Determinants of FDI and FPI Volatility: An E-GARCH Approach

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This study examined the determinants of Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) volatility in Nigeria. The study used annual data covering the periods 1986 to 2016 and the E-GARCH approach was employed. The study observed that trade openness and world GDP were the significant determinants of FDI volatility, while domestic interest rate and stock market capitalization were significant determinants of FPI volatility in Nigeria. Other variables were insignificant in influencing volatility in FDI and FPI. Consequently, the study recommends the need for the prudent management of these determinants (with particular reference to indigenous variables) to ensure reduced volatilities in these capital flows which are essential for the growth of the domestic economy, particularly at this time when the Nigerian economy is in great need of foreign investment owing to the continuous variation in international crude oil price.

Keywords: E-GARCH, FDI, FPI, Nigeria, Volatility.

JEL Classification: F21

1.0 Introduction

Volatility in capital flows has been observed as detrimental to the macroeconomic stability of any economy and recent evidence has suggested different behavioural patterns of capital inflows. Firstly, foreign direct investment has been observed as the most stable and less volatile form of capital inflow compared to portfolio investment which has been observed to be highly volatile (Calafell, 2010; Oyejide, 2005; Rangarajan, 2000). High volatility in portfolio investment signifies large reversal of foreign capital flows which increases the risk of borrowers being faced with the risk of liquidity runs (Chang and Velasco, 1999). Such differences in the volatility of foreign direct investment and foreign portfolio investment could portray different factors influencing these inflows and thus may impact the macro-economy differently. Secondly, Aizenman *et al.* (2011) noted that foreign direct investment and foreign portfolio investment are fundamentally different from each other since

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the former is associated with ownership and control while the latter is not. In this wise foreign direct investment is viewed as more beneficial for growth compared to portfolio investment. Also, Agenor (2003) noted that short term cross border capital flows (such as portfolio investment) are more responsive to changes in relation to the rate of returns compared to longer term capital flows which is less vulnerable to variations in short term interest rate.

Ample literatures have examined the factors underlying the volatility of capital flows (see Broto *et al*., 2011; Mercado and Park, 2011; Neumann *et al*., 2009; Diaz-Cassou, 2006). These studies distinguished between country-specific factors (pull factors) in the host countries (such as economic fundamentals and investment opportunities) and push factors reflecting condition in the international financial market (such as World GDP, World interest rate, United State consumer price index and United State short term interest rate). Neumann *et al*. (2009) and Broto *et al*. (2011) further stressed that the determinants of the volatility of foreign direct investment and foreign portfolio investment are different.

In spite of the growing concern on the volatility of capital inflows and their implication for macroeconomic management, previous indigenous studies have neglected this issue by failing to identify specific pull and push factors underlying foreign direct investment and portfolio investment volatility in Nigeria. Studies by Okafor (2012), Okpara *et al*. (2012), Anyanwu (2011), Arbatli (2011), Obida and Abu (2010), Dinda (2009) and Nwankwo (2006) focused exclusively on the determinants of foreign direct investment only while Agarwal (2006) focused on the determinants of foreign portfolio investment in Nigeria. Furthermore, studies by Okon *et al*. (2012), Adegbite and Ayadi (2010), Osinubi and Amaghioyediwe (2010), Ogunkola and Jerome (2006) and Oyejide (2005) among others focused on the role of foreign direct investment in influencing growth of the host country. The paucity of knowledge on the determinants of the volatility of foreign direct investment and foreign portfolio investment constitute the gap this study intends to fill in the literature.

Understanding underlying forces behind volatility of capital flows matter for macroeconomic management and financial stability of an economy. For instance, if volatility in international capital flows react mainly to

global factors, then the recipient countries are vulnerable to global shocks and are exposed to contagion effects from other economies of the world (as witnessed during the 2007/2008 US financial crisis), even if domestic policymakers maintain prudent macro-policies. In contrast, if volatility of capital flows are predominantly driven by domestic factors, policymakers are better able to manage such volatility (Jevcak *et al*., 2010).

