European Journal of Business and Innovation Research
Vol.12, No.6, pp.,1-22, 2024
Print ISSN: 2053-4019(Print)
Online ISSN: 2053-4027(Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

Response of Nigeria's Stock Market to Portfolio Investment Flux: Asymmetric Evidence

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doi: https://doi.org/10.37745/ejbir.2013/vol12n6122 Published August 25, 2024

Citation: Uguru N.E., Nwokoro A. and Okpara R.M. (2024) Response of Nigeria's Stock Market to Portfolio Investment Flux: Asymmetric Evidence, *European Journal of Business and Innovation Research*, Vol.12, No.6, pp.,1-22

Abstract: *The study investigates the nonlinear effects of foreign portfolio investment on the Nigerian stock market. Quarterly data was sourced from CBN statistical bulletin spanning from first quarter of 2005 to last quarter of 2022. Econometric pretest was conducted. Results from the NARDL model show significant persistence in the All Share Index (ASI), where past values strongly influence current values, aligning with momentum and short-term dynamics studies. Bond Portfolio Foreign Investment (BPFI) has a slightly positive but not robust effect on ASI, serving more as a stabilizer than a driver. Equity Portfolio Foreign Investment (EPFI) lacks an immediate impact but may affect ASI with a delay, illustrating the complex influence of foreign equity on market indices. The analysis of market capitalization (MCAP) reveals that while immediate increases in BPFI boost MCAP, lagged increases may cause reversals, and EPFI's effects suggest initial destabilization followed by stabilization. These results reflect the transient and sometimes destabilizing effects of foreign capital flows in emerging markets. The study recommends that policymakers develop strategies to manage both short-term and long-term impacts of foreign investments. This could include controlling the pace of capital flows and creating incentives for long-term investments to reduce market volatility and enhance stability.*

Keywords: stock market, portfolio investment, asymmetry
JEL Classification: G15, G11, C49

INTRODUCTION

Foreign portfolio investment (FPI) involves international investors buying stocks, bonds, and other financial assets in another country's market. In Nigeria, this means foreign investors acquire Nigerian assets to gain economic exposure and potential returns (Okolie &Ehiedu, 2023). FPI includes securities held by foreigners without direct ownership or control, making it relatively liquid and subject to market fluctuations.

FPI is vital for capital inflow, providing liquidity, enhancing market efficiency, and supporting economic growth. It enables international diversification and benefits from Nigeria's potential as one of Africa's largest economies. According to Adeleke et al. (2004), foreign investors often pursue short-term gains while managing risks. Nigeria has actively sought FPI to spur economic development and industrialization.

Researchers and policymakers agree that foreign capital inflows can stimulate economic growth. Khan (2007) observed that such inflows increase capital stock, employment, and technological transfer, while Chenery et al. (1966) highlighted the need for external financing to close the savings-investment gap in developing countries. Akinwale and Adekunle (2019) noted that globalization has led to increased foreign capital in developing economies, improving domestic capital efficiency and boosting investment and competitiveness.

The Nigerian Stock Exchange (NSE) is the primary venue for FPI in Nigeria, where investors can trade shares of Nigerian companies or invest in government bonds. The NSE has regulations like the "national investor's protection fund" to enhance investor confidence. Nigeria relies on FPI to address the savings-investment gap (Eniekezimene, 2013).

However, FPI in Nigeria faces challenges such as regulatory uncertainty, currency volatility, political instability, and reliance on oil exports, which can affect its attractiveness. Iriobe et al. (2018) noted that despite increased FPI, the Nigerian market remains susceptible to shocks, as highlighted during the 2008 global financial crisis.

Nigeria has seen growth in FPI due to government reforms, including a flexible exchange rate system and improved business conditions. These changes have boosted FPI inflows, aiding

economic development and deepening financial markets. Nonetheless, some researchers, like Yaha, Singh, & Rabanal (2017), argue that FPI's short-term, volatile nature can negatively impact host economies. Osinubi and Amaghionyeodiwe (2010) suggest that FPI often reflects ownership changes rather than actual investment increases, with investors seeking quick returns.

This study will examine the impact of FPI on Nigeria's stock market development using indicators such as the all-share index and market capitalization. It differs from previous research by decomposing FPI into Equity Foreign Portfolio Investment, Bond Foreign Portfolio Investment, and Net Foreign Portfolio Investment. It will also explore the non-linear relationship between FPI and market development using the non-linear autoregressive distributed lag model (NARDL) and determine the causality between stock market development and FPI. The paper is organized as follows: Section 2 reviews the literature, Section 3 outlines the methodology, Section 4 presents data analysis and discussion, and Section 5 offers recommendations.

LITERATURE REVIEW

Trends in Foreign Capital Inflows to Nigeria (1980-2022)

From 1980 to 2022, Nigeria's capital inflows fluctuated significantly, largely driven by oil prices. High oil prices in the 1980s boosted foreign direct investment (FDI) and portfolio investments (FPI). Conversely, oil price drops reduced capital inflows, causing economic challenges. Essien and Onwioduok (2015) noted increased capital flows to emerging markets since 1986, but sub-Saharan Africa, including Nigeria, received a smaller share. Nigeria's capital inflows fell from 7.3% in 1989 to 1.56% in 1994. The structural adjustment program (SAP) in the 1980s and early 1990s aimed to attract foreign investment with market-oriented reforms, boosting FDI. In the late 1990s and early 2000s, privatization and liberalization policies spurred FDI, particularly in telecommunications and banking, to diversify the economy beyond oil.

