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Original Article

Impact of Foreign Portfolio Investment Volatility on Total Market Capitalisation in Nigeria

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Abstract *- Foreign portfolio investment inflows are important to the development of the capital market of any nation that is the recipient of these inflows. This is required to sustain the role of capital markets in achieving resource mobilization, liquidity transformation, and security marketability through the international financial intermediation process. However, market experience across assets and portfolio ranges in equity, bond, and short-term securities had retained volatility and shock effects that had remained speculative as to whether or not it has an impact on the capital market development in Nigeria. Hence, this study investigates the impact of foreign portfolio investment volatility on total market capitalization in Nigeria between 2007M1 and 2018M12. Data generated were analyzed using the Exponential Generalized Conditional Heteroscedasticity (EGARCH) and Autoregressive distributed lag (ARDL) techniques. Findings from the study showed that volatility in Equities investment in foreign portfolio investment has a significant impact on total market capitalization in Nigeria. The study however revealed that Volatility in Bond investment by foreign portfolio has no significant impact on total market capitalization in Nigeria between 2007 and 2018. Information asymmetries that exist within capital market operations, as well as the unpredictability of the activities of the international markets hugely contributes to volatilities of foreign portfolio investment in a bond that impacts insignificantly on capital market development in Nigeria. The study further revealed that Volatility in Money Market instruments foreign portfolio has no significant impact on total market capitalization in Nigeria. The study thus recommends that there is the need for capital market regulatory authorities to develop and implement proper policies that could cushion the effect of unpredictable global activities that reverses foreign portfolio investments inflows.*

Keywords *- Foreign portfolio investment, Volatility, Equity, Bonds, Money market and Capital Market*

I. INTRODUCTION

The role of capital markets in achieving resource mobilization, liquidity transformation, and security marketability through the international financial intermediation process cannot be overemphasized. This is affirmed by its growing awareness of local and international policy discussions in recent times. Thus, its development becomes imperative for effective transmission of either domestic investment, foreign direct or portfolio investments as well as strategic mergers among individuals or nations.

Foreign Portfolio Investment (FPI) is the commitment of resources in foreign securities by foreign nationals, with a view to profitable returns (Ezirim & Ojukwu,2002). Foreign portfolio investment is a component of foreign private capital; it is an aspect of international capital flows, comprising transfer of financial assets, such as cash, stocks, or bonds across the international border for-profit motive (Chukwuemeka, 2008). Foreign portfolio investment consists of securities and other fiscal resources inactively held by alien investors.

However, foreign portfolio investments are relatively unstable and can easily shift away. Since capital markets in emerging countries are relatively shallow, when the "hot money" leaves, domestic capital market turmoil can ensue. Foreign portfolio investment does not provide the investor with direct ownership of financial assets, and thus no direct management of a company. This kind of investment is relatively liquid, depending on the volatility of the market invested in as is usually used by investors who do not want to manage a firm abroad.

The inflow of foreign portfolio investment is determined by the development of the capital market,

the market rate of return, and the monetary policy of the country. Other factors such as portfolio allocation efficiency among developed, emerging and frontier markets, as well as the volume and timing of injection or withdrawal of capital, also determine the inflow of FPI. However, unlike Foreign Direct Investment, an inflow of portfolio investment is sensitive to exchange rate risk, the political risk of the country (Anayochukwu, 2012), and allocation or rebalancing of portfolio assets among developed, emerging and frontier markets in the event of unexpected market behavior. Accordingly, just as trade flows result from individuals and countries seeking to maximize their economic wellbeing by exploiting their own comparative advantage, so too, does capital flows from individuals and countries seeking to make themselves better off, moving accumulated assets to wherever they are likely to be most productive (Schneider, 2003). Foreign portfolio investment (FPI) investors usually make short-term investments in domestic securities of a foreign country with the expectation of earning a return on it after weighing the expected risk. Nigeria in the last few years had clamored for foreign portfolio investment to the country as this is believed to be a facilitator of economic growth and development, which could lead to the industrialization of the economy in the long run (Adeleke, Olowe & Fasesin, 2004).

Statistics from the Nigerian Stock Exchange as presented by Okereke (2010) showed that FPI inflows by foreign investors during 2009 were in excess of N228.986 billion, which was an increase of 67 percent when compared with the N153.457 billion recorded in 2008. This increased further to N350 billion in 2010 (Ikazoboh, 2011) and furthermore to N179.174 billion in 2018 (Onyema, 2019). Ozurumba (2012) stated that FPI investment is a novel phenomenon in Nigeria as available data depicts that Nigeria did not record any figure on portfolio investment (inflow or outflow) in her balance of payments account up to the mid-1980s. This could have a huge impact on capital market development which this study seeks to investigate and determine the extent of the impact.

In addition, market experience across assets and portfolio ranges in equity, bond, and short-term securities had retained volatility and shock effects that had remained speculative as to the impact on the capital market development in Nigeria. However, despite the growing literature on the development of the Nigerian capital market, there are limited studies on foreign portfolio investment and the Nigerian capital market. Such as Ikezam (2018) studied the effect of foreign portfolio investment and performance of the Nigerian Capital Market, but did not consider the effect of the volatility of FPI on Capital Market Development and the class of investment made in the capital market. A similar study by Chi-chi and Eze, (2013) examined the factors that stimulate foreign portfolio investment inflow into Nigeria and not the effect of FPI on capital market development. Furthermore, these studies didn't look at the effect of FPI volatility on the Capital market development in Nigeria by asset class. This study seeks to examine the impact of foreign portfolio investment volatility on capital market development in Nigeria specifically disaggregating the FPI volatility into various assets classes.