Also, the aftermath of global financial crisis of 2008-2009 which originated from the United State on developing economies like Nigeria made it evident that volatility of capital flows played key roles in shaping the performance of emerging and developing economies. Thus, without a full grasp of factors influencing the volatility of foreign direct investment and foreign portfolio investment particularly in the light of the limited ability of the domestic financial market or monetary authority in dealing with volatility in capital inflows, a comprehensive approach or appropriate policy framework to capital flows management may be elusive. Finally, the findings of this study would allow policymakers in Nigeria to hedge against the risks stemming from volatility in capital inflows while trying to maintain their access to international finance (Broto *et al*., 2011).

Against the above backdrop, this study intends to address these research questions. (i) What are the drivers of volatility of foreign direct investment and foreign portfolio investment in Nigeria? (ii) Are these drivers different for volatility in foreign direct investment and foreign portfolio investment in Nigeria? The research objective of this study is "to analyse the determinants of the volatility of foreign direct investment and foreign portfolio investment in Nigeria". In addition to the introduction, the rest of this paper is as follows: section two dealt with a review of literature while section three focused on the research methodology. In section four, the analysis and interpretation of empirical results were discussed while the conclusion and policy recommendations was the focus of section five.

2.0 Literature Review

2.1 Theoretical Framework

Various theories have been postulated regarding the determinants of foreign investment. Theories on the determinants of foreign investment

can be dichotomized into perfect and imperfect market theories. The perfect market theories are based on free trade theories employing general equilibrium analysis and the theories assume among other conditions the absence of obstacles to the market entry by producers or to international capital flows (Wilhelms & Witter, 1998; Moeti, 2005). The perfect market theories include the differential rate of return theory (see Otsubo, 2005; Lizondo, 1991), the portfolio diversification theory (see Moeti, 2005; Sahoo, 2004), the currency differential theory (Froot & Stein, 1991) and the market size approach (see Ayadi, 2009; Wang & Swain, 1995). On the other hand, the imperfect market theories include: the ownership-specific-advantage theory (see Twimukye, 2006; Wilhelms & Witter, 1998; Hymer, 1976), location specific theory (see Denisia, 2010; Meoti, 2005), internalization advantage theory (Coase, 1937; Buckley & Casson, 1976) and the eclectic theory (see Dunning, 1997). The theories focused on the determinants of the size/level of foreign investment (foreign direct investment and foreign portfolio investment). However, these theories were naive when the issue of volatility in foreign investment is considered.

With respect to volatility in foreign investment, Claessens, Dooley and Warner (1995) emphasised the existence of a conventional wisdom shaped by common beliefs on the behavioural patterns of different forms of foreign investment. The approach noted that there is a distinction between foreign investment components as short-term and long-term. Short-term foreign investment includes debt bearing money market securities and loans with a maturity of one year or less and foreign portfolio investment (FPI) are regarded as inherently volatile and speculative hot money (i.e. funding sources that react to changes in expected risk and return, investor psychology and exchange rate differentials) that are also highly reversible and susceptible to sudden stops. On the contrary, long-term foreign investment including bonds and loans with a maturity of more than one year and foreign direct investment (FDI) are construed as intrinsically stable and predictable cold money (i.e. funding sources that respond to slow-moving structural

factors and economic fundamentals) which are rather irreversible, immune to sudden stops and are less volatile (Keskinsoy, 2017).

Also, the information-based trade-off model on components of foreign investment by Goldstein and Razin (2006) showed that if FDI and FPI coexist in the equilibrium then, on average, the expected liquidity needs

of FPI investors are higher than the expected liquidity needs of FDI investors. Thus, this indicates that the withdrawal rate of FPI is higher than that of FDI, resulting in greater volatility of FPI relative to FDI (Keskinsoy, 2017).