Political instability, corruption, and infrastructural issues, alongside global financial crises in the 2000s, reduced capital inflows. However, the 2010s saw a resurgence in FDI due to economic diversification, infrastructure development, and business-friendly reforms, especially in the

technology sector. The COVID-19 pandemic in the 2020s led to a decline in capital inflows due to disrupted investment flows, reduced oil demand, and global trade impacts.

Overall, Nigeria's capital inflows have been influenced by oil prices, economic policies, political stability, global economic conditions, and sectoral reforms. While the country has experienced growth and attracted foreign investment, challenges and external shocks have caused fluctuations in its economic landscape.

Portfolio Theory of International Capital Flows (PTICFs)

Developed by Michael and Makoto in 2006, the Portfolio Theory of International Capital Flows explains the movement of investment funds between countries. It posits that investors diversify their portfolios to reduce risk and enhance returns by allocating funds across various asset classes and markets. Factors such as expected returns, risks, asset correlations, and investors' risk appetites guide this allocation.

Ndugbu, Otiwu, and Uzowuru (2021) highlighted the theory's emphasis on nominal bonds and net foreign assets in facilitating capital flows. Investors are drawn to regions offering higher returns for a given risk level and consider diversification benefits to reduce overall portfolio risk. The theory also considers interest rates, exchange rates, and political stability in investment decisions. Higher interest rates, stable political environments, and strong currencies attract capital inflows as investors seek higher returns and safer investments. However, speculative movements and market sentiments can influence capital flows, making them volatile and unpredictable, posing risks and challenges for both source and recipient countries.

Empirical Review

Previous studies on this topic is rich and diverse, we chronologically arranged them as follows Okolie and Ehiedu (2023) examined the link between Foreign Portfolio Investment (FPI) and the Nigerian Stock Exchange (1981-2022), using total market capitalization as a proxy. Analyzing secondary data from World Bank indicators and the Central Bank of Nigeria, they employed the Augmented Dickey-Fuller unit root test and Johansen co-integration test. Results showed FPI positively, but insignificantly, impacted market capitalization, recommending stronger market

regulation. Ehiedu, Onuorah, and Owonye (2023) studied the correlation between foreign investment inflows and Nigeria's economic growth, using variables such as FPI, FDI, capital market instruments, interest rate, real exchange rate, and GDP. Analyzing data from the Central Bank of Nigeria with an autoregressive distributed lag model, they found mixed impacts of foreign investments on economic growth.

Ehiedu (2022) studied the influence of foreign portfolio investment variations on market capitalization in Nigeria using monthly data between January 2007 and December 2018. The analysis was done on EGARCH and ARDL framework. The study showed that total market capitalization significantly responds to fluctuations in equity investment flux in foreign portfolios. On the other hand, they discovered that foreign portfolios volatility bond investments showed no substantial effect on total market value within the period of investigation. Finally the study reported that Nigeria's total market capitalization is not affected by variations in the money market indexes.

Agu, Ogu, and Ezeanyeji (2019) evaluated the nexus between foreign portfolio investment and Nigerian stock market return using Ordinary Least Square (OLS) and ARDL model, which is based on the bound test approach to cointegration and unconstrained error correction model. The findings of the study showed that foreign portfolio equity investment improves the Nigerian stock market performance at 5% level of significant. Nwonodi (2018) examined the impact of foreign portfolio investment (FPI) on the Nigerian capital market. The study, using data from the Stock Exchange Annual Report and ordinary least squares techniques, found that FPI in bonds and government securities negatively affected the all share Price Index, while FPI in equities and net FPI positively impacted it. Additionally, FPI negatively influenced market capitalization. Granger Causality and ADF tests were used to determine the direction of causality and stationarity, respectively.Akinmulegun (2018) highlighted the importance of Nigeria's capital market in attracting foreign capital inflows. Using data from 1981 to 2016 sourced from the Central Bank of Nigeria, the study employed a vector error correction model to analyze short-run and long-run

relationships. It found that market capitalization negatively influences portfolio investment, while the all share Index has a positive impact on foreign portfolio investment.

Iriobe, Abayomi, and Obamuyi (2018) investigated the impact of foreign portfolio investment in bond stocks on Nigerian stock market profitability. Monthly data from 2007 to 2017, sourced from the national statistical bulletin, was analyzed using an autoregressive distributed lag model. The study revealed a positive impact of foreign portfolio investment in bond stocks on the Nigerian stock market. It recommended that regulators enhance foreign investment in bond stocks to attract more equity investments.Onyeisi, Anoke, and Odo (2018) investigated the impact of foreign portfolio investment on Nigeria's stock market from 1986 to 2014. Their study, using Granger causality and cointegration tests, identified a long-term relationship, prompting the use of a vector error correction model (VECM). However, they did not find evidence of causality between foreign portfolio investment and the Nigerian stock market during the study period. They recommended that monetary authorities should tighten regulations on foreign transactions due to Nigeria's increasing imports. They also suggested improving local production and market conditions to reduce foreign portfolio investment inflows.