The main objective of the study is to examine the impact of foreign portfolio investment volatility on total market capitalization in Nigeria for the period 2007M1 to 2018M12. However, the study has the following specific objectives, which includes to:

i. Investigate the impact of volatility in equity investment foreign portfolio on total market capitalization in Nigeria.
ii. Examine the impact of volatility in the bond investment of foreign portfolio on total market capitalization
iii. Determine the impact of volatility in money market investment of foreign portfolio on total market capitalization

The following formulated hypotheses were used for the study.

Ho1: Volatility in Equity Investment of Foreign portfolio have no significant impact on total market capitalization in Nigeria.

Ho2: Volatility in Bond investment of Foreign portfolio have no significant impact on total market capitalization

Ho3: Volatility in Money Market investment of Foreign portfolio have no significant impact on total market capitalization

II. CONCEPTUAL FRAMEWORK

A. Concept of Equity Foreign Portfolio Investment

The world bank defined Equity Foreign Portfolio Investment (EFPI) to include net inflows from equity securities other than those recorded as direct investment and including shares, stocks, depository receipts (American or global), and direct purchases of shares in local capital markets by foreign investors. Errunza (2005) noted that the new emphasis on the equity market was driven by the failure of past nonmarket-based strategies and the realization of the potential roles that the private initiative and the capital markets can play. According to him, the resultant development of the local equity market created conditions conducive to foreign portfolio investments.

Increased foreign portfolio equity investment leads to greater liquidity in the capital market, resulting in a deeper and broader market, Levine and Zervos (1996). The inflow of foreign portfolio equity investment into the capital market helps to relieve financial constraints of firms as was shown by (Knill 2004). Patro and Wald (2005) are among the studies relating to foreign equity investment and the domestic capital markets which showed the favorable contribution of foreign equity investment in supporting the domestic capital market.

B. Concept of Foreign Portfolio Investment – Bond

One of the most important sources of mobilizing funds for economic development is by issuing bonds. Bonds are issued in tenors (maturities) of three, five, ten, and twenty years long. A bond is a debt instrument that must be paid back to the lender with interest at a maturity date by the issuer or borrower, when borrowers issue a bond, they must price it with coupons rate based on the prevailing interest set by the CBN's monetary policy rates (Ololade & Ekperiware, 2015).

C. Concept of Foreign Portfolio Investment- Money Market Instrument

The money market is a component of the financial market for assets involved in short-term borrowing, lending, buying, and selling with maturities of one year or less. According to Haider, Khan, Saddique, & Hashmi (2017), the existence of money markets facilitates trading in short-term debt instruments to meet the short-term needs of large users of funds such as government, banks, and similar institutions.

Oghenekaro (2013) noted that the money market is fundamentally for the efficient distribution of liquidity in the financial system, allocation of capital as well as the hedging of short-term risks. The money market is the market where short-term financial assets are bought and sold. The market is basically an intermediate market, where short-term financial assets that are close substitutes for money are usually traded. Olokoyo (2016), described the money market as the segment of the financial market where financial instruments with high liquidity and very short maturities are traded

Money market instruments, which are used for borrowing and lending in the short term, include negotiable certificates of deposit (CDs), bankers' acceptances, government treasury bills, commercial paper, municipal notes, and repurchase agreements.
Asogwa and Ezema (2004) observed that money market instruments such as treasury bills and treasury certificates are the only short-term government debt instruments that were marketable and negotiable. Iyiegbuniwe (2005) noted that the Nigerian money market has seen some remarkable and substantial growth and development both in the scale of securities as well as the volume of trading since the deregulation of the financial system in 1986.

D. Concept of Total Market Capitalization

Market capitalization is the total market value of a company's outstanding shares. It is calculated by multiplying the company's share outstanding by the current market price of the share. According to Olson (2015) market capitalization is the price of a stock at any given time multiplied by the current number of shares outstanding. It is the cumulative valuation of the company based on its current share price and the sum of the outstanding stocks.

Market capitalization is one of the most essential features that enable investors to determine the returns and the risk in the share. It also helps the investors choose the stock that can meet their risk and diversification criteria. Total market capitalization enables investors to know the relative size of a company in relation to another.

Haider, Khan, Saddique, & Hashmi (2017) submitted that capital market liberalizations have prompted a sensational growth in global flow. According to them, the world investment report of 2015 said the world foreign portfolio investment stock grew from $106 billion to $744 billion.

III. EMPIRICAL REVIEW

Ogbuagu and Ewubare (2014) studied the relationship between capital flow and capital market development in Nigeria from 1986 to 2012. The study employed an array of methods to estimate the relationship between capital flow and capital market development viz Vector Auto-regression Model, Granger –Causality Wald Test, Impulse Response Test, and Variance Decomposition Test. The measure of the dependent variables Capital account balance, Net foreign direct investment, foreign debt, and Net Portfolio Investment while capital market developments are proxied by market capitalization. They found that result shows Net foreign direct investment and Net Portfolio Investment does not granger-cause Market Capitalisation and they do not significantly impact capital market development in Nigeria.

Gathenya (2015) investigated the relationship between Equity Foreign Portfolio Investment (EFPI) and the capital market development in Kenya from 2004 to 2013. The study used market capitalization to measure capital market development and the sum total of

investment in foreign equity portfolio as a measure of EFPI. The ordinary least square method and Pearson Product Moment Correlation were used to analyze the effect of EFPI on capital market development. The results of the analysis showed that there was a positive and statistically significant correlation between Equity Foreign Portfolio Investments and the capital market development in Kenya. These findings allude to a strong connection between both variables and that as Equity Foreign Portfolio Investments increases there is a correspondent increase in capital market development. Secondly, the result of the causal relationship between both variables indicated that EFPI significantly impacts market capitalization.

