

A Test of Positive Feedback Trading among Foreign Portfolio Investors in Nigeria

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Abstract: It has been established in the literature that the trading behavior of international investors may increase market vulnerability, especially for emerging markets. Consequently, this study examines whether positive feedback trading exists in the Nigerian stock market. Both descriptive and inferential analyses are carried out on monthly data covering the period 2013 to 2020. Specifically, the ARDL bounds testing approach is employed. Findings indicate that positive feedback trading exists in the market, as stock returns have positive and significant influence on foreign portfolio inflows. The results further show that this trading pattern becomes more prominent with rising economic growth. The findings again reveal that the exchange rate and the interest rate explain the foreign portfolio inflows in the Nigerian market. The study's outcomes lend support for the pull theory in explaining the foreign portfolio inflow. However, no evidence is found in support of the push theory, as an explanation for the foreign portfolio inflow as the "OPEC basket crude oil price" is insignificant. It is thereby recommended that regulators should adopt measures that will help foreign investors to be better informed about the Nigerian market, in order to reduce their positive feedback trading behavior. Moreover, there is a need for the government to put in place policies targeted toward enhancing the growth of the stock market and the economy. In this way, the negative impact of such trading behavior will be minimal, as short-term trading by foreign investors will be reduced and the foreign portfolio inflows will be sustainable.

Keywords: foreign portfolio inflow, stock market, stock returns, positive feedback trading

JEL Classification: F21, G11, O11

Introduction

International capital flows bring huge benefits for host economies. Amongst others, such investments contribute to increasing the depth of the host market as well as deepening liquidity and indirectly contributing to its economic growth. However, the gains from such inflows will be better enjoyed by countries with sound macroeconomic policies. Thus, for emerging markets, these investment types may increase market vulnerability. Researchers and policymakers have argued in recent times that international capital flows exert a destabilising influence on emerging markets, and such influence emanates from their trading behavior in the market (Batra, 2003; Bohl & Reitz, 2006; Chhimwal & Bapat, 2020).

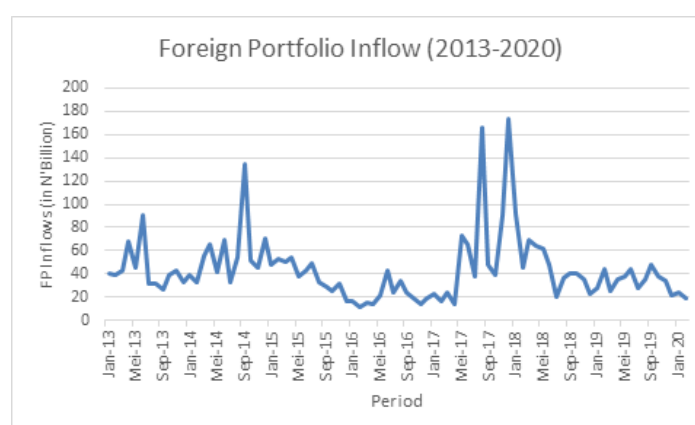
The behavioral approach is one of the ways that the stock market's aggregate behavior can be explained. Due to the heterogeneous setting of emerging markets, differences in the trading styles of investors are expected as a result of their behavioral bias. The heterogeneity is caused by different educational levels, cultural beliefs, investment exposure and financial resources. However, the extant literature shows a convergence in trading patterns arising from a certain prominent behavior. A popular behavior among investors in stock markets is "feedback trading," which involves relying on past prices to trade. As opposed to the expected rational behavior, the extant literature shows that investors are irrational and rely on past prices as the easiest way to make decisions. Thus, they engage in feedback trading, which can be positive or negative. Such trading behavior is considered irrational as it entails ignoring information about other fundamentals. This irrational trading behavior is popular among foreign investors who are induced by exuberance, as opposed to rationality, in their investment options (Batra, 2003). This irrational trading strategy is adopted by foreign institutional investors in pursuit of short-term gains and high returns in emerging markets. Given the huge volume of investment funds at the disposal of foreign portfolio investors, they can move the market by buying a lot when there are better expectations, and withdrawing in bulk when the prospects of the market are weak (Bae, Min & Jung, 2011; Dhingra et al., 2016; Gordon & Gupta, 2003; Kim & Wei, 2002; Kumar & Badhani, 2018), thereby engaging in positive feedback trading.

The motivation for this study is derived from certain factors. In developing economies where financial markets lack depth, irrational trading strategies can cause panic and destabilize the market (Bikhchandani & Sharma, 2001; Caporale et al., 2019; DeLong et al., 1990; Oh, Parwada & Walter, 2008; Tayde & Rao, 2011). Prices can be shifted apart from fundamentals due to these trading strategies (Li, 2021). Such strategies can also cause a mismatch in the demand and supply equilibrium, as well as fluctuations in the price level, thus leading to stock market volatility (Chhimwal & Bapat, 2020; Chiang & Zhang, 2018; Kim & Wei, 2002; Tayde & Rao, 2011). The high volatility of the market, which may be

regarded as mild financial distress in some cases, escalates into a serious financial crisis. Moreover, such trading strategies are likely causes for the negative return autocorrelation observed in times of increased volatility (Angelidis, Koulakiotis & Kiohos, 2018; Bohl & Reitz, 2006; Sentana & Wadhvani, 1992). Therefore, irrational trading strategies are causes of concern for stock markets as they can weaken the financial system.

This paper seeks to examine the existence of positive feedback trading in an emerging market setting. A study of the behavior of foreign portfolio investment (FPI) holders is very significant for an economy where international investment is gaining more importance as a source of external finance. Bikhchandani and Sharma (2001) assert that there is a need for more empirical work to be conducted on irrational trading behavior in emerging markets, where the evidence suggests that there is likely to be a greater tendency for such behavior. This greater tendency for irrational behavior in emerging markets is a result of their weaker structures, as compared to those of the developed markets. Moreover, non-fundamental trading behavior such as feedback trading strategies are more pronounced in developing economies compared to developed countries (Bekaert & Harvey, 2003; Bohl & Siklos, 2004). In this study, it is examined whether positive feedback trading exists in the Nigerian market, which is also considered an emerging market. The paper further investigates whether this behavior holds or is more prominent during periods of economic downturn.

The motivation for this study is due to the recent decline recorded in the Nigerian stock market's performance, which coincides with a significant decrease in foreign portfolio participation. For instance, the stock market index recorded a decline of 20.65% in Q1 of year 2020 (21,300.07 points) compared to 26,842.07 points recorded in Q1 of 2019 (Proshare, 2021). Coincidentally, foreign portfolio inflows into the equity market recorded a significant decline almost throughout the same period, as presented in Figure 1. This coincidence may be suggestive of positive feedback trading in the market.