Adesola and Arikpo (2017) employed ARDL on data from 1984 to 2015 to explore the relationship between foreign portfolio investment and Nigeria's financial market. Their findings indicated no direct causal link between the Nigerian capital market, foreign portfolio investment, and liquidity. Furthermore, they concluded that the relationship between foreign portfolio investment and the financial market lacked significance. Kunofiwa (2017) conducted a study on portfolio investment across 14 European and Asian developing countries, focusing on its impact on economic growth. To address endogeneity concerns between portfolio investment and economic growth, the study utilized the generalized method of moments (GMM). It found that foreign portfolio investment had an insignificant yet positive impact on economic growth in these emerging markets. Ajayi, Adejayan, and Obalade (2017) investigated the connection between foreign portfolio investment and the capital market in Nigeria using secondary data spanning 1986 to 2014. They applied unit root and cointegration tests (ADF and Johansen tests), confirming a long-run relationship between

the study variables. Their error correction model (ECM) results highlighted significant positive impacts of both foreign portfolio investment and foreign direct investment on market capitalization. They recommended enhancing inflows of both types of investment into Nigeria's economy.

Additional studies, such as those by Okpoto (2015), Elekwa, Aniebo, and Ogu (2016), and Ozurumba (2012), reported that increased FPI significantly boosts Nigeria's economic activities. Eniekezimene (2013) and Ali et al. (2012) noted positive impacts of FPI on capital market growth and local stock markets, while Ekeocha, Oduh, and Malaolu (2012) identified key factors influencing FPI inflows, including market capitalization, trade openness, interest rate, and real exchange rate.

There exists plethora of studies that examined the relationship between capital market and foreign portfolio investment in Nigeria as shown in the above literatures review.Some focused on the impact of FPI on market development, including Eniekezimene (2013), Apere and Baghebo (2014), Onyeisi, Anoke, and Odo (2018), Nwonodi (2018), and Ehiedu (2022). Others, like Ajayi, Adejayan, and Obalade (2017), Agu, Ogu, and Ezeanyeji (2019), and Okolie and Ehiedu (2023), examined the nexus between FPI and the capital market. Studies on the determinants of FPI include Ekeocha, Oduh, and Malaolu (2012), Akinmulegun (2018), and Ehiedu, Onuorah, and Owonye(2023).Various econometric techniques were applied: ordinary least square (OLS) by Eniekezimene (2013), Ajayi, Adejayan, and Obalade (2017), Akinmulegun (2018), and Okolie and Ehiedu (2023); autoregressive distributed lag model (ARDL) by Adesola and Arikpo (2017), Iriobe, Abayomi, and Obamuyi (2018), and Agu, Ogu, and Ezeanyeji (2019); vector error correction model (VECM) by Onyeisi, Anoke, and Odo (2018) and Ali et al. (2012); and generalized method of moments (GMM) by Kunofiwa (2017).

This study differs in two ways: it challenges the assumption of a linear relationship between FPI and the capital market, proposing a non-linear approach due to factors deterring foreign investors. It will use a non-linear autoregressive distributed lag model (NARDL) to capture both linear and non-linear relationships.

METHODOLOGY

In carrying out this study, we will make use of time series secondary data. The secondary data will be obtained from central bank of Nigeria statistical bulletin 2021 and World Development Indicator.

Model Specification

This study will adopt and applied Nonlinear Autoregressive Distributed Lag (NARDL) model as recently developed by Shin et al. (2014). The NARDL model is an asymmetric modification of the conventional linear ARDL model of Pesaran, Shin, and Smith (2001).

The functional form of the model can be specified as follows

$$MCAP = f(NFPI, EFPI, BFPI, IFR) \quad (3.1)$$

$$ASI = f(NFPI, EFPI, BFPI, IFR) \quad (3.2)$$

The econometric form of the equations in the linear form is specified:

$$MCAP = \alpha_0 + \alpha_1 NFPI + \alpha_2 EFPI + \alpha_3 BFPI + \alpha_3 IFR + \mu_1 \quad (3.3)$$

$$ASI = \alpha_0 + \alpha_1 NFPI + \alpha_2 EFPI + \alpha_3 BFPI + \mu_2 \quad (3.4)$$

Where;

MCAP = market capitalization, ASI = All share index, NFPI = Net Foreign Portfolio Investment, EFPI = Equity Foreign Portfolio Investment, BFPI = Bond Foreign Portfolio Investment, μ_1 and μ_2 = = Stochastic error terms

α economic parameters to be estimated. Inflation (INF) is included as a control variable in the models to prevent omission errors. These models indicate that the stock market is influenced by net foreign portfolio investment, equity foreign portfolio investment, bond foreign portfolio investment, the inflation rate, and a stochastic error term for other variables. Net foreign portfolio investment, equity foreign portfolio investment, and bond foreign portfolio investment are expected to positively affect stock market development, while inflation is expected to have a negative effect. To ensure robustness, an additional model is estimated to capture asymmetric effects of net foreign portfolio investment (NFPI), equity foreign portfolio investment (EFPI),

bond foreign portfolio investment (BFPI), and inflation rate (IFR) on stock market development, as proxied by market capitalization (MCAP) and the all shares index (ASI).

