co-interacted, the next step in the model is the volatility test. The volatility test for the variables was carried out using autoregressive conditional Heteroscedasticity (ARCH) Generalized conditional Hateroseedasticity (GARCH) and Exponential GARCH (EGARCH) model as explained by Nelson (1991). The results are in table 3 below.

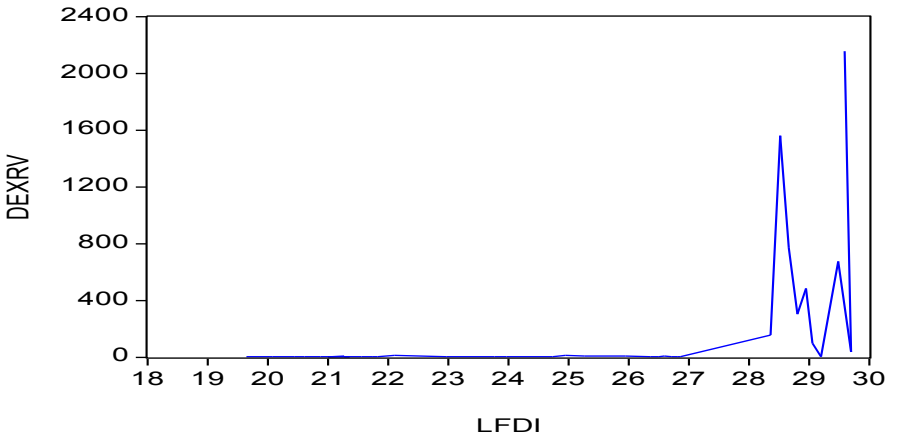
Table 3: Volatility results

Variable	ARCH coefficient	GARCH coefficient	EGARCH coefficient	ARCH z-statistics	ARCH probability
$(V^{N/\$})$	0.149178	-1.612744	0.349509	1.075507	0.2821
$(V^{N/E})$	0.252833	3.426816	0.615685	5.546634	0.0000
$(V^{N/Y})$	0.93006	-0.592515	0.860827	6.595423	0.0000

See appendix

The result of the volatility test in table 3 above shows that the variable dollar exchange rate volatility $(V^{N/\$})$ exhibit high degree of volatility clustering. The cause of the result obtained from our test was due to the fact that we have a low frequency data (annual data) figure below show the graphical illustration of the relationship between FDI and Dollar exchange rate volatility.

FIG 3 GRAPHICAL ILLUSTRATION OF L(FDI) AGAINST $V^{N/\$}$



The Results of the Objective Model

The objective model which shows the relationship between the independent variable, foreign direct investment (FDI) and the explanatory variables, Dollar Exchange rate volatility $(V^{N/\$})$.As earlier stated, this study examines the relationship between Dollar exchange rate volatility and foreign direct investment in Nigeria. The analysis was done using annual data and we estimated our objective models with OLS using Eview 5.0 software version.

Table 4: Relationship between Dollar exchange rate volatility and FDI in Nigeria. Dependant variable: Log (FDT)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	28.26657	1.361567	20.76032	0.0000
$(V^{N/\$})$	0.002516	0.000944	2.664758	0.00118
INF	-0.006554	0.027702	-0.236580	0.8144
LN (OPN)	6.351631	1.302225	4.877523	0.0000
IR	-0.096224	0.031364	-3.067981	0.0302

See appendix

Result in table 4 show that the coefficient of Dollar exchange rate volatility $(V^{N/\$})$ = 0.002516 and the t-statistic is 2.6647.8 which implies that the coefficient is statistically significant at 5 percent. This means that the Dollar exchange rate volatility affects FDI flow into Nigerian economy. The positive sign is in accordance with a priori expectation of the relationship between exchange rate volatility and FDI flow into any economy. Although the orthodox theory is of the view that exchange rate volatility has inverse relationship with FDI. Since exchange rate determines the naira worth of any foreign currency brought into the country for investment, it means that the high the relative change in

the volatility of exchange rate, the higher will be the relative change in the inflow of FDI, here a percent change in $(V^{N/\$})$ will lead to about 0.25 Percent change in FDI. It is also worthy to mention that the coefficient of inflation (INF) is discovered to take the value of -0.006554 which is not statistically significant meaning that inflation does not affect FDI inflow into Nigeria though this result is not in accordance with the a priori expectation; but the use of secondary data might introduce intrinsic errors to the analysis.