Source: *Monthly Economic Reports of the Central Bank of Nigeria*

Figure 1. Foreign Portfolio Inflows (2013-2020)

The Nigerian market is considered an ideal laboratory for certain reasons. Firstly, for some years now, the market has become an attractive hub for foreign investors desirous of high risk-adjusted returns. Thus, there is a considerable level of foreign participation, with foreign ownership representing 33.63% of total market capitalization on the Nigerian Stock Exchange (NSE) for the year 2020 (NSE, 2020). The market imposes no restriction (except in the oil and gas sector) on foreign ownership. Secondly, the NSE is chosen as the sample market because it is one of the biggest in Africa. According to Statista (2021), Nigeria was recorded as having the best performing stock market in Africa for the year 2020. As at the end of February 2021, the total market capitalization of the NSE was approximately USD57 billion. Most importantly, studies on the trading behavior of investors on the NSE remain scanty.

Thirdly, irrational trading behavior such as positive feedback trading have been discussed extensively for other markets but remain unexplained for the Nigerian market. Results obtained for the other markets may not be applicable to the Nigerian market, due to differences in market structure and policy regulations. A number of studies have investigated the existence of positive feedback trading in other emerging markets. However, to the best of the researcher's knowledge, such trading behavior remains unexplored in the Nigerian market. Moreso, there is no evidence to show that previous studies conducted in other regions have examined whether or not such behavior is driven by economic conditions.

The Nigerian stock market has developed over the years. Restrictions imposed on the free flow of capital were abolished by the Nigerian government, contingent on the need to enhance foreign investment in the country. Consequently, Nigerian law allows wholly foreign-owned companies (except oil and gas companies). Foreign portfolio investment (FPI) inflow has also increased considerably over the years in Nigeria. It rose from 14.8% in 2007 to 33.63% in 2020 (Proshare, 2021). Statistics however show a significant decline in the figures within the period. Evidence suggests that foreign portfolio investors have dominated the market in the past few years, as they own the single largest shareholding in a number of firms. Due to their large shareholdings in the market, their trading behavior has serious implications for market performance.

The remaining part of this write-up is structured as follows; theoretical considerations and a review of empirical literature are presented in the next section, the methodology applied is explained in Section 3, results are provided and discussed in Section 4, while concluding remarks are discussed in Section 5.

Literature Review

Theoretically, international capital flows stem from external (push) factors as well as internal (pull) factors. The difference in the marginal product of capital between countries is the main reason behind international capital flows. That capital flows from developed to developing markets is the assertion of the “traditional neoclassical economic theory.” The assertion is based on the argument that the desire for more returns will cause capital to flow to countries with a lower stock of capital and higher marginal productivity. Thus, where returns are higher, FPI is expected to be higher. A prominent theoretical explanation is offered by Fernandez-Arias and Montiel (1996) in their “return and credit worthiness” model, which states that the credit worthiness of a country is very important for capital flows. In the model, the factors that influence the capital flows are categorized into two factors, which are commonly referred to in the literature as “pull factors” and “push factors.” The pull theory attributes foreign capital flows to fundamentals within the domestic environment, while the push theory attributes FPI to external factors, particularly from industrialized nations. Thus, the explanation for foreign portfolio investment into the host nation is basically given by the push/pull factor theory.

Specifically, the model of Brennan and Cao (1997) gives a theoretical explanation of positive feedback trading. The model suggests that positive feedback trading can be ascertained by looking at how foreign portfolio inflows react to stock returns. The model further states that foreign portfolio net inflows should be a linear function of stock returns in any equity market. Brennan and Cao (1997) argue that investors may not have a cumulative information advantage. However, with marginal positive information coming from equity returns, it is expected that the trade of the investor will be conditional on price changes in the market. Thus, the model predicts a positive relationship between investment flows and equity returns. In other words, “positive feedback trading” according to the model of Brennan and Cao (1997) implies a positive relationship between portfolio flows and stock returns.

Empirically, positive feedback trading involves trading toward the direction suggested by past prices (Bikhchandani & Sharma, 2001; Chauhan & Chaklader, 2020; Chhimwal & Bapat, 2020; Dai & Yang, 2018; DeLong et al., 1990; Li, 2021). Some investors observe the trend in the stock prices and rely on this for their investment decisions, with the expectation that the trend will continue. This trading method involves investors acquiring stocks in a prospering market and dumping the stocks when the market is dwindling. Prominent among the reasons that have been advanced for such behavior are the presence of noise traders whose demands are sentiment-driven (Chau, Deesomsak & Lau, 2011), the low level of information among foreign investors about the host markets (Baba & Sevil, 2021; Edelen & Warner, 2001; Watson & Wickramanayake, 2012), and extrapola-

tive expectations about prices (Chau et al., 2011; Kim & Wei, 2002).

Mixed findings have been reported on the existence of positive feedback trading across different stock exchanges. Sentana and Wadhvani (1992) report the existence of such a trading strategy in the American market in the nineteenth century. In recent times, studies by Angelovska (2013), Belhoula and Naoui (2011), Bohl and Reitz (2006), Bonser-Neal et al. (2002), Hsieh, Tai and Vu (2008), Oh et al. (2008), Richards (2005) and Tayde and Rao (2011) document positive feedback trading strategies among foreign investors. In testing for positive feedback trading, past studies document a positive relationship between international equity flows and stock returns (Froot, O'Connell & Seaholes, 2001; Gerlach & Yook, 2016). Thus, in line with the model of Brennan and Cao (1997), which explains positive feedback trading as a positive relationship between investment flows and stock returns in any equity market, and in line with the past studies that document this positive relationship, this current study postulates that foreign portfolio inflows will increase as stock returns increase.

The extant literature shows that different factors may be useful in explaining this trading behavior. Data series may be important as Batra (2003) finds that positive feedback trading exists daily, although no such evidence is found on a monthly basis for the Indian market. Similarly, Baba and Sevil (2021) report that the behavior of foreign investors varies with time. The residence of foreign investors can also be important in explaining whether they are positive feedback traders or not. Kim and Wei (2002) find that there is a higher likelihood that non-resident foreign investors will engage in positive feedback trading than their resident counterparts in the Korean market. The authors argue that this disparity in trading practices is very likely due to variations in the information available to the foreign investors. Tayde and Rao (2011) also find stock performance to be important in explaining positive feedback trading, which is found to be more prominent for large cap stocks in their study. This finding is linked to the fact that large cap stocks enjoy more liquidity. Similarly, past studies (Belhoula & Naoui, 2011; Kadanda & Raj, 2017; Sentana & Wadhani, 1992) document that positive feedback trading is more prominent when stock prices are highly volatile. The authors opine that this finding is due to the fact that sell decisions are dominant during periods of market volatility. Investor sentiment is also important in explaining positive feedback trading. Chau et al. (2011) observe that the level of feedback trading tends to increase when investors are optimistic. Dai and Yang (2018) likewise find that a high level of investor sentiment induces positive feedback trading. However, the authors report that such trading behavior does not exist when investor sentiment is at the intermediate level.