Nonlinear ARDL

The nonlinear autoregressive distributive lag (NARDL) model, developed by Shin et al. (2014), will be used to investigate the asymmetric effects of foreign portfolio investment on stock market development in Nigeria. This model considers both short-run and long-run negative and positive effects of the variables. This are shown the models below for the two objectives

$$\Delta MCAP_t = \alpha MCAP_{t-1} + (\alpha^{+}\text{NFPI}_{t-1}^{+} + \alpha^{-}\text{NFPI}_{t-1}^{-}) + (\gamma^{+}EFPI_{t-1}^{+} + \gamma^{-}EFPI_{t-1}^{-}) + (\chi^{+}BFPI_{t-1}^{+} + \chi^{-}BFPI_{t-1}^{-}) + (\varphi^{+}IFR_{t-1}^{+} + \varphi^{-}IFR_{t-1}^{-}) + \sum_{J=I}^{n-1}\beta_j \Delta MCAP_{t-j} + \sum_{j=1}^{n-1}(\delta^{+}\Delta\text{NFPI}_{t-1}^{+} + \delta^{-}\Delta\text{NFPI}_{t-1}^{-}) + \sum_{j=1}^{n-1}(\delta^{+}\Delta EFPI_{t-1}^{+} + \delta^{-}\Delta EFPI_{t-1}^{-}) + \sum_{j=1}^{n-1}(\delta^{+}\Delta BFPI_{t-1}^{+} + \delta^{-}\Delta BFPI_{t-1}^{-}) + \sum_{j=1}^{n-1}(\delta^{+}\Delta IFR_{t-1}^{+} + \delta^{-}\Delta IFR_{t-1}^{-}) + \mu_{1t} \quad (3.5)$$

$$\Delta ASI_t = \alpha ASI_{t-1} + (\alpha^{+}\text{NFPI}_{t-1}^{+} + \alpha^{-}\text{NFPI}_{t-1}^{-}) + (\gamma^{+}EFPI_{t-1}^{+} + \gamma^{-}EFPI_{t-1}^{-}) + (\chi^{+}BFPI_{t-1}^{+} + \chi^{-}BFPI_{t-1}^{-}) + (\varphi^{+}IFR_{t-1}^{+} + \varphi^{-}IFR_{t-1}^{-}) + \sum_{J=I}^{n-1}\beta_j \Delta ASI_{t-j} + \sum_{j=1}^{n-1}(\delta^{+}\Delta\text{NFPI}_{t-1}^{+} + \delta^{-}\Delta\text{NFPI}_{t-1}^{-}) + \sum_{j=1}^{n-1}(\delta^{+}\Delta EFPI_{t-1}^{+} + \delta^{-}\Delta EFPI_{t-1}^{-}) + \sum_{j=1}^{n-1}(\delta^{+}\Delta BFPI_{t-1}^{+} + \delta^{-}\Delta BFPI_{t-1}^{-}) + \sum_{j=1}^{n-1}(\delta^{+}\Delta IFR_{t-1}^{+} + \delta^{-}\Delta IFR_{t-1}^{-}) + \mu_{2t} \quad (3.6)$$

Where MCAP, ASI, NFPI, EFPI, BFPI and IFR remain as explained above while $\alpha^{+}, \alpha^{-}, \lambda^{+}\lambda^{-}\chi^{+}, \chi^{-}, \varphi^{+}, \varphi^{-}$ are the associated long run parameters to be estimated and $\beta, \delta^{+}, \delta-$ are the associated short run parameters to be estimated, Δ is the change parameter.

Cointegration Test

We shall rely on the Bound test approach to ascertain the long run relationship between the variables of the study. If the Bound test show any evidence of coitegration among the series, we will proceed to specify the conditional error correction model for equations (3.5) and (3.6) which contain the negative and positive partial sums as:

$$Y_t = \pi y_{t-1} + \lambda^{+}X_{t-1}^{+} + \lambda^{-}X_{t-1}^{-} + \sum_{i=1}^{q-1}\gamma_i \Delta y_{t-1} + \sum_{i=1}^{r-1}(\sigma_i^{+}X_{t-1}^{+} + \sigma_i^{-}X_{t-1}^{-}) + \varphi ECM_{t-1} + \mu_t \quad (3.7)$$

Shin et al. (2014) noted that equation (3.7) adequately corrects for the potentially weak endogeneity of non-stationary explanatory variables adequately in a nonlinear ARDL model. The relationship $-\phi_t^+ = \lambda^+ / q$ and $-\phi_t^- = \lambda^- / q$ are applied while determining the long run coefficients. The null hypothesis which states that no long run relationship exists within the levels of y_t, X_t^+ and X_t^- this gives $q = \lambda^+ = \lambda^- = 0$ will be tested using the bound testing technique proposed and applied by Pesaran et al. (2001). This approach is valid no matter the time series properties of *X*t.

We shall proceed to determine the direction of causality between the variables of the model using Granger causality test. The optimal lag lengths will be selected using Akaike information criteria.

Tests for Asymmetry

The Wald test which has the null hypothesis of no asymmetry in the long run coefficients $(\phi_1^+ = \phi_1^-)$ for model as well as $(\sigma_i^+ = \sigma_i^-)$ for the short run coefficients will be estimated. If the result proves otherwise, we reject the null hypothesis. Wald test for asymmetry (for short-run and long-run) which is crucial to this study will be tested. This test is based on the null hypothesis that positive and negative variations in foreign portfolio investment inflows has direct opposite influence on stock market development in Nigeria. The decision rule states that if the probability of the Wald test is above conventional significance level of 1% or 5% significant level, conclusion of no asymmetry is accepted. Conversely, if the probability is below the 1% or 5% significant level, we reject the null hypothesis and conclude that there exists asymmetric effect of foreign portfolio investment inflows on stock market development in Nigeria.