Hence in line with the findings, the coefficients of Dollar exchange rate volatility $(V^{N/\$})$, is statistically significant and with positive sign which implies that Dollar exchange rate volatility has a positive impact on FDI inflow to Nigerian. This implies the rejection of the null hypothesis (H0:) and acceptance of the alternative hypothesis (H1:). The stationarity test revealed that the entire variables used in the study are integrated of order one and are thus, an I (1) series. For a series to be an I [1] means that they have to be differenced once for them to be stationary. According to Gujarati (2006) a time series variable is said to be stationary when its mean and variance are constant and the value of the covariance between any two time periods depend on the lag between the two time periods and not on the actual time in which the covariance was computed: As explicitly stated in the objectives of the study, this finding is very important for researchers and other students who in one way or the other may be using any of the variables in his/her work.

The volatility test using EGARCH ascertained the degree of volatility clustering of the variable of interest. The result as shown in table 3 revealed that $(V^{N/\$})$, exhibit element of volatility clustering. Although value obtained was low, the positive sign of the ARCH coefficient proves it (Gujarati, 2006); which implies that the variable has volatility clustering. The regression result was focussed on the impact of Dollar exchange rate volatility on foreign direct investment in Nigeria. The result in table 4 show that $(V^{N/\$})$, impact positively on foreign direct investment (FDI) in Nigeria. This is indicated by the coefficients 0.002516 and the t-statistics 2.664758, respectively which implies that it is statistically significant.

Policy Implications And Recommendations

The study has examined the impact of Dollar exchange rate volatility on FDI in Nigeria. One clear conclusion that emerged from the above analysis is that Dollar exchange rate volatility has a positive impact on aggregate FDI inflow to Nigeria, though this impact is very minimal, this finding is in line with literature underscoring threshold effect.

This is attributed to high volatility clustering of the variable of interest as this is evidenced on the value of the coefficients which shows a small significant positive relationship with FDI. It is therefore recommended that policies that ensures stability in exchange rate be formulated and or maintained to attract the inflow of FDI to the economy. From the above findings, we suggest that such policies should involve both fiscal and monetary policies targeted towards stability in exchange rate, decrease in interest rate and reduction of inflation. In addition to these policies according to Abdulahi and Suard (2009) is that of financial liberalization. The policy makers of the economy should strengthen and intensify the level and degree of financial liberalization in the country to achieve a high level

of macroeconomic stability in the country. We also discovered that the financial system is crucial in the link between exchange rate volatility and foreign direct investment in Nigeria. This underscores the need to sustain and improve on the recent reforms in the Nigerian financial sector which started in 2005. Better developed financial system offering enhanced risk diversification opportunity should be able to reduce the adverse effect of sector-specific volatility such as that associated with exchange rate.

The inference that is derivable from this analysis is that dollar exchange rate volatility leads to volatility in FDI and other macroeconomic variables which in turn, causes volatility in exchange rate, forming a vicious cycle. This can be broken by finding an external means of smoothening out the volatility in exchange rate. Buthe and Milner (2008), maintain that developing countries can achieve this by joining Bilateral Investment Treaties (BITs), Preferential Trade Agreements (PTAs), and General Agreement on Trade and Tariff (GATT). They also suggested that having more democratic political institutions might help developing countries reduce the volatility of exchange rate which in turn reduces the volatility of FDI inflow to Nigeria. This last policy should be very important to Nigeria which is still an emerging democratic institution. We therefore, recommend that Nigeria government should try to practice real democratic political institution as it will go a long way in reducing the volatility of macroeconomic variables in the country. This is in line with the recommendation of Kazembe and Namizinga (2007) in Malawi, that government can play an important role in promoting investment in the country. In the long-run, government can increase the FDI inflows by streamlining the investment regulatory framework, implementing policies that promotes macroeconomic stability and improving infrastructural facilities.

REFERENCES

Abdulahi W. and M. Suadi (2009), "Financial Liberalization in SSA," Mimeo.