Chen and Mcmillan (2020) report that positive feedback trading increases during crises due to the lower levels of liquidity that characterize such periods. Contrarily, Choe,

Kho and Stulz (1999) report in an earlier study that the positive feedback trading strategy of international investors ceases during crises. Similarly, Gerlach and Yook (2016) document that foreign investors in the North Korean market engage in positive feedback trading, which disappears on days coinciding with military attacks. Unlike studies that find evidence for positive feedback trading, Khanthavit (2020) finds no evidence to support the trading strategy on the Stock Exchange of Thailand during the COVID-19 period.

Investor trading behavior can be time-variant. Particularly, positive feedback trading (an irrational trading behavior) may exhibit varying trends across time. On one hand, studies such as Ahmed and Sehgal (2015) and Maharaj, Galagedera and Dark (2011) confirm that the movement of stock returns is time-variant. On the other hand, Pagliari and Hannan (2017) show that portfolio flows follow different trends over time for 65 countries, including emerging countries. Thus, the relationship between the two (foreign portfolio inflows and stock returns), which is used to explain positive feedback trading, may vary over time. Such time variations may be drawn from different factors. As earlier mentioned, some studies (Chen & Mcmillan, 2020; Choe et al., 1999) show that positive feedback trading changes during crises. Gerlach and Yook (2016) report changes in positive feedback trading during military attacks, while Khanthavit (2020) reports changes in trading behavior during the COVID-19 pandemic. Such time variations, which can cause changes in trading behavior, can also be drawn from economic conditions. Empirical evidence shows that economic factors do affect investor trading behavior (Gulen & Ion, 2016; Merikas et al., 2004). Thus, any trading behavior can change over time, depending on the economic conditions. Consequently, this study postulates that there are changes in positive feedback trading by the foreign portfolio investors as the economic condition changes.

A review of the literature shows that the existing evidence on the subject matter solely focuses on the developed markets (Belhoula & Naoui, 2011; Bohl & Reitz, 2006; Chau et al., 2011; Chen & Mcmillan, 2020; DeLong et al., 1990; Edelen & Warner, 2001; Li, 2021; Sentana & Wadhani, 1992; Watson & Wickramanayake, 2012) and other emerging markets outside Africa (Angelovska, 2013; Baba & Sevil, 2021; Batra, 2003; Bikhchandani & Sharma, 2001; Bonser-Neal et al., 2002; Chauhan & Chaklader, 2020; Chhimwal & Bapat, 2020; Choe et al., 1999; Dai & Yang, 2018; Gerlach & Yook, 2016; Hsieh et al., 2008; Kadanda & Raj, 2017; Khanthavit, 2020; Kim & Wei, 2002; Oh et al., 2008; Richards, 2005; Tayde & Rao, 2011). There is a paucity of research on positive feedback trading in the African market, and specifically the Nigerian market. In addition, how the economic conditions influence this trading behavior remains unexplained in the literature. Existing studies do not offer any explanation in this regard. This study thus seeks to fill this gap.

Methodology

Data and Sample

The study covered the period from January 2013 to February 2020 in the Nigerian Stock Exchange. The recession witnessed in the economy within this period, which subjected the market to volatility, may have influenced the trading behavior of foreign portfolio investors. The study employed time-series data. Data on foreign portfolio investment, market indices and economic fundamentals were collected monthly from the “Monthly Economic Reports of the Central Bank of Nigeria.”

Model Specification and Variable Measurement

The general specification below depicts the functional relationship investigated in this study.

$$FPI = (SR, GDP, SR * GDP, EXC, CPI, OP, INT)$$

Specifically, the model estimated was given in Equation 1 below. The dependent variable, FPI, represents foreign portfolio investment. It was measured as the percentage of the foreign portfolio inflow relative to the total inflow in the market.

$$FPI = a + b SR_t + c GDP_t + d SR * GDP_t + e EXC_t + f CPI_t + g OP_t + h INT_t + \epsilon_t \quad (1)$$

The main explanatory variable was stock returns (SR). The relationship between stock returns and foreign portfolio flows tells whether positive feedback trading existed or not. Thus, the study tests for positive feedback trading by observing whether foreign capital inflows followed the same direction as stock returns. In line with past studies (Batra, 2003; Bohl & Reitz, 2006), the study employed “monthly stock returns” as the main variable, and this was measured as the difference in the log value of price index at time t and time t-1.

$$R_t = \log P_t - \log P_{t-1}$$

Where:

R_t = stock return at time t

P_t, P_{t-1} = closing value of the stock price index at time t; t-1

Based on the postulation that economic condition may influence the trading be-

havior of foreign investors, the study tested for “economy-driven feedback trading” by interacting stock returns with changes in GDP. Thus, SR*GDP was included in the model to ascertain whether the economic condition influenced positive feedback trading behavior. However, GDP (measure of economic growth) was included before incorporating the interaction term.

Other explanatory variables were included as the extant literature shows that they can also impact FPI flows. The variables had also been included to ensure that the model was correctly specified. EXC was measured as the rate at which Naira was exchanged for USD in the I & E window (investors’ and exporters’ foreign exchange window), CPI represented the consumer price index for all items, OP denoted OPEC’ basket crude oil price, while INT represented the average prime lending rate of the CBN.

The ARDL bounds testing approach was employed to ascertain whether foreign portfolio investment had a long-run association with the explanatory variables. Thus, the unrestricted model required for bounds testing is specified below.

$$\Delta FPI_t = \beta_0 + \sum_{j=1}^n \beta_1 \Delta SR_{t-j} + \sum_{j=0}^n \beta_2 \Delta GDP_{t-j} + \sum_{j=0}^n \beta_3 \Delta SR * GDP_{t-j} + \sum_{j=0}^n \beta_4 \Delta EXC_{t-j} + \sum_{j=0}^n \beta_5 \Delta CPI_{t-j} + \sum_{j=0}^n \beta_6 \Delta OP_{t-j} + \sum_{j=0}^n \beta_7 \Delta INT_{t-j} + \gamma_1 SR_{t-1} + \gamma_2 GDP_{t-1} + \gamma_3 SR * GDP_{t-1} + \gamma_4 EXC_{t-1} + \gamma_5 CPI_{t-1} + \gamma_6 OP_{t-1} + \gamma_7 INT_{t-1} + \varepsilon_t \quad (2)$$

Where ln = natural logarithm; n = optimum lag length; Δ = first difference operator; β_0 = constant term; $\beta_1 \dots \beta_8$ = short-run coefficients; $\gamma_1 \dots \gamma_8$ = long-run coefficients; ε_t = error term.