2.2 Empirical Literature

With respect to empirical literatures, studies on the determinants of volatility in foreign direct investment and foreign portfolio investment are scanty with particular reference to Nigeria. Most of the previous studies focused on the determinants of the level of capital flows. For instance, Agarwal (2006) examines the determinants of foreign portfolio investment (FPI) and its impact on the national economy of six developing Asian countries. The regression estimate showed that inflation rate had a statistically significant negative influence on FPI while real exchange rate, index of economic activity and the share of domestic capital market in the world stock market capitalization were observed as positive determinants of FPI. Reinhart and Reinhart (2008) examined the macroeconomic implications of capital flows between the period 1980 and 2007. The study observed that global factors such as changes in commodities prices, international interest rates, and growth in developed countries are the underlying forces of international capital flows.

Obida and Abu (2010) examined the determinants of foreign direct investment in Nigeria for the period 1977 to 2006. Using the error correction technique, the study observed that the market size of the host country, deregulation, political instability and exchange rate depreciation are the main determinants of foreign direct investment in Nigeria. Okafor (2012) examined the impact of pull (domestic) factors on capital movement in Nigeria for the period 1970 to 2009. Using an Ordinary Least Square (OLS) estimation technique, the study observed that real gross domestic product, interest rate, and real exchange rate are key determinants of foreign direct investment in Nigeria.

Okpara *et al*. (2012) examined the determinants of foreign direct investment in Nigeria; the study also examined the nature of causation between foreign direct investment and its determinants in Nigeria for the period 1970 to 2009. The study adopted the Granger causality and error correction model techniques. The findings of the study revealed a unidirectional causation from government policy, fiscal incentives,

availability of natural resources and trade openness to FDI. The parsimonious result of the error correction model revealed that lagged foreign investment inflows, fiscal incentives; favorable government policy, exchange rate and infrastructural development were positive and significant determinants of foreign direct investment while current natural resources negative influenced FDI inflow. Also, market size and trade openness were observed as insignificant determinants of foreign direct investment in Nigeria.

Anyanwu (2011) observed that market size, high government consumption, international remittance, agglomeration, and natural resource endowment and exploitation are significant positive determinants of foreign direct investment in Africa while higher financial development was observed as negative determinant of foreign direct investment in Africa. Arbatli (2011) used dynamic partial adjustment model examined the influence of push (external or global) factors on capital inflows among (G-7) economies. The study observed that growth in the exporting (G-7) economies; international liquidity and global risky environment are influential determinants of capital flow in these economies. Dinda (2009) observed that natural resources endowment, openness, inflation rate and exchange rate were significant factors influencing foreign direct investment in Nigeria. Nwankwo (2006) observed political instability, macro-economic instability and the availability of natural resources as significant determinants of foreign direct investment in Nigeria.

With respect to literatures on determinants of volatility of capital flows, Mercado and Park (2011) examined the impact of a set of domestic and global factors on the level and volatility of different types of capital flows to emerging market and developing Asian economies, using the standard deviation of these flows (as a % of gross domestic product [GDP]) in 5-year rolling windows as the volatility estimates. The results of the study showed that pull factors (trade openness and financial openness) were important determinants of FDI and FPI to emerging market economies. Also, change in stock market capital (a pull factor) had significant impact on FPI but was insignificant in determining FDI in emerging market economies. With respect to the Asian developing economies, the result of the study showed that pull factors (trade openness, change in stock market capital, financial openness and institutional quality) and a push factor (global broad money growth)

were important drivers of FDI volatility while only trade openness and change in stock market capital were key drivers of FPI.

Broto *et al.* (2008) analysed the determinants of the volatility of different capital inflows to emerging countries for the period 1960 to 2006. The result of the study showed that per capita GDP, trade openness, deposit money bank asset to GDP ratio, private credit of deposit money bank to GDP ratio, financial system deposit to GDP ratio, interest rate spread, stock market capitalization to GDP ratio, Standard and Poor stock exchange index and global liquidity are the determinants of volatility of FDI to emerging economies. On the other hand, per capita GDP growth rate, inflation, foreign exchange reserve to import, financial system deposit to GDP ratio, stock market capitalization to GDP ratio and 3-month US Treasury Bill are determinants of volatility of FPI to emerging economies. Neumann *et al*. (2009) analysed how different types of capital flows responded to financial market opening in emerging economies. The results of the study showed that volatility of FDI is influenced by the opening of financial markets in emerging economies while it was insignificant in influencing volatility of portfolio investment flows.