Unit Root Test

We will proceed to ascertain the time series properties of the data using Philip Peron (PP) and Augmented Dickey Fuller (ADF) unit root test also we relied on descriptive statistics to establish the basic statistical properties of the data.

Post-estimation tests

Post-estimation or diagnostics tests such as normality, linearity, serial correlation, and heteroskedasticity tests of the models will be carried out.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1: Descriptive Statistics

ASI	BPFI	EPFI	MCAP	NFPI
30388.26	1.84E+10	1.43E+09	16358.02	-2.93E+09
27961.95	1.48E+10	8.98E+08	16530.42	-1.87E+09
57990.20	6.17E+10	9.96E+09	28849.18	3.69E+09
20730.63	-8.31E+09	-1.55E+09	2900.060	-1.50E+10
8641.111	1.85E+10	2.58E+09	7811.379	4.69E+09
1.783872	0.901705	2.080993	0.034737	-1.045409
6.360154	3.184999	7.327641	1.926182	3.659459
72.05829	9.859537	108.1518	3.473737	14.41921
0.000000	0.007228	0.000000	0.176071	0.000739
2187955.	1.33E+12	1.03E+11	1177777.	-2.11E+11
5.30E+09	2.42E+22	4.74E+20	4.33E+09	1.56E+21
72	72	72	72	72

Author's computation

Table 1 presents various economic indicators for Nigeria's stock market, including the All Shares Index (ASI), Bond Foreign Portfolio Investment (BFPI), Equity Foreign Portfolio Investment (EFPI), Market Capitalization (MCAP), and Net Foreign Portfolio Investment (NFPI). ASI and MCAP values fluctuate, indicating changing market performance. BFPI and EFPI reflect varying levels of foreign interest in bonds and equities. NFPI shows both positive and negative values, indicating periods of net inflows and outflows of foreign investments. Significant changes in ASI and MCAP correspond to shifts in foreign investment levels, impacting the market positively and negatively. Statistical measures like mean, standard deviation, and cumulative sums provide insights into data distribution, variability, and overall investment impact. High variance in BFPI and EPFI suggests instability, while negative NFPI values in some periods indicate net outflows, potentially signaling economic challenges.

Unit Root Test

Table 2: Unit Root Tests

Augmented Dickey-Fuller Unit Root test (AGF)				**Philips-Perron Unit Root Test (PP)**				
Variables	**Level**	**1st Difference**	**Critical Values**	**Level**	**1st difference**	**Critical Values**	**Integration order**	**Prob. value**
ASI	-2.86	-6.46*	1% -3.54 5% -2.91* 10% -2.59	-2.92	-8.25*	1% -3.54 5% -2.91* 10% -2.59	*I*(1)	0.0000
MCAP	-0.98	-8.71*	1% -3.53 5% -2.90* 10% -2.59	-0.93	-8.74*	1% -3.53 5% -2.90* 10% -2.59	*I*(1)	0.0000
BFPI	-1.41	-8.25*	1% -3.53 5% -2.90* 10% -2.59	-1.45	-8.25*	1% -3.53 5% -2.90* 10% -2.59	*I*(1)	0.0000
EPFI	-2.15	-8.25*	1% -3.53 5% -2.90* 10% -2.58	-2.25	-8.25*	1% -3.53 5% -2.90* 10% -2.58	*I*(1)	0.0000
NPFI	-2.19*		1% -2.60 5% -1.95* 10% -1.61	-2.31*		1% -2.60 5% -1.95* 10% -1.61	*I*(0)	0.0214

*Source: Author's computation (*shows the variable is stationary at 5% level of significant)*

Table 2 above present the unit root stationarity tests using Augmented Dickey Fuller unit root test and Philips-Perron unit root test, the two test results shows that all the variables are stationary at distinct order (i.e *I*(0) and *I(1))*. From the table 2, Net portfolio foreign investment (NPFI) is stationary at level *I*(0), since their ADF and PP values is less than the critical values at 5% level of significance while All share index (ASI), Stock market capitalization (MCAP), Bond portfolio investment (BPFI), Equity portfolio foreign investment (EPFI) were found to be stationary after the first difference *I*(1) since their ADF and PP values were less than the critical values at 5% level of significance.

Null hypothesis of no unit root was accepted for Net portfolio foreign investment at level form but was rejected after 1st difference. Also null hypothesis of no unit root was rejected for, ASI, MCAP, BPFI and EPFI after the 1st difference. Thus, we conclude that the variables under investigation

are integrated at level ($I(0)$) and after first difference ($I(1)$). Thus, we have a combination of order of integration.

We then examined the cointegration relationship among the variables using the NARDL bound test for model one, as presented in Table 3 below

Table 3A: NARDL Model Bounds Test for ASI, BPFI, EPFI and NPFI

Test Statistic	Values	K	Lower bound(I0)	Upper bound(I1)	Significant level
F-statistic	2.2068	6	2.27	3.28	5%

Source: Author's computation

Table 3B: NARDL Model Bounds Test for MCAP, BPFI, EPFI and NPFI

Test Statistic	Values	K	Lower bound(*I*0)	Upper bound(*I*1)	Significant level
F-statistic	1.3761	6	2.55	3.28	5%

Source: Author's computation

From Table 3A and 3B, the results confirmed the mixed order integration of the variables of the study, thus, there is no evidence of cointegration between All share index and the regressors and market capitalization and the independent variables at 5% level of significance.