Following the approach of Pesaran, Shin and Smith (2001), the ARDL approach was adopted as it was applicable to different orders of cointegration. Thus, the unit root could be avoided (Raji, Jusoh & Jantan, 2014). Consequently, the bounds testing approach was employed in testing the long-run relationship. As required in the ARDL approach, a bounds test was employed as the initial step in ascertaining a long-run relationship between FPI and the regressors. The null hypothesis indicated that there was no cointegration, and it was tested against the alternate hypothesis, which indicated a long-run relationship among the variables.

The study employed the case 111 model, which was unrestricted intercepts and no trend. The hypothesis was tested by estimating Equation 2 and comparing the estimated F-statistic with the two critical values provided by Narayan (2005). The study employed Narayan’s critical values because they were suitable for the small sample size in this study. Given that the F-statistic exceeded the upper level of the band, the null hypothesis could not be accepted, and this suggested cointegration. Contrarily, if the F-statistic fell below

the lower level of the band, we accepted the null hypothesis, and that suggested no cointegration. The results would be inconclusive if the F-statistic was within the range of the upper and lower bounds.

Result and Discussion

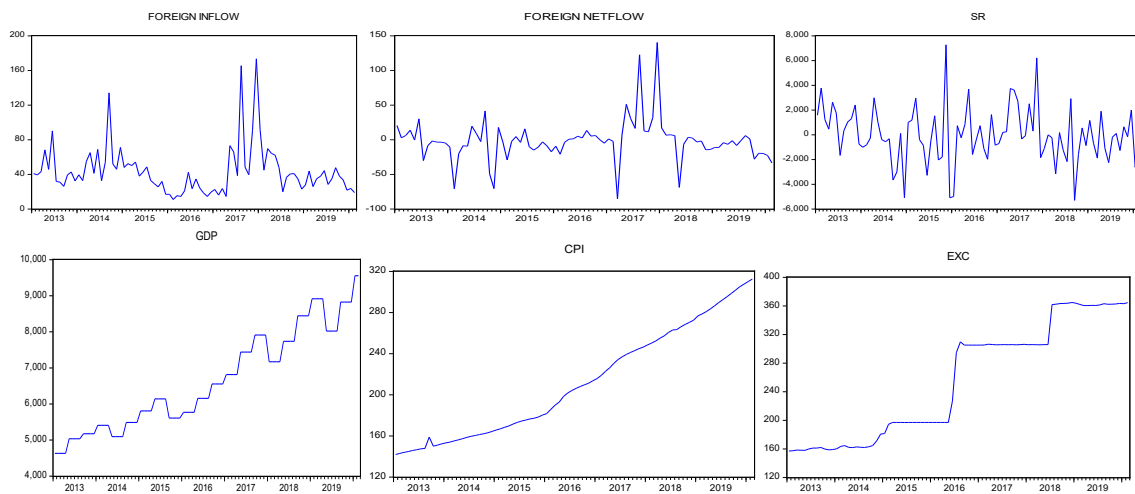
Descriptive Statistics

The descriptive statistics of the variables and their return series covering 86 observations are presented in Table 1. Wide margins in the minimum and maximum values of the series suggested evidence of significant variations in the trend of the series over the study period. Similarly, Figure 2 presents time series plots to depict the movement of the variables over time.

Table 1. Descriptive Statistics of Variables

	FPIN-FLOW	FPNET-FLOW	SR	GDP	CPI	EXC	OP	INT
Mean	43.740	31.293	2,468.232	6,648.525	211.722	256.130	67.644	16.865
Median	38.890	52.300	2,176.265	6,156.938	205.250	299.875	63.070	16.775
Maximum	173.430	140.380	7,271.460	9,555.585	312.600	364.760	112.750	31.110
Minimum	10.940	-85.230	-5,300.100	4,630.548	141.900	157.000	0.600	14.920
Std. Dev.	28.316	30.151	2,260.106	1,374.197	52.851	81.198	24.953	1.731
Skewness	2.506	1.424	0.248	0.386	0.343	0.068	0.264	6.491
Kurtosis	11.048	11.225	4.086	1.915	1.748	1.327	2.411	54.701
Observations	86	86	86	86	86	86	86	86

Source: Author's Computation (2021)



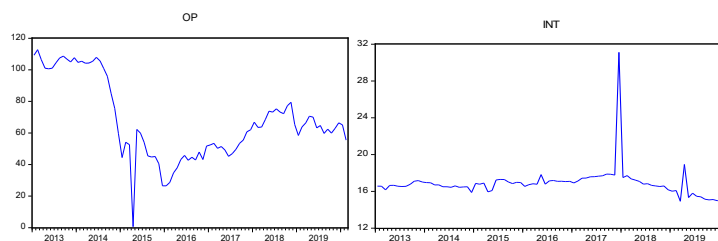


Figure 2. Time Series Plots of Variables

Regression Results

ARDL can be employed when the variables are of different integration orders. Nevertheless, a stationarity test was conducted to determine the integration order of the series and to prevent the reporting of spurious regression results. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were employed for the stationarity testing. The PP test was specifically employed to address any issue of higher order autocorrelation and heteroscedasticity. The outcomes of the unit root tests are presented in Table 2. Using automatic lag selection, the table reports stationarity at level and at first difference.

ADF statistics revealed that GDP, SR and INT were stationary at levels. Similar results were obtained using PP. In addition, FPI was also found to be stationary at levels under the PP approach. ADF statistics further revealed that FPI, EXC, CPI and OP were stationary at first difference. EXC, CPI and OP were also found to be stationary at first difference under the PP approach. Consequently, the study rejected the null hypothesis, which stated the presence of the unit root in each variable.