Adesola and Arikpo (2017) examined the relationship between financial market performance and foreign portfolio investment in Nigeria. The study used the autoregressive distributive lag (ARDL) technique for data analyses. Findings from the analyses showed that financial market performance has no long-run causal relationship with foreign portfolio investment in Nigeria. Also, capital market performance and capital market liquidity have no short-run causal relationship with foreign portfolio investment in Nigeria. The study which covered capital market performance between the periods of 1984 – 2015, concluded that the capital market did not influence foreign portfolio investment. This result contrasted with Haider, Khan, Saddique, & Hashmi (2017) when they examined the impact of capital market performance on foreign portfolio investment in China. The data on net foreign portfolio investment was taken from the International Monetary Fund on a quarterly basis, while the capital market performance was captured from the Shanghai composite capital market index from quarter 1 of 2007 to quarter 4 of 2015. The autoregressive distributive lag (ARDL) was used in estimating the impact of the market on FPI and the result showed the significant positive impact of capital market performance on FPI in China.

Iriobe, Obamuyi, and Abayomi, (2018) investigated the long-run and causal relationships between foreign portfolio investments in bond stocks and capital market performance in Nigeria from 2007-2017 using monthly data. The study employed Autoregressive Distributed Lag Model (ARDL) to evaluate the relationship between the dependent and independent variables. The volume of trade was used to proxy capital market performance while investment in BFPI was used as a proxy for the independent variable. The study found that foreign portfolio investment in bond stocks has a positive and significant effect on the volume of stocks traded in the capital market both in the short and long run. However, the proxy used in the study to measure capital market performance does not totally measure all aspects of capital market performance.

IV. THEORETICAL FRAMEWORK

A. Modern Portfolio theory

Modern portfolio theory (MPT) is a theory of investment that attempts to explain how investors can maximize return and minimize risk. Modern portfolio theory has revolutionized the world of investment management by allowing managers to quantify the investment risk and expected return of a portfolio (James, 2001). The theory is primarily concerned with risk and return. The investor is concerned only with the expected values of securities and is interested in the expected value of the portfolio. In his paper "Portfolio Selection" published in 1952, Harry Markowitz propounded the modern portfolio theory (MPT). Essentially, MPT is an investment framework for the selection and construction of investment portfolios based on the maximization of expected returns of the portfolio and the simultaneous minimization of investment risk (Fabozzi, Gupta, & Markowitz, 2002). The theory's underpinning concept is that risk is an inherent part of a higher reward. MPT assumes that investors are risk-averse (Akinmulegun, 2018). This suggests that given two sets of investments that offer equal expected returns, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. On the other, an investor who wants a higher expected return must assume more risk.

The modern portfolio theory was adopted for this study because it is built upon the traditional investment models and it is important in the mathematical modeling of finance. The theory encourages asset diversification to hedge against market risk as well as the risk that is unique to a specific foreign investment decision. More so, the theory departs from traditional security analysis in shifting emphasis from analyzing the characteristics of individual investments to determining the statistical relationships among the individual securities that comprise the overall portfolio. The theory focuses on the effect that investments have on an entire capital market, rather than as a single investment which is strategic for this study.

V. RESEARCH METHODOLOGY

The ex-post facto research design was adopted for the paper as it aids in testing hypotheses concerning cause-and-effect relationships; as well as combining theoretical consideration with empirical observation. The use of this design allowed for the testing of

expected relationships between and among variables and the making of predictions regarding these relationships.

The data employed in this research work consist mainly of secondary (quarterly) data which are relevant to the study and were obtained from Central Bank publications. The variables for this study include; Foreign Portfolio Investment in Equity, Foreign Portfolio Investment in Bond, Foreign Portfolio Investment in Money Market, and total market capitalization for periods 2007M1-201M12.

A. Model Specification

As earlier stated, the main aim of this study is to examine the impact of foreign portfolio investment volatility on capital market capitalization in Nigeria. The mathematical relationship is implicitly specified as follows:

$$TMC = f(FPIE, FPIB, FPIM) \text{----------(1)}$$

Where:

FPIB = Foreign Portfolio Investment in Equity

FPIB = Foreign Portfolio Investment in Bond

FPM = Foreign Portfolio Investment in Money Market

TMC = Total Market Capitalization

Expressing equation (1) in an explicit form, we have:

$$TMC = \beta_0 + \beta_1 FPIE + \beta_2 FPIB + \beta_3 FPIM + \mu \text{---(2)}$$

The study employed the ARCH modeling technique to generate the volatility series of the FPI. However, the modeling of ARCH estimators starts with testing the ARCH (1) effects. Testing for ARCH effects is to help find out if the series in question is volatile. The test, following the procedure of ARCH LM test proposed by Engle (1982), shall begin with an estimation of the AR model as specified in equation (3) below:

$$R_t = \alpha + \delta_1 R_{t-1} + \varepsilon_t ; \varepsilon_t \sim IID(0, \sigma^2) \text{-------(3)}$$

Where:

R_t is the rate of return of series

ε_t is the heteroscedastic error term which is independently distributed with a zero mean and constant variance (σ^2)

Estimated residual is obtained from equation (3), then the squared of estimated residual is regressed on its lag as follows:

$$\varepsilon^2_t = \gamma_0 + \gamma_1 \varepsilon^2_{t-1} + \nu_t \text{----------(4)}$$

$H_0 : \gamma_1 = 0$, while $H_1 : \gamma_1 \neq 0$

The test statistics for the null hypothesis are F-test and nR^2 tests.