Engle and Rangel (2008) examined the conditional volatility of different types of capital flows in order to investigate the impact of various domestic and global factors on volatility. The study observed that global factors are more important significant factors compared to country specific factors since 2000, determining the volatility of portfolio and other investment flows and that the institutional framework has important implications for capital flow volatility. IMF (2007) noted that financial openness and institutional quality negatively influence volatility in capital flows for a sample of developed and emerging countries examined. Broner and Rigobon (2005) observed that differences in the persistence of shocks to capital flows together with the likelihood of contagion explained most of the volatility differential in a sample of fifty-eight countries. Alfaro *et al.* (2005) observed that institutional quality and sound macroeconomic policies curtail capital flows volatility while bank credit tends to increase volatility based on a pool data from advanced and emerging economies.

An overview of the above reviewed literatures showed the following: (a) there exist a paucity of knowledge on the determinants of volatility of foreign direct investment and foreign portfolio investment among studies

in Nigeria. Most of the previous studies on Nigeria focused on the determinants of the size of foreign direct investment while none of them explained the volatility inherent in these capital flows. (b) The literature review also showed the absence of consensus among studies on the determinants of volatility of capital flows in different countries and regions of the world, hence the need to examine this issue within the context of the Nigerian economy. (c) It was also observed that foreign direct investment and foreign portfolio investment responded differently to some determinants of volatility in these capital flows. (d) Finally, most studies on the determinants of volatility of capital flows are cross sectional or panel studies rather than country specific studies. The results obtained by such cross country or panel studies have been brought into serious doubt due to the implicit assumption of a common economic structure and similar production technology across different countries, which is unlikely to be true (Cuadros *et al*., 2001). Also, Levine and Renelt (1992) stressed that a lot of conceptual and statistical problems plague cross-country investigations. Cross country regression analysis presupposes that observations are drawn from a distinct population, which goes against the basic intuition that very different countries may not be comparable. Thus, the question may be asked as to whether highly heterogeneous countries should be put in the same regression. Furthermore, Levine and Renelt (1992) noted that there are conceptual difficulties in interpreting the coefficients on regressions that involve averaged data for a various countries, thereby casting serious doubt on the robustness of results from cross-country regressions.

This study intends to fill the above gap in literature by carrying out a country specific analysis on the determinants of the volatility of foreign direct investment and foreign portfolio investment in Nigeria for the period 1986 to 2016. This study also seeks to know if volatility of foreign direct investment and foreign portfolio investment are driven by different factors in Nigeria. The above issues have not been explored by previous empirical studies in Nigeria. This study commenced from 1986 rather than earlier years because the determination of the Naira exchange rate was based on market forces with the introduction of second tier Foreign Exchange Market (SFEM) in September1986. Although the exchange rate was pegged in 1994 and liberalized again in 1995, the periods 1986 to date have in the history of exchange rate in Nigeria been characterized by greater market forces.

3.0 Research Methodology

3.1 Theoretical Framework and Model Specification

While theories on the determinants of foreign investment (foreign direct investment and foreign portfolio investment) are naive on issue of volatility, studies by Aizenman *et al*. (2011), Agenor (2003) and Claessens, Dooley and Warner (1995) offered plethora factors influencing volatility of capital flows. Thus, to identify specific factors influencing volatility of capital flows, this study specifies a simple model as follows:

$$FCI_v = \psi_0 + \sum_{i=1}^{m} \beta_i X_i + \varepsilon_t \qquad (1)$$

Where FCI_v refers to conditional volatility of foreign capital flows (that is foreign direct investment and foreign portfolio investment) derived from E-GARCH (1, 1). The E-GARCH has been identified as the most appropriate of all the ARCH families in examining asymmetric effect (Chipili, 2012). β_i refers to the coefficients of the factors influencing capital flows volatility; X_i refers to factors influencing capital flows that have been identified in the literature while ε_t is the error term assumed to be normally distributed with N $(0, \sigma^2_t)$. Factors influencing capital flows are classified into global and domestic factors. Global factors have been observed in the literature as important push factors influencing foreign capital flows, but their relationship with volatility of capital flows remained unclear. The global factors used in this study include: World GDP growth rate (WGDP) (which measures global economic activity) and US inflation rate (USCPI) (which reflects macroeconomic conditions in the US economy). The domestic factors which have been recognised in the literature as drivers of capital inflows in the literature include: GDP per capital (GDPPC) (a measure of market size), domestic inflation rate (INF), trade openness (OPNX) (measure as the ratio import plus export to real GDP), domestic interest rate (INTR) and stock market capitalization (MCAP). However, other variables like institutional quality and regional factor among others used in other studies were not included in the model due to lack of data availability.

A priori, capital flows tend to be less volatile in an economy with large market size (proxied by GDP per capita) and vice versa. Inflation rate reflects the extent of macroeconomic instability (Anyanwu, 2011;

Buckley *et al.*, 2007). It also reflects erratic and distortionary monetary conditions of a country (Broto *et al*., 2008). Therefore, capital flows tend to be more volatile in periods of high inflation than during low inflationary period. Trade openness reflects the level of economic integration into the global market and has been identified in the literature as an important pull factor of foreign capital flows. However, the relationship between trade openness and volatility in capital flow is indeterminate. Theoretically, high domestic interest rate is an incentive for higher investment in an economy, and therefore it is expected that the relationship between domestic interest rate and capital flows is positive.

3.2 EGARCH Model for Capital Flows in Nigeria

Volatility series for FDI and FPI used in the study is generated via the Exponential Generalize Autoregressive Conditional Heteroeskedaticity (E-GARCH) [1, 1]. The E-GARCH process is described as follows:

$$FDI_t = \varphi + FDI_{t-1} + \mu_t \quad (2)$$

$$FPI_t = \varphi + FPI_{t-1} + \mu_t \quad (3)$$

The AR[1] approach is followed. The following E-GARCH model is estimated for FDI and FPI flows:

$$ln\sigma^2 = \omega + ln\sigma_{t-1}^2 + \alpha \left|\frac{\mu_{t-1}}{\sigma_{t-1}}\right| + \gamma \left|\frac{\mu_{t-1}}{\sigma_{t-1}}\right| + \sum_{k=1}^{m} \psi_k X_k \quad (4)$$

In the equations (2) and (3) above μ_t is residual, and in equation (4) σ denotes the conditional variance obtained from equations (2) and (3). The estimates of the conditional variance for FDI and FPI are used as their volatility and are used in equation (1) as in Demachi (2012). Also, X_k is a set of explanatory variables (determinants) explaining volatility of capital flows while ψ_k is the coefficients of the explanatory variables (determinants).

3.3 Data Sources

Data on World GDP, US-Inflation, domestic population figures were sourced from World development indicator (WDI) while data on foreign direct investment, foreign portfolio investment, real gross domestic product (GDP), import, export, inflation rate, domestic interest rate and stock market capitalization were obtained from the Central Bank of Nigeria statistical bulletin, 2016 edition.

4.0 Result and Discussion

4.1 Descriptive Statistics and Unit Root Test

The descriptive statistics in Table 1 showed that the mean values for foreign direct investment (FDI), foreign portfolio investment (FPI), gross domestic product per capita (GDPPC) and inflation rate (INF) were 404861.60, 298222.90, 0.00 and 20.40 respectively while the mean values for domestic interest rate (INTR), market capitalization (MCAP), trade openness (OPNX), United State consumer price index (USCPI) and World Gross Domestic Product (WGDP) were 13.64, 4801.19, 56.15, 2.63 and 4.32E+13 respectively. The standard deviation for FDI and FPI were 446651.00 and 616605.70 respectively showing that FPI is more volatile than FDI under the period of study. The skewness statistics which shows the degree of asymmetry, or departure from symmetry revealed that foreign direct investment, foreign portfolio investment, gross domestic product per capita, inflation rate, interest rate, market capitalization, trade openness and World gross domestic product were positively skewed while United State consumer price index was negatively skewed. The kurtosis indicates the degree of peakedness of a distribution and it was observed that foreign portfolio investment, inflation rate, interest rate and United State consumer price index had a relatively high peaked distribution called leptokurtic since it is greater than three (>3) while foreign direct investment, gross domestic product per capita, market capitalization, trade openness and World gross domestic product had a relatively low peaked distribution called platykurtic since their values were less than three (<3).