Table 2. Result of Unit Root (Stationarity) Test

Variables	Augmented Dickey-Fuller (ADF)	5% Critical level	Phillips-Perron (PP)	5% Critical level	Order of integration	
					ADF	PP
FPI	-12.03872	-3.464865	-6.256851	-3.463547	I(1)	I(0)
SR	-4.868193	-3.465548	-4.914650	-3.465548	I(0)	I(0)
GDP	-5.669668	-3.463547	-5.732580	-2.895924	I(0)	I(0)
EXC	-6.595399	-3.464198	-6.474873	-3.464198	I(1)	I(1)
CPI	-12.13555	-3.464198	-11.86949	-3.464198	I(1)	I(1)
OP	-12.43388	-3.464198	-12.55823	-3.464198	I(1)	I(1)
INT	-7.298927	-3.463547	-7.568744	-3.463547	I(0)	I(0)

Source: Author's computation (2021)

Given the combined series (level and first difference), the ARDL bounds test approach to cointegration was conducted. The test was employed to check if there was a long-run relationship between the regressors and foreign portfolio investment (FPI). To achieve this, a maximum lag length of four was imposed. In order to avoid bias in the

lag selection, Equation 2 was estimated using adjusted R2, Akaike information criterion (AIC) and Schwarz Bayesian criterion (SBC). The use of multiple lag selection criteria was essential as the real nature of the model could only be identified using an appropriate lag selection (Akinlo, 2005; Bahmani-Oskooee, 2001). However, only the estimates of AIC, which were considered the most appropriate criterion, were reported. The decision rule was that when the value of the F-statistic exceeded the critical value of the upper bound at 5% significance level, the null hypothesis should be rejected. Contrarily when the value of the F-statistic was less than the critical value of the lower bound, the null hypothesis could be accepted. The test would be inconclusive if the F-statistic was within the upper and lower bounds.

In Table 3, the F-statistic is reported alongside the critical values of Narayan (2005). The F-statistic (5.3193) computed exceeded the upper bound critical value at the 1% level (4.760). As a result, the null hypothesis that no cointegration exists between the explanatory variables (SR, GDP, SR*GDP, EXC, CPI, OP, INT) and foreign portfolio investment was rejected. Therefore, cointegration was present of between the explanatory variables and foreign portfolio investment.

Table 3. Results of Bounds Test for Cointegration

Test Statistics	Value	Sig. Level	I(0)	I(1)
F-statistics	5.319270***	1%	3.233	4.760
		5%	2.476	3.746
		10%	2.129	3.289

Note: The critical values refer to Narayan (2005) case 111: unrestricted intercept and no trend

The results of the error correction model are presented in Table 4. The table shows that the coefficient of error term $CointEq(-1)$ was negative and significant. The negative and significant values obtained for the error term further confirmed the presence of cointegration among the variables. To avoid reporting spurious results, which would lead to incorrect conclusions, the study tested for the possible presence of serial correlation and heteroscedasticity. This was achieved using the Breusch-Pagan-Godfrey test of heteroscedasticity and Breusch-Godfrey Serial Correlation LM tests, respectively. The results of the diagnostic tests are presented in the second panel of Table 4.

For the heteroscedasticity test, the estimates showed an insignificant result for the F-statistic. Therefore, the null hypothesis, which states that there is absence of heteroscedasticity in the model, was accepted. Similarly, estimates of the serial correlation test showed that the probability value of the F-statistic was greater than 5% level of significance. Consequently, the null hypothesis was accepted, and this implied that the model was free of serial correlation. Therefore, it was concluded that the residuals were

not serially correlated and there was no problem of heteroscedasticity.

Table 4. Estimated Results of Long- and Short-Run Relationships

Long-run estimates			Short-run estimates		
Variables	Coeff.	Std. error	Variables	Coeff.	Std. error
SR	0.757	0.304**	Δ SR	0.156	0.069**
GDP	8.154	2.696***	Δ GDP	5.038	2.539**
SR*GDP	9.523	2.983***	Δ SR*GDP	6.400	4.488
EXC	-0.157	0.067**	Δ EXC	-0.019	0.009**
CPI	-0.041	0.051	Δ CPI	-0.206	0.469
OP	0.314	0.309	Δ OP	-0.034	0.081
INT	5.925	3.071*	Δ INT	5.182	3.160
C	13.33	3.815***	C	9.535	3.036***
-	-	-	CointEq(-1)	-0.802	0.101***

Diagnostic Tests	F-statistic	P-value
Heteroscedasticity Test	1.7514	0.0572
Serial Correlation LM Test	0.2383	0.7886

Note: *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively. Dependent Variable = foreign portfolio investment inflows (FPI); SR = stock returns; GDP = economic growth; SR*GDP = interaction of stock returns and economic growth; EXC = exchange rate; CPI = consumer price index; OP = oil price; INT = interest rate.

Since joint cointegration had been established between the explanatory variables and the FPI, the study proceeded to reporting the long- and short-run relationships in Table 4. Similar results were obtained for the short-run and long-run estimates on the existence of positive feedback trading. The estimated coefficients in Table 4 show that the coefficient of stock returns was positive and significant in the short and long run. A positive coefficient of stock returns indicated that capital inflows moved in the same direction as stock returns. Thus, the result obtained suggested that positive feedback trading existed in the market as foreign portfolio inflows rose with an increase in the market's performance. This finding matches the position of the traditional neoclassical economic theory, which suggests that the desire for more returns drives capital to countries with a lower stock of capital and higher marginal productivity. In line with this, it was inferred that an increase in foreign portfolio inflows on the Nigerian Stock Exchange were due to the desire for more returns by the foreign investors when the market was booming. Similarly, outflows from the market during the period observed were due to the declining trend in market performance. The coefficients of the long-run relationship, which showed the presence of positive feedback trading, matched some earlier findings (Belhoula & Naoui, 2011; Froot et al., 2001; Gerlach & Yook, 2016; Hsieh et al., 2008; Oh et al., 2008; Richards, 2005;

Sentana & Wadhvani, 1992; Tayde & Rao, 2011).

Different results were obtained for short-run and long-run estimates with respect to how economic conditions influenced the positive feedback trading. Short-run estimates did not provide evidence that economic conditions influenced positive feedback trading. However, it became important for explaining this trading behavior in the longer term. The results in Table 4 show that the role of stock returns in explaining foreign portfolio inflows was enhanced with rising economic growth in the long run. Thus, the positive coefficient of economic growth's interaction with stock returns (SR*GDP) from the long-run estimates indicated that positive feedback trading became more prominent (with significance at 1%) when the economy was booming. Thus, it was inferred that positive feedback trading was also economically enhanced in the Nigerian market.