The null hypothesis of no ARCH effects is rejected if the probability values (p-values) of these tests are less than any of the conventional levels of statistical significance (10%, 5%, and 1%). The rejection H_0 implies the presence of the ARCH effect in the series. Thus, if ARCH effects are present, the estimated parameters should be significantly different from zero (the series are volatile). However, if ARCH effects are not present, then, the estimated parameters should be statistically insignificant (the series are not volatile).

The study shall however utilize the Exponential GARCH (EGARCH) model developed by Nelson (1991). The model captures asymmetric effects or leverage effects not accounted for in the ARCH and GARCH models. Nelson (1991) argued that market information affects conditional variances and this affection varies from information to information. The EGARCH model exhibits better fit and accuracy in the estimation of volatility as compared to other types in the asymmetric GARCH family models (Sokpo, Iorember & Usar, 2017; Ladokhin, 2009).

The FPI variables are integrated into the variance equation in order to know whether the FPI volatility in any way contributes to total market capitalization in Nigeria. Thus, the general specification of the EGARCH (*p,q*) model for the volatility of FPIE, FPIB, and FPIM in the variance equation, we have:

The volatility of the FPIE Model:

$$\ln FPIE_t = \alpha + \sum_{i=1}^{p} \varphi_i \ln FPIE_{t-i} + \varepsilon_t \text{----------(5)}$$

$$\ln\left(\sigma_t^2\right) = \lambda_0 + \sum_{j=1}^{q} \lambda_1 \left| \sqrt{\varepsilon_{t-1}^2 / \sigma_{t-1}^2} \right| + \sum_{j=1}^{q} \phi \sqrt{\varepsilon_{t-1}^2 / \sigma_{t-1}^2} + \sum_{i=1}^{p} \theta \ln \sigma_{t-1}^2 \text{----------(6)}$$

The volatility of the FPIB Model:

$$\ln FPIB_t = \vartheta + \sum_{i=1}^{p} \rho_i \ln FPIB_{t-i} + \varepsilon_t \text{----------(7)}$$

$$\ln\left(\sigma_t^2\right) = \lambda_0 + \sum_{j=1}^{q} \lambda_1 \left| \sqrt{\varepsilon_{t-1}^2 / \sigma_{t-1}^2} \right| + \sum_{j=1}^{q} \phi \sqrt{\varepsilon_{t-1}^2 / \sigma_{t-1}^2} + \sum_{i=1}^{p} \theta \ln \sigma_{t-1}^2 \text{----------(8)}$$

The volatility of the FPIM Model:

$$\ln FPIM_t = \psi + \sum_{i=1}^{\rho} \xi_i \ln FPIM_{t-i} + \varepsilon_t \text{----------(9)}$$

$$\ln\left(\sigma_t^2\right) = \lambda_0 + \sum_{j=1}^{q} \lambda_1 \left| \sqrt{\varepsilon_{t-1}^2 / \sigma_{t-1}^2} \right| + \sum_{j=1}^{q} \phi \sqrt{\varepsilon_{t-1}^2 / \sigma_{t-1}^2} + \sum_{i=1}^{p} \theta \ln \sigma_{t-1}^2 \text{----------(10)}$$

Equations (5,7 and 9) represent the mean equation of the AR (1) for FPIB, FPIE, and FPIM; while equations (6, 8, and 10) represent the variance equation of the EGARCH model for FPIB, FPIE, and FPIM.

Where:

ln FPIB = logarithm of Foreign Portfolio Investment in Bond

ln FPIE = logarithm of Foreign Portfolio Investment in Equity

ln FPIM = logarithm of Foreign Portfolio Investment in Money market

λ_0 = is the constant term

λ_1 = is the effect of the conditional shock

θ = Measures the persistence of shocks.

ε_t = is a random error that is Gaussian in nature implying that the error term is dependent upon itself.

ϕ = The asymmetry effect parameter (If $\phi > 0$, positive shocks (good news) implies that positive shocks increase volatility more than negative shocks (if $\phi < 0$) of the same magnitude; while if $\phi = 0$, there is no asymmetric effect, meaning that the model is symmetric and thus reduces to GARCH (1,1). *p* is the number of ARCH terms, and *q* is the number of GARCH terms.

Re-specifying equations (2) to capture the volatility of FPI variables, we have:

$$TMC = \beta_0 + \beta_1 FPIEV + \beta_2 FPIBV + \beta_3 FPIMV + \mu \text{----(11)}$$

After generating the monthly series of foreign portfolio investment volatility which comprises of foreign portfolio investment in equity volatility, foreign portfolio investment in bond volatility, and foreign portfolio investment in money market volatility using the EGARCH approach, the study proceeds for the empirical analysis. The generated foreign portfolio investment in equity volatility, foreign portfolio investment in bond volatility and foreign portfolio investment in money market volatility series were inserted into the total market capitalization ARDL-ECM equations and estimated separately. The ARDL-ECM of equations (11) is given as:

$$\Delta TMC_t = \psi_0 + \sum_{j=0}^{x} \psi_{1i} \Delta SMC_{t-j} + \sum_{k=0}^{y} \psi_{2i} \Delta FPIEV_{t-k} + \sum_{l=0}^{z} \psi_{3i} \Delta FPIBV_{t-l} + \sum_{l=0}^{z} \psi_{4i} \Delta FPIMV_{t-l} + \varphi ECT_{t-1} + \xi_t \text{---(12}$$

Where: Δ is difference operator; ECM (-1) is a one-period lag of the residual; ψ_0 is the constant term; $\psi_1 - \psi_3$ are respective volatility parameters, and ξ_t is the error term.