Finally, the Jarque-Bera statistic rejected the null hypothesis of normal distribution at five per cent critical level for foreign portfolio investment, inflation rate and interest rate while the null hypotheses of normal distribution for the other variables were accepted at the same critical value.

Table 1: Descriptive Statistics

Variables	FDI	FPI	GDPPC	INF	INT	MCAP	OPNX	USCPI	WGDP
Mean	404861.60	298222.90	0.00	20.40	13.64	4801.19	56.15	2.63	4.32E+13
Std. Dev.	446651.00	616605.70	0.00	18.93	3.89	6494.68	50.91	1.24	2.09E+13
Skewness	0.77	2.83	0.61	1.50	0.82	1.02	0.58	-0.15	0.48
Kurtosis	2.12	10.51	1.76	3.84	4.81	2.45	1.93	3.33	1.78
Jarque-Bera	4.05	114.44	3.93	12.61	7.65	5.75	3.23	0.26	3.13
Probability	0.13	0.00	0.14	0.00	0.02	0.06	0.20	0.88	0.21

The Unit root test is applied to know the order of integration of the variables. An important condition for applying ARCH family test is that the variables involved must be stationary. The result of the Unit root test is presented in Table 2 below.

Table 2: ADF Unit root test

Variable	ADF Statistics	Critical value	Order of Integration
FDI	-6.555	-3.6793*	I(1)
FPI	-3.9683	-3.6793*	I(1)
GDPPC	-5.9087	-3.6892*	I(1)
INF	-4.3037	-3.7524*	I(1)
OPNX	-5.799	-3.6793*	I(1)
INTR	-7.0111	-3.6793*	I(1)
WGDP	-4.295	-3.6793*	I(1)
USCPI	-5.6636	-3.6892*	I(1)
MCAP	-5.3138	-3.6793*	I(1)

The result of the unit root test showed that all the variables used in the model were stationary after the first difference. This is part of the condition for using any of the ARCH family for analysis which include ARCH, GARCH, GJR_GARCH, TARCH, PARCH, EGARCH among others. Both FDI and FPI were used separately as dependent variables and the remaining variables were used as determinants as explained under the methodology. The second condition before embarking on GARCH analysis is confirming if there is ARCH effect. The presence of ARCH effect justifies application of any of the ARCH family analysis. This is done through the ARCH test. The results of the ARCH test for both FDI and FPI are presented in table 3 below.

Table 3: ARCH Test for FDI and FPI

Heteroskedasticity Test: ARCH	ARCH Test for FDI and FPI			
FDI-MODEL	F-Statistics	9.435	Pro. F(1, 27)	0.0048
	Obs*R-Squared	7.51	Pro. Chi-Square(1)	0.0061
FPI-MODEL	F-Statistics	5.316	Pro. F(1, 27)	0.0146
	Obs*R-Squared	3.861	Pro. Chi-Square(1)	0.0318

The results from Table 3 showed that the Null hypotheses of no ARCH effect were rejected at 1% level, implying that the results from the table confirmed the presence of ARCH effect in both FDI and FPI. The presence of the ARCH effect further justified the use of the E-GARCH method. In examining the determinants of FDI and FPI volatility, the Exponential Generalized Autoregressive Conditional Heteroscedasticity

(E-GARCH) volatility model introduced by Nelson (1991) is employed. The E-GARCH model has been judge by studies (see Berument, *et al*., 2001; Kontonikas, 2004) as superior to other models of volatility due to its capturing of asymmetric effects and its non imposition of non-negative constrain on the parameters (Jamil, Streissler & Kunst, 2012; Chipili, 2012). The results of the E-GARCH estimates for both FDI and FPI are presented on table 4 below.