Based on the long-run estimates, other variables that positively influenced foreign portfolio inflows in the market included GDP and the interest rate. Thus, rising economic growth and an increase in the interest rate would lead to a rise in foreign portfolio inflows. On the other hand, the negative coefficient obtained for the exchange rate showed that with a rise in the rate (depreciation of Naira), foreign portfolio inflows into the market were reduced. Thus, exchange rate depreciation deterred foreign portfolio investors. No evidence was found either in the short or long run to show that the consumer price index (CPI) and oil price (OP) had any influence on foreign portfolio inflows into the Nigerian stock market. The insignificance of the consumer price index (CPI) may be due to the fact that foreign portfolio investors were not necessarily resident in Nigeria and were not directly affected by rising price levels in the host market. In the same vein, the insignificance of oil price may be due to the fact that the home countries of these foreign portfolio investors may have measures in place to cushion the effect of rising oil prices on the global market. Thus, such a rise may not affect their investment decisions. Overall, the findings of the study lend support for the pull theory (internal factors) in explaining foreign portfolio flows. No evidence was found in support of the push theory (external factors), as the oil price was found to be insignificant in explaining foreign portfolio inflows.

As suggested by Akinlo (2005) and Bahmani-Oskooee (2001), inappropriate modeling of the short-run dynamics may cause instability. Thus, the stability of long-run coefficients was tested using the CUSUM test advanced by Brown, Dublin and Evans (1975). Figure 3 depicts the test results based on the cumulative sum of the recursive residuals for the model tested. For stability to be ascertained, it was expected that the cumulative should remain within the two critical lines at a 5% significance level. Otherwise, instability would be present. The figure suggests the stability of the parameters as the CUSUM plot falls within the two critical bounds or lines.

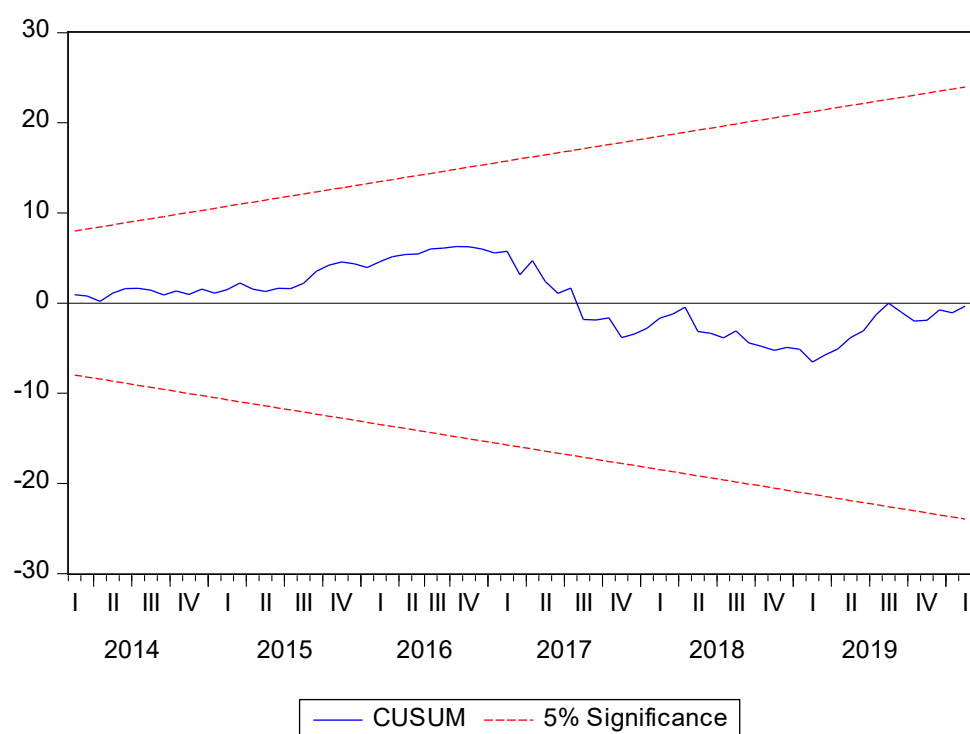


Figure 3. Plot of Cumulative Sum of Recursive Residuals

Robustness Check

The study further checked to see if the initial findings on the presence of positive feedback trading were robust to an alternate specification of foreign portfolio investment. As opposed to the use of foreign portfolio inflows relative to total inflows in the market, the study employed net foreign portfolio flows as the dependent variable. A few prior studies (Bae et al., 2011; Batra, 2003; Dhingra et al., 2016) have employed netflow as a measure of foreign portfolio investment when testing for positive feedback trading. Netflow was measured as foreign portfolio inflows minus foreign portfolio outflows. The results of the robustness check are presented in Table 5.

Table 5. Results of Long- and Short-Run Relationships (Robustness Check)

Long-run estimates			Short-run estimates		
Variables	Coeff.	Std. error	Variables	Coeff.	Std. error
SR	0.139	0.069**	Δ SR	0.634	0.339*
GDP	7.620	2.430***	Δ GDP	7.583	2.520***
SR*GDP	8.730	1.740***	Δ SR*GDP	7.317	5.068
EXC	-0.298	0.155*	Δ EXC	-0.184	0.109*
CPI	-0.143	0.171	Δ CPI	-0.003	0.008
OP	0.774	1.148	Δ OP	0.020	0.018
INT	7.320	0.0002	Δ INT	2.112	2.781

C	13.524	1.883***	C	11.807	4.001***
-	-	-	CointEq(-1)	-0.590	0.101***

Note: *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively. Dependent variable = foreign portfolio netflows (FPN); SR = stock returns; GDP = economic growth; SR*GDP = interaction of stock returns and economic growth; EXC = exchange rate; CPI = consumer price index; OP = oil price; INT = interest rate.

Using netflows for the robustness check, the findings showed weak evidence of positive feedback trading in the short run. Results similar to the initial findings (using FPinflows) were found in the long run. Therefore, in the long run, it was revealed that the finding on positive feedback trading was robust to an alternate specification of foreign portfolio investment (i.e. the use of netflows). The robustness check further confirmed that economic conditions only influenced positive feedback trading behavior in the long run. In other words, the economic conditions did not influence this irrational trading behavior in the short term.

Conclusion

This study examines whether positive feedback trading exists in the Nigerian market. This is achieved by investigating how stock returns impact on foreign portfolio inflows. Monthly data covering the period from January 2013 to February 2020 are analyzed using the ARDL bounds testing approach. This time range is based on the availability of consistent data for the observed variables. The empirical results reveal that joint cointegration exists between stock returns, other explanatory variables (economic growth, stock return interaction with economic growth, exchange rate, consumer price index, oil price, interest rate) and foreign portfolio inflows. Most importantly, the findings indicate the presence of positive feedback trading in the Nigerian market, both in the short and long run. However, the long-run findings further show that positive feedback trading is more prominent with rising economic growth. Other explanatory variables that are significant in explaining foreign portfolio inflows include economic growth, the exchange rate and the interest rate. Based on the findings, the study concludes that positive feedback trading exists in the Nigerian market and it is enhanced by economic growth.