Accam B., (1997), "Survey of Measurement of Exchange Rate Instability", Mimeo.

Aghion P. Bacchetta P.and Ranciere R.(2008) "Exchange Rate Volatility and Productivity Growth",The Role of Financial Development.

Aizenman, J. (1992), "Exchange Rate Flexibility, and Domestic and Foreign Direct Investment". IMF Staff Papers 39 (4): 890 – 922.

Aizenman, J. (1994), "Monetary and Real Shocks, Productive Capacity and Exchange Rate Regimes", Economic 61 (244): 407 – 34.

Alaba, O.B, (2003) " Exchange Rate Uncertainty and Foreign Direct Investment in Nigeria', Trade Policy Research and Training Programmed (TPRTP). Ibadan, Nigeria.

Aliber, R.Z., (1970), " A Theory of Foreign District Investment", In the International Corporation: A Symposium, edited by C.P. Kindlebargar, 17 – 34. Cambridge: MIT Press.

Allaire et al (1999). "Dissenting views on Target zones for the G-3 currencies." Safeguarding prosperity in a Global Financial system: The future international financial Architecture. Report of an independent Task Force of the council on foreign Relations. New York.

Aremu, J.A. (2005) "Foreign Direct Investment and Performance". Paper delivered at a workshop on Foreign Investment Policy and Practice Organized by the Nigerian Institute of Advanced and Legal Studies. Lagos Nigeria.

Arize A, Osang T and Slottje D (2000), "exchange rate volatility and foreign trade: Evidence from Thirteen LDCS," Journal of Business and Economics statistics, 18 (1)

Bacchetta, P., and E.V. Wincoop, (1998), "Does Exchange rate Stability Increase trade and Capital Flows", NBER working Paper series, WP 6704.

Bayoumi, T., and G. Lipworth (1998), "Japanese Foreign Direct Investment and Regional Trade", Journal of Asian Economics. 9(4): 581 – 607.

Bennasy, Q.A., A.L. Fontagne and A. Lahreche – Revil (2001) "Exchange Rate Strategies in the Competition for Attracting Foreign Direct Investment", Journal of the Japanese and International Economics, 15 (2) 178 – 198.

Bollersleve, T. (1986): "Generalized Auto-Regressive Conditional Hetroscedasticity", Journal of Econometrics. 307 – 327.

Bredin, D., S. Fountas and E. Mrphy (2003): "An Empirical Analysis of Short-run and Long-run Irish Export Functions: Does Exchange Rate Volatility Matter?". International Review of Applied Economics 17, 193 – 208.

Buthe H.and Milner C. (2008), "The impact of exchange rate volatility on international Trade Flows." Journal of Economic surveys 13 (1): 71-106.

Caballero R. and Corbo v (1989). "The effect of real exchange rate uncertainly on exports," Empirical evidence. World Bank Economic Review # (2): 263-278. May.

Caporale, T. and K. Doroodian (1994), "Exchange rate Variability and the Flow of International Trade". Economics Letters 46, 49 – 54.

Choudhry, T. (2005): "Exchange Rate Volatility and The United States Exports: Evidence from Canada and Japan," Journal of the Japanese International Economics 19, 51 – 71.

Cushman, D.O., (1985), "Real Exchange Rate Risk, Expectations, and the Level of Direct Investment, "Review of Economics and Statistics. 67 (2): 297 – 308.

Cushman, D.O., (1998), "Exchange Rate Uncertainty and Foreign Direct Investment in the United State", Weltwirtscheafliches Archiv (Review of World Economy), 124 (2): 322 – 336.

Devita, G. and A. Abbott (2004): "The Impact of Exchange rate volatility on UK Exports to EU Countries", Scottish Journal of Political Economy 51, 62 – 81.

Dorby J., Hughes – Hallet, A., Ireland, J. and Piscitelli, L., (1999) "The Impact of Exchange Rate Uncertainty on the level of Investment", Economic Journal 109 (454). 55 – 67.

Dornbusch, R., (1973), "Devaluation, Money and Non-Traded Goods", the American Economic Review 63 (5): 871 – 80.

Dupont and juan R (1996), "Exchange Rates and foreign Direct investment A Note," Board of governors of the federal Reserve system international Finance Discussion paper No 44.