VI. RESULTS AND DISCUSSIONS

Testing for ARCH Effects

Before estimating ARCH(q) models, it is important to check for the possible presence of ARCH effects in order to know which models require the ARCH estimation method instead of OLS. The result of the ARCH test following the procedure of the ARCH LM test proposed by Engle (1982) is captured in Table 1:

Table 1. ARCH Test for Foreign Portfolio Investment Variables

Heteroskedasticity Test: ARCH Test for FPIE, FPIB, and FPIM				
FPIE-Model	F-statistic	6.486123	Prob. F(1,128)	0.0121
	Obs*R-squared	6.269762**	Prob. Chi-Square(1)	0.0123
FPIB-Model	F-statistic	11.87389	Prob. F(1,128)	0.0008
	Obs*R-squared	11.0357*	Prob. Chi-Square(1)	0.0009
FPIM-Model	F-statistic	10.26171	Prob. F(1,124)	0.0099
	Obs*R-squared	10.26537*	Prob. Chi-Square(1)	0.0065

Note: *, ** and *** denote significant at 1%, 5% and 10% level.

Source: Researcher's Computation Using Eviews-10 (2019)

The results from Table 1 showed that the Null hypotheses of no presence of ARCH effect were rejected at 1% level for FPIB-Model and FPIM-Model as captured by the Obs*R-squared p-values which were

found to be less than 0.01. However, the Null hypothesis of no presence of ARCH effect for FPIE-Model was rejected at a 5% level of significance. Hence, the results from Table 1 confirmed the presence of the ARCH effect in FPIE, FPIB, and FPIM models. This simply conveys that the variables have a time-varying variance (heteroscedasticity) that depends on (conditional) lagged effects (autocorrelation).

E-GARCH estimates

The presence of the ARCH effect further justified the use of the E-GARCH method for better results. In examining the determinants of FDI and FPI volatility, the Exponential Generalized Autoregressive Conditional Heteroscedasticity E-GARCH) The volatility model introduced by Nelson (1991) was employed. The E-GARCH model has been judged by studies (such as 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 the FPI, FPIE, and FPIM model are presented in Table 2, 3, and 4:

Table 2. EGARCH (1,1) model for the FPIB

Dependent variable: LOG(FPIB)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	4.50633*	1.183705	3.80697	0.0001
LOG(FPIB(-1))	0.693036*	0.070224	9.868934	0.0000
Variance Equation				
C	2.889419*	0.381831	7.567277	0.0000
RESID(-1)/@SQRT(GARCH(-1))	-0.010671	0.072114	-0.14797	0.8824
EGARCH(-1)	-0.616962*	0.087757	-7.03035	0.0000

Note: *, ** and *** denote significant at 1%, 5% and 10% level.

Source: Researcher's Computation Using Eviews-10 (2019)

The result in table 2 is the conditional mean and variance equation result of FPIB regressed on its lagged value. The constant-coefficient in the mean equation which was found to be 4.50633 is the mean value of the FPIB, and it was found to be statistically significant. The mean equation estimates further showed that the coefficient of the lagged variable for FPIB had a positive and significant impact on FPIB.

The variance equation gives the result of the EGARCH model. The time-varying volatility includes a constant (2.889419) plus a component that depends on past errors, RESID (-1)/@SQRT(GARCH (-1)). The constant parameter estimates in the variance equation met the *apriori* expectations of being positive.

The coefficient of the term RESID (-1)/@SQRT(GARCH (-1)) for the FPIB model is negative and statistically insignificant, indicating the absence of asymmetric effect in the volatility series of FPIB. It however met the *apriori* expectation in which the coefficient value has to lie between 0 and 1, thus showing that the model is not explosive. Because the coefficient of the RESID (-1)/@SQRT(GARCH (-1)) term is negative (and statistically insignificant), indeed for the FPIB, bad news has higher insignificant effects on the volatility of the series than good news. The coefficient (-0.616962) in the EGARCH model is negative and significant indicating that negative shocks reduce the volatility of FPIB in Nigeria more than positive shocks of the same magnitude. The significant coefficient value of the EGARCH further shows evidence of volatility clustering.

Table 3: EGARCH (1,1) model for the FPIE

Dependent variable: LOG (FPIE)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	1.921371**	0.795134	2.416411	0.0157
LOG(FPIE(-1))	0.887647*	0.040822	21.74445	0.0000
Variance Equation				
C	1.039765*	0.323965	3.209502	0.0013
RESID(-1)/@SQRT(GARCH(-1))	-0.625199*	0.145943	-4.283869	0.0000
EGARCH(-1)	0.12749	0.241838	0.52717	0.5981

Note: *, ** and *** denote significant at 1%, 5% and 10% level.
Source: Researcher's Computation Using Eviews-10 (2019)

From the result in table 3, it could be observed that the constant coefficient in the mean equation was found to be 1.039765 and it was found to be statistically significant. The mean equation also showed that the coefficient of the lagged variable for FPIE had a positive and significant impact on FPIB.

From the variance equation, it could be seen that the time-varying volatility has a constant value of 1.039745. The constant parameter estimates in the variance equation met the *apriori* expectations of being positive and statistically significant.

The coefficient of the term RESID (-1)/@SQRT(GARCH (-1)) for the FPIE model is negative and statistically significant. The significant level indicates the presence of an asymmetric effect in the volatility series of FPIE. The value of -0.625199 met the *apriori* expectation in which the coefficient value has to lie between 0 and 1, thus showing that the model is not explosive. In addition and with respect to the FPIE model, the coefficient of the term RESID (-1)/@SQRT(GARCH (-1)) is negative and statistically significant implying that negative shock (bad news) generates more volatility in FPIE than positive shock (good news). The coefficient of 0.12749 in the EGARCH model, which is positive and insignificant indicates that positive shocks increase the volatility of the FPIE-model more than negative shocks of the same magnitude. The insignificant value further shows the absence of volatility clustering.