Table 4: EGARCH Regression Estimate on Determinants of FDI and FPI Volatilities

Regressors	FDI-Model	FPI-Model
Mean Equation Estimate		
C	0.3217) (2.8210)*	0.0063 (15.2185)*
FDIGDP(-1)/FPIGDP(-1)	0.9124 (30.1274)*	0.9721 (1.6E+1)*
Variance Equation Estimate		
C	-0.6669 (-0.1888)	2.9939 (0.0838)
(RESID)/SQRT(GARCH(1))	1.5670 (3.4017)*	3.6015 (3.7298)*
RESID/SQRT(GARCH(1)	0.4915 (0.3981)	2.3176 (3.6190)*
EGARCH(1)	0.1029 (0.1424)	0.2348 (0.9616)
GDPPC	10399.55 (0.8545)	4451.97 (0.1486)
INF	0.0278 (0.7780)	0.0181 (0.3897)
OPNX	0.1320 (7.3644)*	0.0270 (0.5817)
INT	-0.0761 (-1.2846)	0.4329 (2.8229)*
LWGDP	-0.0881 (-5.73)*	-0.0249 (-0.0200)
USCPI	0.2081 (0.3924)	-0.6014 (-0.7565)
LMCAP	0.5752 (1.5540)	0.3451 (2.2182)**
R-Squared	0.76	0.43
Durbin-Watson Stat.	2.21	1.83

Note: * and ** denotes 1% and 5% significant level respectively. The values outsides the brackets are the coefficient values of the variables while the values in brackets are the z-Statistic values

The results presented on Table 4 show the mean and variance estimates for both the FDI and FPI models. The mean equation estimates of both models showed that lagged variable of foreign direct investment and foreign portfolio investment had positive and significant impact on foreign direct investment and foreign portfolio investment respectively. With respect to the variance estimate on FDI-model, it was observed that trade openness (OPNX) had positive and significant impact on FDI volatility, thus implying that trade openness increases volatility in foreign direct investment. This finding is in line with that obtained by Mercado and Park (2011). When an economy is more opened to the outside world, there is tendency for rapid inflow and outflow of foreign capital inform of goods and services which is shown by FDI. In contrast,

the variance estimate showed that World GDP (LWGDP) had negative and significant impact FDI volatility, implying that increases in global production reduces volatility in foreign direct investment. The situation is in line with the a priori expectation that the increase in the world production has the tendency of reducing capital flow volatility. The import from the FDI-model is that only trade openness and world GDP were significant determinants of volatility in FDI while other variables in the model were insignificant in influencing FDI volatility. In addition, the coefficient of the term RESID/SQRT(GARCH(1) for the FDI model is statistically insignificant, indicating the absence of asymmetric effect in the volatility series of foreign direct investment.

With respect to the variance estimate on FPI-model, it was observed that domestic interest rate (INT) and stock market capitalization (LMCAP) had positive and significant impact on FPI volatility, indicating that interest rate and stock market capitalization increases volatility in foreign portfolio investment. The positive influence of stock market capitalization on FPI volatility is in line with the findings by Mercado and Park (2011). The import from the FPI-model is that only short term domestic interest rate and stock market capitalization were significant determinants of volatility in FPI while other variables in the model were insignificant in influencing FPI volatility. In addition and with respect to the FPI model, the coefficient of the term RESID/SQRT(GARCH(1) is positive and statistically significant implying that positive shock (good news) generate more volatility in FPI than negative shock (bad news).

To ascertain the validity of the E-GARCH estimate on Table 4, some diagnostic tests were carried out to supports validity of the regression estimates. Figures 1a and 1b were the normality tests for both the FDI and the FPI models. The results showed that the probability of the Jarque-Bera is greater than 5%. Therefore, we accept the null hypothesis that the distribution is normal. For the FDI model the probability is 0.3903 while for the FPI model is 0.056. This indicates that the distributions were normally distributed which is very good for our results. The heteroskedaticity (ARCH test) also showed the absence of serial correlation in the estimates (see Table 5). This is because the null hypothesis of no serial autocorrelation for the two models was accepted. The probabilities in the two tables were greater than 0.05. Hence, the study concludes that ARCH effect is eliminated from the model and there is no problem of heteroskedaticity.