Results of NARDL

Table 4A: Estimated NARDL for ASI and BPFI,NPFI, EPFI model

Dependent Variable: ASI				
ASI(-1)	0.729680	0.075044	9.723323	0.0000
BPFI_POS	4.47E-07	2.29E-07	1.948790	0.0562
BPFI_POS(-1)	-4.21E-07	3.03E-07	-1.385977	0.1712
BPFI_POS(-2)	-3.93E-07	2.42E-07	-1.625145	0.1096
BPFI_NEG	5.99E-08	1.16E-07	0.516624	0.6074
EPFI_POS	-7.45E-07	1.13E-06	-0.658712	0.5127
EPFI_POS(-1)	9.04E-07	1.44E-06	0.625894	0.5339
EPFI_POS(-2)	2.15E-06	1.16E-06	1.855832	0.0686
EPFI_NEG	3.03E-08	5.87E-07	0.051579	0.9590
NFPI_POS	-1.86E-07	2.52E-07	-0.737799	0.4637
NFPI_NEG	-1.24E-07	3.13E-07	-0.394996	0.6943
C	10904.47	3408.801	3.198917	0.0023

Source: Author's computation

From table 4A, the NARDL model results for the All Share Index (ASI) indicate that the previous value of ASI has a strong and significant influence on its current value, as evidenced by the highly

significant coefficient of the lagged ASI (0.729680, p-value = 0.0000). This suggests a high level of persistence in the ASI over time. The Bond Portfolio Foreign Investment (BPFI) shows a marginally positive effect on ASI when there are positive changes, with a coefficient that is nearly significant (p-value = 0.0562). However, lagged positive changes in BPFI do not significantly impact ASI, nor do negative changes in BPFI.

Similarly, the Equity Portfolio Foreign Investment (EPFI) does not have a significant immediate impact on ASI, although a lagged positive change in EPFI (at a 2-period lag) shows a p-value (0.0686) close to significance, hinting at a possible delayed effect. Changes in the Net Portfolio Foreign Investment (NFPI), whether positive or negative, do not significantly affect ASI, as indicated by the non-significant coefficients. The model's constant term is positive and highly significant (p-value = 0.0023), reflecting a stable baseline level of ASI independent of the variables included. Overall, while past ASI values are crucial in predicting current ASI, the effects of BPFI, EPFI, and NFPI on ASI are not consistently significant. The results suggest that while past values of the All Share Index (ASI) strongly influence its current value, the effects of Bond Portfolio Foreign Investment (BPFI), Equity Portfolio Foreign Investment (EPFI), and Net Portfolio Foreign Investment (NFPI) on ASI are not consistently significant.

Table 4B: Estimated NARDL for MCAP and BPFI,NPFI, EPFI model

Dependent Variable: MCAP				
MCAP(-1)	0.833363	0.072733	11.45784	0.0000
BPFI_POS	2.89E-07	5.39E-08	5.368643	0.0000
BPFI_POS(-1)	-3.18E-07	5.68E-08	-5.600781	0.0000
BPFI_NEG	2.03E-08	2.68E-08	0.756715	0.4522
EPFI_POS	-9.10E-07	3.02E-07	-3.009516	0.0038
EPFI_POS(-1)	1.09E-06	3.13E-07	3.476645	0.0010
EPFI_NEG	-1.79E-08	1.36E-07	-0.130970	0.8962
NFPI_POS	2.42E-08	6.45E-08	0.375126	0.7089
NFPI_NEG	-2.92E-07	1.13E-07	-2.573623	0.0126
NFPI_NEG(-1)	1.95E-07	1.13E-07	1.728074	0.0892
C	1282.473	615.8056	2.082594	0.0416

Source: Author's computation

The results from table 4B shows the NARDL model, where the dependent variable is market capitalization (MCAP), indicate that past values of MCAP have a strong and significant impact on its current value, as reflected by the highly significant coefficient of the lagged MCAP (0.833363, p-value = 0.0000). This suggests a high degree of persistence in market capitalization over time. The results also show that positive changes in Bond Portfolio Foreign Investment (BPFI_POS) have a significant positive impact on MCAP (p-value = 0.0000), although the lagged positive changes in BPFI (BPFI_POS(-1)) have a significant negative impact on MCAP (p-value = 0.0000). This indicates a complex relationship where immediate increases in BPFI boost market capitalization, but these effects may reverse over time. Negative changes in BPFI (BPFI_NEG), however, do not have a significant effect on MCAP.

In contrast, positive changes in Equity Portfolio Foreign Investment (EPFI_POS) have a significant negative immediate impact on MCAP (p-value = 0.0038), but the lagged positive changes (EPFI_POS(-1)) reverse this effect, showing a significant positive impact on MCAP (p-value = 0.0010). This suggests that while initial increases in EPFI may reduce market capitalization, this effect is offset or reversed in subsequent periods. Negative changes in EPFI (EPFI_NEG) do not significantly affect MCAP. For Net Portfolio Foreign Investment (NFPI), neither positive changes (NFPI_POS) nor lagged negative changes (NFPI_NEG(-1)) have a significant impact on MCAP, although immediate negative changes in NFPI (NFPI_NEG) do have a significant negative effect (p-value = 0.0126). The constant term is positive and significant (p-value = 0.0416), indicating a baseline level of market capitalization independent of the included variables.