Table 4: EGARCH (1,1) model for the FPIM

Dependent variable: LOG (FPIM)

Variable	Coefficient	Std. Error	Z-Statistic	Prob.
Mean Equation				
C	3.2953*	0.675067	4.881438	0.0000
LOG(FPIM(-1))	0.815599*	0.038752	21.04675	0.0000
Variance Equation				
C	2.679713*	0.170333	15.73224	0.0000
RESID(-1)/@SQRT(GARCH(-1))	-0.503772*	0.080495	-6.258454	0.0000
EGARCH(-1)	-0.852528*	0.032493	-26.23756	0.0000

Note: *, ** and *** denote significant at 1%, 5% and 10% level.
Source: Researcher's Computation Using Eviews-10 (2019)

Lastly, from the result in table 4, it could be seen that the constant coefficient in the mean equation was found to be 3.2953 and was also found to be statistically significant at 1%. The mean equation further showed that the coefficient of the lagged variable for FPIM had a positive and significant impact on FPIM.

The variance equation showed that the time-varying volatility has a constant value of 2.679713. it also met the *apriori* expectations of being positive and statistically significant at 1 p%.

The coefficient of the previous residual error, RESID (-1)/@SQRT(GARCH (-1)) for the FPIM model is negative and statistically significant. The statistically significant value of previous residual error indicates the presence of asymmetric effect in the volatility series of FPIM. The negative coefficient value of -0.503772 also

met the *apriori* expectation in which the coefficient value has to lie between 0 and 1, which showed that the model converges. The negative coefficient (and statistically significant value) of the RESID (-1)/@SQRT(GARCH (-1)) term shows that for the FPIM series, bad news has higher significant effects on the volatility of the series than good news.

The coefficient of -0.852528 in the EGARCH model, which was found to be negative and highly significant at 1% indicates that negative shocks increase the volatility of FPIM more than positive shocks of the same magnitude. The significant EGARCH coefficient further implies volatility clustering.

Unit Root Test Results

The presence of unit root in the underlying series points to the fact that there is non-stationarity in that series. If the series are non-stationary, using standard econometric techniques can point to misleading results, so standard economic theory requires the variables to be stationary.

The study employs the Augmented Dickey-Fuller or ADF, (*p*) test (Dickey and Fuller 1979; 1981) to test for a unit root in the variables.

Table 5: Unit Root Test Results

Variable	Order of Integration	ADF Test Statistics	Critical ADF Test Statistics
TMC	I(1)	-9.887641	-4.030157*
FPIEV	I(0)	-14.84043	-4.030157*
FPIBV	I(0)	-16.05633	-4.030157*
FPIMV	I(0)	-15.86822	-4.030157*

Source: Authors Computation, 2019 (Eviews-10)

From table 5, it could be observed that three variables, FPIEV, FPIBV, and FPIMV were found to be stationary at levels, that is, they are integrated at order zero {I(0)} and at a 1% level of significance. However, TMC was found to be stationary at first difference; that is integrated at order one and at 1% level of significance. Since all the variables were found to be stationary at different orders, it was safe for the study to employ a bound test approach to validate or test for the presence of cointegration.

Cointegration Results

After conducting the stationarity test on the times series, it is imperative to ascertain if they have long-run associations among themselves. Thus, to determine whether a linear combination exists among our variables, abound test approach was employed. Pesaran and Shin (1999) showed that cointegrating systems can be estimated using the bound test, with the advantage that the variables in the specified model can either be I(0) or I(1) or a combination of both; and without needing to pre-specify which are I(0) or I(1). Table 3, thus presents the bounds test co-integration results.

Table 6: Results of Cointegration Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	1.124574	10%	2.37	3.2
k	3	5%	2.79	3.67
		1%	3.65	4.66

Source: Authors Computation, 2019 (Eviews-10)

From table 6, the calculated F-Statistic that the joint hypothesis that the lagged level variable of the coefficients is zero equals 1.124574. This figure is less than the upper and lowers bound of the critical values of the conventional level of5%. This means that the joint null hypothesis of all the lagged level variables of the coefficients being zero is accepted. This suggests that there is no cointegration between FPIV and TMC and hence there is no long-run relationship. The study thus conducted a first differenced ARDL model.

Statistical Test of Hypotheses

The result of the first differenced ARDL model is presented in table 7.

From table 7, it could be seen that the R-Bar-square, which was used to measure the goodness of fit of the estimated model, indicates that the model is reasonably fit in prediction. It showed that a 79.69percent change in TMC was collectively due to FPIEV, FPIBV, and FPIBV while 26.85percent unaccounted variations were captured by the white noise error term. It showed that FPIV variables had a significant impact on the TMC within the period under the study.

More so, the F-statistics which examines the overall significance of the regression model equally showed that the result is significant. This was indicated by the value of the *F*-statistic, 2.357 and it is significant at the 5percent.

Wald test (f-statistic) and *p*-value were used in testing the three hypotheses formulated in this paper. The level of significance for the study is at 5%, for a two-tailed test. The results of the Wald-f-statistics are presented in table 8.