Engle; R.F., (1982) "Autoregressive Conditional Hetroscedasticity with estimates of the Variance of United Kingdom Inflation," Econometrica 50, 987 – 1007.

Fountas, S. and K. ARistotelous (1999): "Has the European Monetary System led to more exports: Evidence from four European Union countries", Economics Letters 62, 357 – 363.

Franses, H.P. and D.V., Dijk (2006): "Nonlinear Time Series Model in Empirical Finance: Cambridge University Press. United Kingdom.

Froot, K.A. and J.C. Stein, (1991)` "Exchange Rate and Foreign Direct Investment: An Imperfect Capital Market Approach, "The Quarterly Journal of Economics 106 (4): 1191 – 217.

Goldberg L.S., (1993) "Exchange Rate and Investment in United State Industry" Review of Economics and Statistics LXXV: 575 – 88.

Goldberg, L.S., and C.D Kolstad (1995), "Foreign Direct Investment, Exchange Rate Variability and Demand Uncertainty", International Economic Review. 36 (4): 855 – 873.

Gujarati, N.D. (2006) Basic Econometrics, 7th Edition New York. Mc Graw Hill. Inc.

Itagaki, T., (1981), "The Theory of the Multinational firm under Exchange Rate Uncertainty", Canadian Journal of Economics 14 (2): 276 – 97.

Ito, T., (2000) "Capital Flow in Asia", in Sebastian Edwards eds., Capital flow and the emerging Economies, Chicago, IL: The University of Chicago Press: 255 – 296.

Kazembe A.and Namizinga K. (2007), Foreign Direct Investment and Exchange Rate Volatility in Nigeria", Journal of Economic surveys 13 (1): 71-106.

Klein, M.W., and E. Rosengren, (1994) "The Real Exchange Rate and Foreign Direct Investment in the United State: Relative Wealth VS Relative Wage Effect", Journal of International Economics, 36 (3/4): 373 – 389.

Kosteletou, N., and P. Liargovas, P., (2000), "Foreign Direct Investment and Real Exchange Interlinkages", Open Economies Review 11: 135 – 48.

Koutsoyiannis A. (1993), "Theory of Econometrics", Harper & Row, New York,

Kroner, K.F. and W.D. Ladstrapes (1993), "The Impact of Exchange rate Volatility on International Trade: Reduced from Estimates Using the GARCH- in mean Model", Journal of International Money and Finance 12, 298 – 318.

Lee, J. (1999): "The Effect of Exchange Rate Volatility on Trade in Durables, Review of International Economics 7, 189 – 201.

Lucas, R.E (1967), "Adjustment costs and the Theory of Supply. Journal of political Economy, "75 (4), 321-34

Makennon R (1999)."Euroland and East Asia in a Dolla-based international monetary system: Mundell revisited. Stanford, CA, Stanford University working paper 99-020.

Mckenzie M. (1999), "The impact of exchange rate volatility on international Trade Flows." Journal of Economic surveys 13 (1): 71-106.

Nickel, S.J. (1974), "On the Role of Expectations on the Prime Theory of Investment," Review of Economic Studies, 41 (1) 1-19.

Osinubi,T.S. (2009) " Foreign Direct Investment And Exchange Rate Volatility In Nigeria", International Journal of Applied Econometrics and Quantitative Studies V6-2(2009)

Pagan, A. and A. Ullah (1988): "The Econometric Analysis of models with risk terms", Journal of Applied Econometrics 3, 87 – 105.

Pagan, A.R. (1984): "Econometric Issues in the Analysis of Regressions with Generated Regressors," International Economic Review 25, 221 – 247.

Sanusi, J.O., (2004), "Exchange Rate Mechanism: The Current Nigerian Experience". Nigerian – British Chember of Commerce, Abuja, Nigeria.

Sazanami, Y., and W.Y. Ching (1997) "Strategies of Japanese Multinationals: Changes in the Locational Importance of Asia, the EC and North America", Multinational Firms and International Relocation, Cheltenham, UK: Edward Elga: 103 – 122.

Sukar, A.H. and S. Hassan (2001): "US Exports and Time varying Volatility of real Exchange Rate", Global Finance J0ouranl 12, 109 – 119.