This study has theoretical implications. Investors (existing and potential) should focus more on the pull theory (internal factors) in making their investment decisions. These internal factors (stock returns, economic growth, exchange rate and interest rate) are country specific fundamentals which are considered essential in drawing foreign portfolio investment. The internal factors are a function of the government's policies, thus they can be worked upon by regulatory authorities/policy makers to attain the desired

level of foreign portfolio investment. Contrarily, the push (external) factors are exogenous factors that the domestic economy has no control over. Therefore, regulatory authorities should also be guided more by these internal factors in setting policies that affect foreign portfolio investment.

These findings also have a few policy implications. Firstly, understanding the investment behavior of foreign portfolio investors is very important for policymakers, for the monitoring of systemic risk that may arise from the nature of their erratic investments. This study suggests that foreign portfolio investors in the Nigerian market will only be attracted by high stock returns. This also implies that outflows will be high when returns are low, and this trading pattern may increase market vulnerability. Consequently, policymakers should adopt measures that will enable foreign investors to be better informed about the Nigerian market. This is expected to reduce their positive feedback trading behavior. In addition, the government needs to strengthen domestic participation to forestall the weakening of the market that may arise from the trading patterns of the positive feedback traders. While strengthening domestic participation, regulators of the Nigerian market also need to formulate and implement policies that will be tailored toward the protection of minority investors in the market.

Secondly, in line with the finding which suggests the further prominence of positive feedback trading with rising economic growth, the need arises for the government to continue to adopt policies aimed at enhancing the growth of the stock market and economy. In this way, the negative impact of such trading behavior will be minimal, as short-term trading by foreign investors will be reduced and foreign portfolio inflows will be sustainable.

This paper is novel, as to the best of the researcher's knowledge, positive feedback trading has gained little or no attention in existing research conducted on the Nigerian market. However, the study has a few limitations which readers should bear in mind. The study excludes the bond market in studying this irrational trading behavior. Thus, the findings may not be applicable to bond market trading activities in Nigeria. Secondly, due to data constraints, foreign institutional and foreign retail investors could not be differentiated. However, the study takes solace in the fact that most foreign investors in the market are institutional investors. Lastly, observing this trading behavior would have been more informative by comparing some African countries. Consequently, future researchers can examine whether positive feedback traders exist in the bond market as well. In addition, this trading behavior can be compared among various African countries.

References

- Ahmed, W., & Sehgal, S. (2015). Regime shifts and volatility in BRIICKS stock markets: and asset allocation perspective. *International Journal of Emerging Markets*, 10(3), 383-408. <https://doi.org/10.1108/IJoEM-02-2013-0022>
- Akinlo, A. E. (2005). The stability of money demand in Nigeria: an autoregressive distributed lag approach. *Journal of Policy Modelling*, 28, 445-452. <https://doi.org/10.1016/J.JPOLMOD.2005.09.001>
- Angelidis, D., Koulakiotis, A., & Kiohos, A. (2018). Feedback trading strategies: the case of Greece and Cyprus. *South East European Journal of Economics & Business*, 13(1), 93-99. <https://doi.org/10.2478/jeb-2018-0006>
- Angelovska, J. (2013). Detecting positive feedback trading when autocorrelation is positive. *Zagreb International Review of Economics and Business*, 16(1), 93-101.
- Baba, B., & Sevil, G. (2021). Bayesian Analysis of time-varying interactions between stock returns and foreign equity flows. *Financial Innovations*, 7(51). <https://doi.org/10.1186/s40854-021-00267-9>
- Bae, S. C., Min, J. H., & Jung, S. (2011). Trading behavior, performance, and stock preference of foreigners, local institutions, and individual investors: evidence from the Korean stock market. *Asia-Pacific Journal of Financial Studies*, 40, 199-239. <https://doi.org/10.1111/j.2041-6156.2011.01037.x>
- Bahmani-Oskooee, M. (2001). How stable is M2 money demand function in Japan? *Japan and the World Economy*, 13, 455-461. <https://mp.ra.ub.uni-muenchen.de/id/eprint/19807>
- Batra, A. (2003). The dynamics of foreign portfolio inflows and equity returns in India. Indian Council for Research on International Economic Relations, New Delhi, India. <http://hdl.handle.net/10419/189629>
- Bekaert, G., & Harvey, C. R. (2003). Emerging markets finance. *Journal of Empirical Finance*, 10, 3-55. <https://EconPapers.repec.org/RePEc:eee:empfin:v:10:y:2003:1-2:p:3-56>
- Belhoula, M., & Naoui, K. (2011). Herding and positive feedback trading in American stock market: a two co-directional behavior of investors. *International Journal of Business and Management*, 6(9), 244-252. <https://doi.org/10.5539/ijbm.v6n9p244>
- Bikhchandani, S., & Sharma, S. (2001). Herd behavior in financial markets. *IMF Staff Papers (International Monetary Fund Washington)*, 47(3), 279-310.
- Bohl, M. T., & Reitz, S. (2006). Do positive feedback traders act in Germany's Neuer market? *Quarterly Journal of Business and Economics*, 45(1/2), 3-14. <https://www.jstor.org/stable/40473411>
-