Table 7. ARDL Regression Result
Dependent Variable: D(TMC)

Variable	Coefficient	t-Statistic	Prob.*
D(SMC(-1))	0.136619	1.604657	0.1111
D(SMC(-2))	0.1393	1.657043	0.1000
D(SMC(-3))	0.190614	2.245855	0.0265
D(SMC(-4))	-0.23679	-2.75071	0.0068
D(FPIEV)	42.48057	1.410604	0.1608
D(FPIEV(-1))	3.28925	0.079522	0.9367
D(FPIEV(-2))	-38.5368	-0.93251	0.3529
D(FPIEV(-3))	-70.6357	-2.31842	0.0221
D(FPIBV)	31.33211	1.591563	0.114
D(FPIBV(-1))	59.13376	2.317307	0.0221
D(FPIBV(-2))	55.87987	2.25536	0.0258
D(FPIBV(-3))	38.10235	2.215139	0.0286
D(FPIMV)	5.510466	0.372391	0.7102
C	30.03472	0.53217	0.5956
R-squared	0.796915		
Adjusted R-squared	0.613395		
F-statistic	2.357681		
Prob(F-statistic)	0.007494		
DW	1.982061		

Source: Authors Computation, 2019 (Eviews-10)

Table 8: Wald-F-statistics-Test Results

	Test Statistic	**Value**	**df**	**Probability**
VIEW	F-statistic	2.711326	(4, 125)	0.033
	Chi-square	10.8453	4	0.0284
FPIBV	Test Statistic	Value	df	Probability
	F-statistic	1.666515	(4, 125)	0.1619
	Chi-square	6.666062	4	0.1546
FPIMV	Test Statistic	Value	df	Probability
	F-statistic	0.138675	(1, 125)	0.7102
	Chi-square	0.138675	1	0.7096

Source: Authors Computation, 2019 (Eviews-10)

Hypothesis One

H_{01}: Volatility in Equity investment of Foreign Portfolio has no significant impact on total market capitalization in Nigeria

It could be observed from Table 8 that the calculated f-statistic value for Foreign Portfolio investment in equity volatility and total market capitalization is 2.711 and its probability value is 0.033. Since the probability value is less than 0.05 at a 5% level of

significance, it thus falls in the rejection region and hence, we reject the first null hypothesis **(H_{01})**. The result thus shows that Foreign Portfolio investment in equity volatility has a significant impact on total market capitalization in Nigeria.

Hypothesis Two

H_{02}: Volatility in Bond Investment of Foreign Portfolio has no significant impact on total market capitalization in Nigeria

Furthermore, from the Wald-test result in Table 8, the calculated f-statistic value for Foreign Portfolio investment in bond volatility and total market capitalization in Nigeria was found to be 1.666515 and its probability value is 0.1619. The probability value is greater than 0.05 using a 5% confidence level. It thus falls also in the acceptance region and hence, we accept the second null hypothesis **(H_{02})** and conclude that Foreign Portfolio investment in bond volatility has no significant impact on total market capitalization in Nigeria between 2007 and 2018

Hypothesis Three

H_{03}: Volatility in Money Market investment of Foreign Portfolio has no significant impact on total market capitalization in Nigeria

Lastly, from the Wald-test in Table 8, it could be seen that the calculated f-statistic value for Foreign Portfolio investment in money market volatility and total market capitalization in Nigeria was found to be 0.138675; with an associated probability of value of0.7102. Since the probability value was found to be greater than 0.05 at 5% confidence level, it thus fell in the acceptance region and hence, we accept the third null hypothesis **(H_{03})**; and conclude also that Foreign Portfolio investment in money market volatility has no significant impact on total market capitalization in Nigeria.

Robustness (Test) Results

The paper conducted various post estimation diagnostic tests to ascertain the robustness of the results. Post estimation tests such as the serial correlation Lagrangian Multiplier test (for higher-order autocorrelation), the heteroscedasticity test, and the normality test.

The decision rule for accepting the null hypothesis for any of these diagnostics tests is that the probability-value (p-value) of each has to be greater than 0.05 or 5% level of significance. Table 9 thus presents the Residual Test Results;

Table 9. Robustness (Test) Results

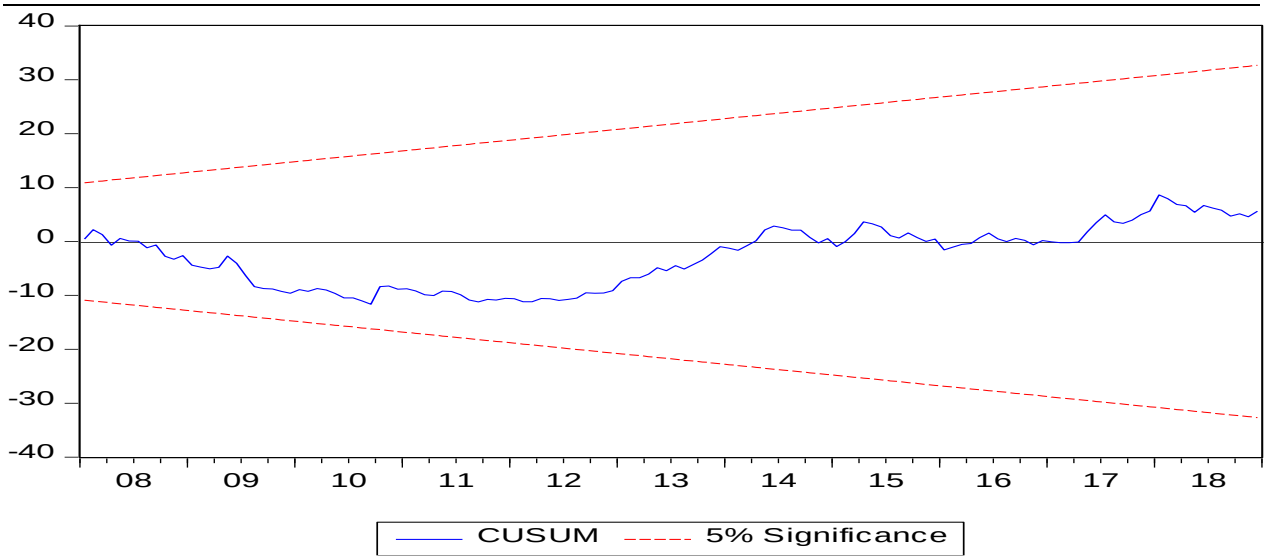
Tests		Outcomes	
		Coefficient	Probability
Breusch-Godfrey-Serial-Correlation Test	F-stat.	0.229593	0.7952
Heteroscedasticity-ARCH Test	F-stat.	0.160150	0.6897
Normality Test	Jarque-Bera	4.219867	0.1212