Diagnostic Tests

Table 5A: Test of Asymmetry, Normality, Serial Correlation and Heteroscedasticity for model one

Variable	Coefficient	Prob
$\phi_1^+ = \phi_1^-$	4.690109	0.0345
Jarque-Bera normality test:	38.33551	0.0000
Breusch-Godfrey serial correlation LM test	1.807697	0.1736
ARCH heteroscedasticity test	0.621266	0.4334

Source: Author's computation

Table 5B: Test of Asymmetry, Normality, Serial Correlation and Heteroscedasticity for model Two

Variable	Coefficient	Prob
$(\sigma_i^+ = \sigma_i^-)$	28.95489	0.0000
Jarque-Bera normality test:	44.44528	0.0000
Breusch-Godfrey serial correlation LM test	0.287984	0.7509
Breush-Pagan-Godfrey heteroscedasticity test	1.160087	0.3356

Source: Author's computation

Table 5A and B shows the Wald test along with other post estimation diagnostic tests that was conducted. Wald test has the null hypothesis that stock market has no asymmetric effect on foreign portfolio investment. From the result the null hypothesis is accepted at the conventional 5% level of significance both in the ASI model $(\sigma_i^+ = \sigma_i^-)$ and MCAP model $(\phi_1^+ = \phi_1^-)$ since the probability values are less than the conventional 5% level of significant. Results of diagnostics test show that the model residuals are abnormally distributed as indicated by Jarque Bera statistic (p = 0.000), it also indicated that the model do not suffer from autocorrelation (p = 0.1736 and 0.7509) respectively and there is no evidence of heteroscedasticity
(p = 0.4334 and 0.3356) for the two models.

DISCUSSION OF RESULTS

The findings from the NARDL model for the All Share Index (ASI) underscore the significant persistence in the ASI, as the previous values strongly influence its current value. This aligns with recent studies that emphasize the momentum effect in stock markets, where past performance tends to predict future trends due to behavioral factors like investor sentiment and market momentum (Narayan et al., 2021). The persistence observed in the ASI also mirrors the findings of Ahmed and Mustafa (2022), who demonstrated that the lagged effects of major indices are crucial in understanding short-term market dynamics in emerging economies. The nearly significant positive effect of Bond Portfolio Foreign Investment (BPFI) on ASI suggests that while bond investments might contribute to market performance, their impact is not robust, particularly in the short term, a conclusion supported by similar research indicating that bond flows often act as a stabilizer rather than a driver of equity market movements (Baker & Wurgler, 2022).

Furthermore, the results indicate that Equity Portfolio Foreign Investment (EPFI) does not have an immediate significant impact on ASI, although the lagged effect suggests a possible delayed response. This delayed effect is consistent with the findings of Chen et al. (2022), who noted that equity investments in emerging markets often exhibit a lag before influencing market indices, due to factors such as market adjustment periods and the initial volatility caused by foreign capital flows. This relationship highlights the complexity of how equity investments interact with broader market indices, with immediate inflows potentially causing volatility before stabilizing and contributing to market growth. This nuanced impact of EPFI is crucial for policymakers and investors who seek to understand the temporal dynamics of foreign investments in equity markets.

The results from the NARDL model for market capitalization (MCAP) further emphasize the complex interactions between different forms of foreign investment and market performance. While positive changes in BPFI immediately boost market capitalization, the negative impact of lagged positive changes suggests a potential reversal over time, a finding that resonates with the work of Li and Giles (2023), who highlighted the transient nature of bond-driven market growth. Similarly, the contrasting effects of immediate and lagged EPFI on MCAP suggest that initial

inflows might destabilize the market, a phenomenon often seen in emerging markets where sudden capital inflows can lead to short-term volatility (Gulzar et al., 2023). However, the reversal of this effect in the following periods indicates that the market eventually absorbs these inflows, leading to a positive impact on capitalization. The significance of negative changes in NFPI on MCAP also aligns with existing research, which points to the destabilizing effects of foreign capital outflows, particularly in markets with less developed financial infrastructures (Alvarez et al., 2022). These findings contribute to the broader understanding of how different types of foreign portfolio investments impact market capitalization and index performance, particularly in the context of emerging markets.

The graph below depicts further the above findings.