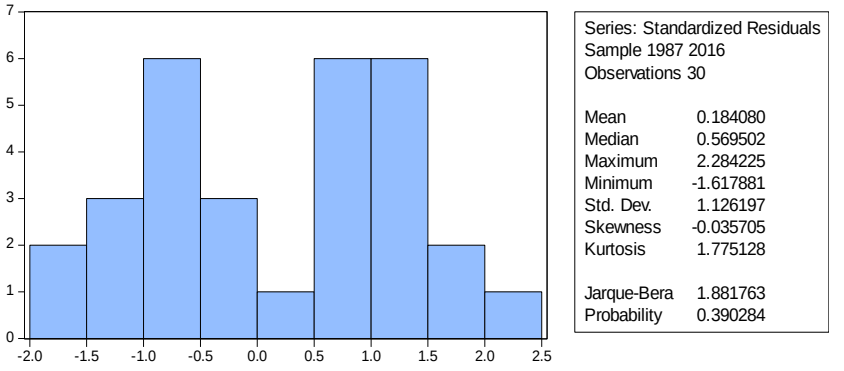

Figure 1a: Normality Test for FDI

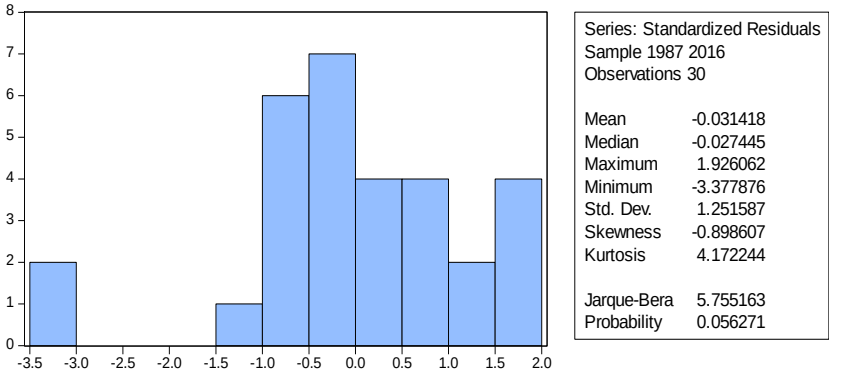

Figure 1b: Normality Test for FPI

Table 5: ARCH Test for FDI and FPI

ARCH TEST FOR FDI AND FPI			
ARCH Test for FDI			
F-statistic	0.6131	Prob. F(1,27)	0.4404
Obs*R-squared	0.6439	Prob. Chi-Square(1)	0.4223
ARCH Test for FPI			
F-statistic	0.0504	Prob. F(1,27)	0.8241
Obs*R-squared	0.054	Prob. Chi-Square(1)	0.8162

5.0 Conclusion and Policy Implications

This study examined the determinants of Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) volatilities in Nigeria using the E-GARCH approach. The result of the study showed that trade openness and world GDP were the significant determinants of volatility in FDI while domestic interest rate and stock market capitalization were the significant determinants of volatility in FPI in Nigeria. Specifically, with respect to the first research question, the result of the study showed

that trade openness and World gross domestic product (WGDP) were the key drivers/determinants of FDI volatility while domestic interest rate and stock market capitalization were the key drivers/determinants of FPI volatility.

With respect to the second research question, the result of the study showed that foreign direct investment and foreign portfolio investment responded differently to the determinants – trade openness, world gross domestic product, domestic interest rate and market capitalization. In addition, the result of the study showed the existence of asymmetric effect in FPI volatility while asymmetric effect does not occur in FPI volatility. Therefore, the study concluded that volatility in FDI and FPI are determined by both domestic and global factors. These factors had differential impact on both FDI and FPI volatility. Consequently, the study recommended the need for the prudent management of these determinants (with particular reference to indigenous variables) to ensure reduced volatilities in these capital inflows which are essential for the growth of the domestic economic particularly at this time when the Nigerian economy is in great need of foreign investment owing to the continuous fall in international crude oil price and the recession facing the economic.

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