Source: Authors Computation, 2019 (Eviews-10)

The SMC model result as presented in Table 9 revealed that there was no evidence of serial correlation and heteroskedasticity in the estimated first differenced ARDL model as the p-values of both (0.7952 and 0.6897) were found to be greater than 0.05 or 5percent. Furthermore, the Jarque-beta test for normal distribution revealed that the result attained a normal distribution with a bell-shaped symmetrical distribution at a 5percent significance level. This was captured by the Jarque-Bera probability value of 0.1212 and found to be greater than 0.05.

Lastly, the CUSUM stability tests in Figure 1 revealed the recursive residuals are within the critical 5% significant lines, which indicate the absence of structural change or misspecification in the estimated model. This suggests that the stability of the estimated coefficients is verified.

Fig. 1 CUSUM Stability Tests



Source: Authors Computation (2019)

VII. DISCUSSION OF FINDINGS

Findings from the study revealed that volatility in equity investment of foreign portfolios has a significant impact on total market capitalization in Nigeria. The implication of this result is that increased foreign investment in equity, as well as the variations in such investment, has hugely impacted significantly on the development of the capital market in Nigeria within the period under review. The findings here are in line with Gathenya (2015)whose results showed that there was a positive and statistically significant correlation between Equity Foreign Portfolio Investments and the total market development in Kenya. The findings allude to a strong connection between both variables and that as Equity Foreign Portfolio Investments increases there is a correspondent increase in total market development. More, his result of the causal relationship between both variables indicated that EFPI significantly impacts total market capitalization.

However, it was discovered from the analysis that volatility in the bond investment of foreign portfolios has no significant impact on total market capitalization in Nigeria between 2007 and 2018. Information asymmetries that exist within capital market operations, as well as the unpredictability of the activities of the international markets hugely contributes to volatilities of foreign portfolio investment in a bond that impacts insignificantly on capital market development in Nigeria. This is in line with Adesola and Arikpo (2017) whose study revealed that capital market performance and capital market liquidity have no short-run causal relationship with foreign portfolio investment in Nigeria; and more so, that capital market is not significantly influenced by foreign portfolio investment. This study however contradicts the results of Iriobe, Obamuyi, and Abayomi, (2018) whose study showed that foreign portfolio investment in bond stocks has a positive and significant effect on the volume of stocks traded in the capital market both in the short and long run.

Lastly, the study revealed that volatility in money market investment of foreign portfolios has no significant impact on total market capitalization in Nigeria. The global financial crises witnessed in 2008/09 and the recent recession the economy witnessed in Nigeria between 2016-2017 created a dwindling fortune in the activities of Nigeria's capital exchange markets. This made an investment in interest-yielding bonds to be unstable and highly volatile and as a result, impacted greatly on capital market development in Nigeria. These findings agree with Ogbuagu and Ewubare (2014), whose study showed that Net foreign direct investment and Net Portfolio Investment do not granger-cause Market Capitalisation and they do not significantly impact capital market development in Nigeria.

VIII. CONCLUSION AND RECOMMENDATIONS

The study has shown that foreign portfolio investment inflows are important to the development of the capital market of any nation that is the recipient of these inflows. However, the volatility of these foreign investments during the global economic crunch impacts hugely on the development of the capital market which occurs during spontaneous reversals in foreign portfolio investment flows. Conclusively, the study revealed the existence of significant symbiotic connectivity between

the volatility of foreign portfolio investment in equity and total market capitalization; while an insignificant relationship exists between the volatility of foreign portfolio investment in bond and money market and capital market development (proxied by total market capitalization). The study thus concludes that the unpredictability and asymmetric behavior of foreign portfolio investments has an insignificant impact on capital market development between 2007M1 and 2018M12.

Based on these findings, the following recommendations were raised:

i. There is a need to further strengthen the supervisory and regulatory frameworks in the financial system to ensure strict compliance with various policies targeted at tracking and controlling indiscriminate capital transmission via foreign portfolio investments transactions in equity. Inbuilt loopholes which encouraged asymmetric moves by capital market players that secretly execute security procurement mandates from any source without proper documentation should be discouraged so as to enhance the capital market development.

ii. There is the need for capital market regulatory authorities to develop and implement proper policies that could cushion the effect of unpredictable global activities that reverses the gains made in foreign investments in bonds. This could be done by ensuring that a robust re-investment incentive policy or roll-over window package is established to encourage retention of foreign portfolio investment proceeds within the system to enhance the capital market development.

iii. Regulatory authorities are encouraged to develop an appropriate policy framework that would sustain the operations and activities of the capital market at any point in time. This will help curb foreign portfolio outflows within the financial institutions and minimize reversals of foreign portfolio investments in the money market. It will also help to minimize the rate of flight capital through illegal and indiscriminate repatriation of investment proceeds through foreign portfolio investment channels.

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