Urata, S., and H. Kawai (2000) "The Determinants of the Location of Foreign Direct Investment by Japanese small and medium-sized Enterprises", small Business Economics 15 (2): 79 – 103.

Yoshumura, S., and K. Kiyota (2001) "Japanese Foreign Direct Investment Flow to East Asia and the Real Exchange Rate: Lessons from the Asian Financial Crises", Conference Proceedings: Regional Development and the Global Economy, European and East Asian Experience, University of Le Harvre, France, September 26, 27: 421 – 432.

APPENDIX

year	DEXR	EUEXR	YENEXR	IR	FDI	OPN	INF
1970	0.7143	0.1958	0.002	3	146431500	0.310939	13.8
1971	0.6955	0.2013	0.0021	3	341490500	0.356689	15.6
1972	0.6579	0.2055	0.0022	3	523688400	0.337294	3.2
1973	0.6579	0.2434	0.0023	3	769085100	0.405909	5.4
1974	0.6299	0.2557	0.002	3	898237400	0.400152	13.4
1975	0.6159	0.239	0.0021	4	1167820308	0.40265	33.9
1976	0.6265	0.267	0.0022	4	1400302680	0.446417	21.2
1977	0.6466	0.3095	0.0027	4	1730062358	0.46714	15.4
1978	0.606	0.3542	0.0033	5	1749255360	0.41332	16.6
1979	0.5957	0.3237	0.0023	5	1903952512	0.436198	11.8
1980	0.5464	0.2779	0.0027	6	1342663256	0.469094	9.9
1981	0.61	0.2825	0.0029	6	1829768200	0.501114	20.9
1982	0.6729	0.282	0.0029	7.5	2308201767	0.386737	7.7

1983	0.7241	0.2748	0.0032	7.5	2747720547	0.308925	23.2
1984	0.7649	0.2568	0.0032	9.5	3047239216	0.272822	39.6
1985	0.8938	0.4061	0.005	9.5	3994767596	0.276598	5.5
1986	2.0206	1.6464	0.0203	9.5	9421330384	0.215544	5.4
1987	4.0179	2.5438	0.0326	14	21187150101	0.458288	10.2
1988	4.5367	3.0389	0.0433	14.5	25640793262	0.378462	38.3
1989	7.3916	4.5631	0.0539	16.4	55703910676	0.409744	40.9
1990	8.0378	5.925	0.0663	18.8	68631639458	0.581588	7.5
1991	9.9095	5.8042	0.0726	14.29	95750642845	0.676055	13
1992	17.2984	12.3654	0.1574	16.1	187155022264	0.654814	44.5
1993	22.0511	13.5902	0.2052	16.66	279989652541	0.562095	57.2
1994	21.8861	14.2109	0.2217	13.5	327956861531	0.409893	57
1995	21.8861	15.1326	0.2421	12.61	355775262467	0.88236	72.8
1996	21.8861	14.5328	0.2	11.69	403720805995	0.692699	29.3
1997	21.8861	12.611	0.1805	4.8	439668116235	0.744968	8.5
1998	21.8861	12.4932	0.1684	5.49	466152600947	0.586788	10
1999	92.6934	97.2086	0.1484	5.33	2083444837824	0.642291	6.6
2000	102.1052	101.8815	0.155	5.29	2428714981631	0.639604	6.9
2001	111.9433	100.3039	0.335	5.49	2805726631558	0.682767	18.9
2002	120.9702	132.581	0.1837	4.15	3278776457107	0.471165	12.89
2003	129.3565	163.5413	0.1711	4.11	3786962194477	0.608943	14.03
2004	133.5004	175.0674	0.26	4.19	4192243340594	0.577494	15.01
2005	132.147	152.0798	0.2234	3.83	4807605351428	0.689488	17.85
2006	128.6516	167.4241	0.2592	3.14	6475964889581	0.578351	8.24
2007	125.8331	127.8349	0.2596	3.55	7901182123962	0.605213	5.38
2008	119.7925	179.9000	0.2716	2.46	7188573506771	0.658328	15.1

CBN Statistical Bulletin 2008 and Annual Reports various years