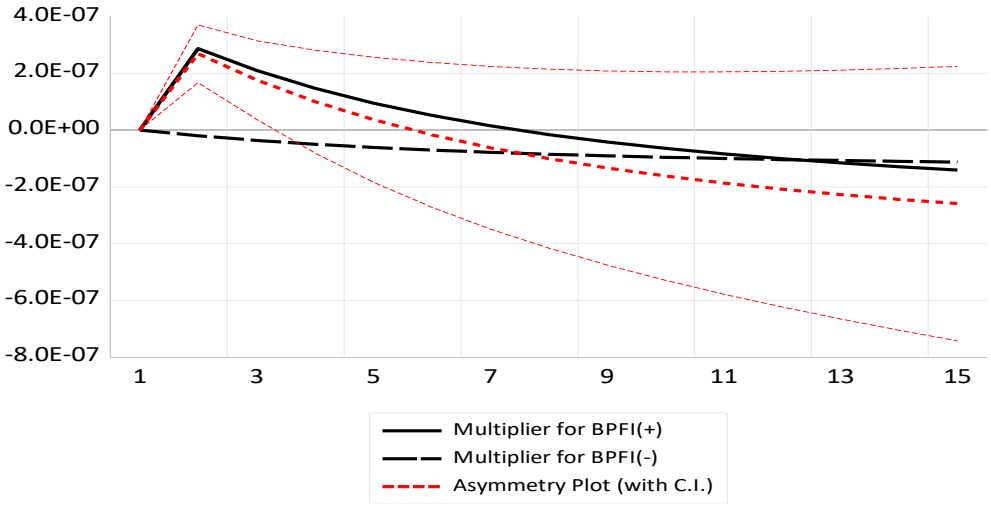

Fig 1: Asymmetric plot of BFPI

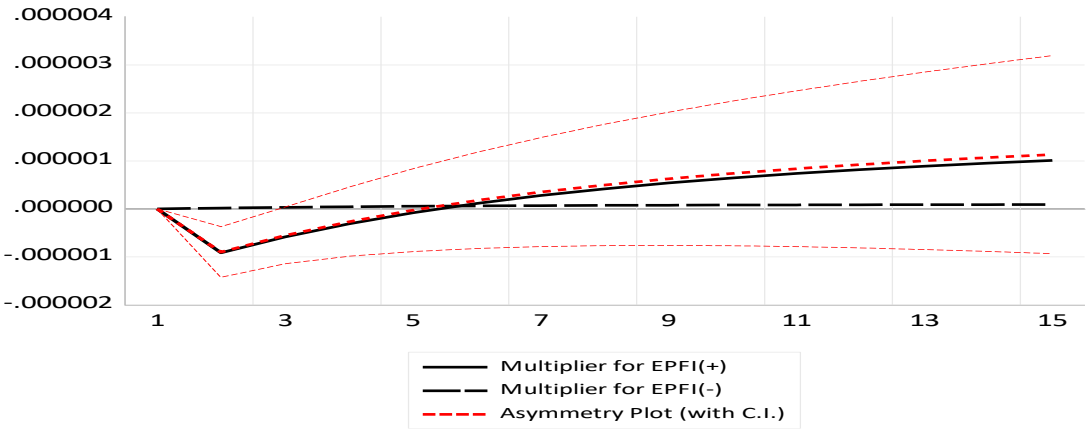

Fig 2: Asymmetric plot of EPFI

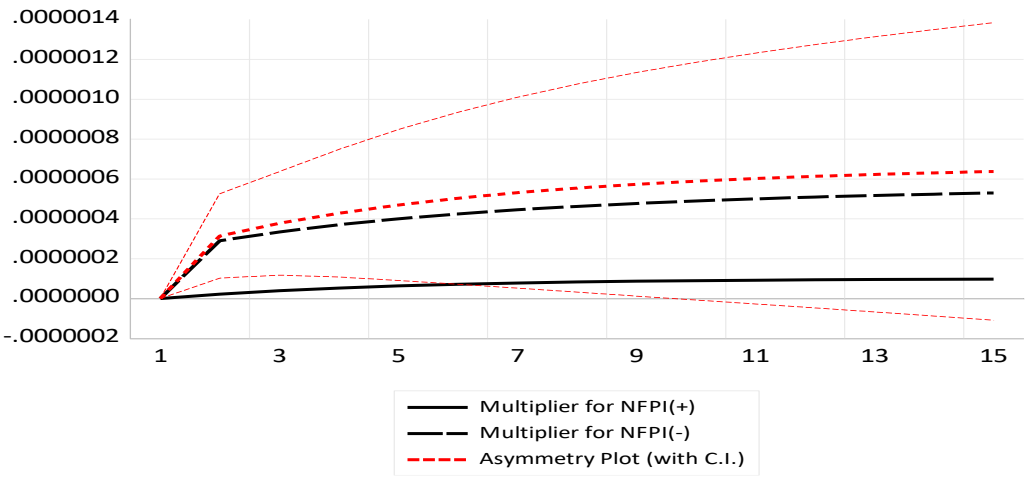

Fig 3: Asymmetric plot of NFPI

CONCLUSION

The aim of the study is to establish the nonlinear impact of foreign portfolio investment on Nigerian stock market. The NARDL model results for the All Share Index (ASI) reveal significant persistence in the ASI, where past values strongly influence its current value, consistent with studies on market momentum and short-term dynamics in emerging economies. Bond Portfolio Foreign Investment (BPFI) shows a marginally positive, though not robust, effect on ASI, reflecting its role more as a market stabilizer than a driver. Equity Portfolio Foreign Investment (EPFI) does not have an immediate impact on ASI but exhibits a potential delayed effect, highlighting the complexity of foreign equity investments in influencing market indices over time. The model for market capitalization (MCAP) further underscores the intricate relationships

between different forms of foreign investment and market performance, with immediate positive changes in BPFI boosting MCAP, while lagged positive changes suggest potential reversals, and EPFI's contrasting effects suggest initial destabilization followed by market absorption and stabilization. These findings align with existing research on the transient and sometimes destabilizing effects of foreign capital flows in emerging markets, offering insights into the temporal dynamics of portfolio investments.

Recommendation

The study therefore recommends that policymakers should consider developing strategic frameworks that address both the short-term and long-term effects of foreign portfolio investments. This could involve implementing policies that manage the pace and volume of foreign capital inflows and outflows to minimize destabilizing impacts. Additionally, creating incentives for longer-term investments and stabilizing mechanisms can help mitigate the potential reversals observed in market capitalization, fostering a more resilient and predictable investment environment.

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