- Bohl, M. T., & Siklos, P. L. (2004). Empirical evidence on feedback trading in mature and emerging stock markets. *Quantitative Finance Research Papers*, Sidney, 137. <https://doi.org/10.1080/09603100701704280>
- Bonser-Neal, C., Jones, S. L., Linnan, D., & Neal, R. (2002). Herding and feedback trading by foreign Investors: the case of Indonesia during the Asian financial crisis. Working paper, Indiana University.
- Brennan, M.J., & Cao, H.H. (1997). International portfolio investment flows. *The Journal of Finance*, 52(5), 1851-1880. <https://doi.org/10.2307/2329467>
- Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society, Series B (Methodological)*, 37(2), 149-192. <https://doi.org/10.1111/j.2517-6161.1975.tb01532.x>
- Caporale, G. M., Karanasos, M., Yfanti, S., & Kartsaklas, A. (2019). Investors' trading behavior and stock market volatility during crisis periods: a dual long-memory model for the Korean Stock Exchange. *International Journal of Finance and Economics*, 26(3), 4441-4461. <https://doi.org/10.1002/ijfe.2024>
- Chau, F., Deesomsak, R., & Lau, M. (2011). Investor sentiment and feedback trading: evidence from exchange-traded fund markets. *International Review of Financial Analysis*, 20(5), 292-305. <https://doi.org/10.1016/j.irfa.2011.06.006>
- Chauhan, A. K., & Chaklader, B. (2020). Do local investors exhibit smart value investment? Empirical evidence from India. *Global Business Review*. <https://doi.org/10.1177/0972150920915330>
- Chen, J., & Mcmillan, D. G. (2020). Stock returns, illiquidity and feedback trading. *Review of Accounting and Finance*, 19(2), 135-145. <https://doi.org/10.1108/RAF-02-2017-0024>
- Chhimwal, B., & Bapat, V. (2020). Impact of foreign and domestic investment in stock market volatility: empirical evidence from India. *Cogent Economics and Finance*, 8(1). <https://doi.org/10.1080/23322039.2020.1754321>
- Chiang, T. C., & Zhang, Y. (2018). An empirical investigation of risk-return relations in Chinese equity markets: evidence from aggregate and setoral data. *International Journal of Financial Studies*, 6(2), 1-22. <https://doi.org/10.3390/ijfs6020035>
- Choe, H., Kho, B-C., & Stulz, R. M. (1999). Do foreign investors destabilize stock markets? The Korean experience in 1997. *Journal of Financial Economics*, 54, 227-264. [https://doi.org/10.1016/S0304-405X\(99\)00037-9](https://doi.org/10.1016/S0304-405X(99)00037-9)
- Dai, Z. M., & Yang, D. C. (2018). Positive feedback trading and investor sentiment. *Emerging Markets Finance and Trade*, 54(10), 2400-2408. <https://doi.org/10.1080/1540496X.2018.1469003>
-

- DeLong, B. J., Shleifer, A., & Waldman, R. J. (1990). Positive feedback investment strategies and destabilizing rational expectations. *Journal of Finance*, 45, 379-395. <https://doi.org/10.1111/j.1540-6261.1990.tb03695.x>
- Dhingra, V.S., Gandhi, S., & Bulsara, H.P. (2016). Foreign institutional investments in India: An empirical analysis of dynamic interactions with stock market return and volatility. *IIMB Management Review*, 28, 212-224. <http://dx.doi.org/10.1016/j.iimb.2016.10.001>
- Edelen, R. M., & Warner, J. B. (2001). Aggregate price effects of institutional trading: a study of mutual fund flow and market returns. *Journal of Financial Economics*, 59, 195-220. [https://doi.org/10.1016/S0304-405X\(00\)00085-4](https://doi.org/10.1016/S0304-405X(00)00085-4)
- Fernandez-Arias, E., & Montiel, P. J. (1996). The surge in capital inflows to developing countries: an analytical overview. *The World Bank Economic Review*, 10(1), 51-77. <https://doi.org/10.1093/wber/10.1.51>
- Froot, K. A., O'Connell, P. G. J., & Seaholes, M. S. (2001). The portfolio flows of international investors. *Journal of Financial Economics*, 59, 151-193. [https://doi.org/10.1016/S0304-405X\(00\)00084-2](https://doi.org/10.1016/S0304-405X(00)00084-2)
- Gerlach, J. R., & Yook, Y. (2016). Political conflict and foreign portfolio investment: evidence from North Korean attacks. *Pacific-Basin Finance Journal*, 39(C), 178-196. <https://doi.org/10.1016/j.pacfin.2016.05.009>
- Gordon, J. P., & Gupta, P. (2003). Portfolio flows into India: do domestic fundamentals matter? *IMF working papers*. <https://doi.org/10.5089/9781451843866.001>
- Gulen, H., & Ion, M. (2016). Policy uncertainty and corporate investment. *The Review of Financial Studies*, 29(3), 523-564. <https://doi.org/10.1093/rfs/hhv050>
- Hsieh, M. F., Tai, Y. Y., & Vu, T. B. (2008). Do herding behavior and positive feedback effects influence capital inflows? Evidence from Asia & Latin America. *The International Journal of Business and Finance Research*, 2(2), 19-34. <https://ssrn.com/abstract=1543867>
- Kadanda, D., & Raj, K. (2017). Relationship between foreign portfolio investment (FPI), domestic institutional investors and stock market returns in India. *International Journal of Financial Management*, 7(4).
- Khanthavit, A. (2020). Foreign investors' abnormal trading behavior in the time of COVID19. *The Journal of Asian Finance, Economics and Business*, 7(9), 63-74. <https://doi.org/10.13106/jafeb.2020.vol7.no9.063>
- Kim, W., & Wei, S-J. (2002). Foreign portfolio investors before and during a crisis. *Journal of International Economics*, 56, 77-96. [https://doi.org/10.1016/s0022-1996\(01\)00109-X](https://doi.org/10.1016/s0022-1996(01)00109-X)
- Kumar, A., & Badhani, K. N. (2018). Empirical investigation of herding under different

- economic set-ups. *Theoretical Economic Letters*, 8(15), 3313-3352. <https://doi.org/10.4236/tel.2018.815205>
- Li, A. (2021). Conditional estimates of diffusion processes for evaluating the positive feedback trading. *Quantitative Finance*.
- Maharaj, E. A., Galagedera, D. U., & Dark, J. (2011). A comparison of developed and emerging equity market return volatility at different time scales. *Managerial Finance*, 37(10), 940-952. <https://doi.org/10.1108/03074351111161592>
- Merikas, A. A., Merikas, A. G., Yozikis, G. S., & Prasad, D. (2004). Economic factors and individual investor behavior: the case of the Greek Stock Exchange. *Journal of Applied Business Research*, 20(4). <https://doi.org/10.19030/jabr.v20i4.222.7>
- Narayan, P.K. (2005). The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*, 37(17). <https://doi.org/10.1080/00036840500278103>
- Oh, N. Y., Parwada, J. T., & Walter, T. S. (2008). Investors' trading behavior and performance: online versus non-online equity trading in Korea. *Pacific-Basin Finance Journal*, 16, 26-43. <https://doi.org/10.1016/j.pacfin.2007.04.009>
- Pagliari, M. S., & Hannan, S. A. (2017). The volatility of capital flows in emerging markets: measures and determinants. IMF Working Papers 17/41.
- Pesaran, M. H., Shin, Y., & Smith, R. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289-326. <https://www.jstor.org/stable/2678547>
- Proshare Nigeria (2021). Domestic and foreign portfolio participation in equity trading. <https://www.proshareng.com>
- Raji, J. O., Jusoh, J., & Jantan, M. D. (2014). Real money supply, price and fiscal deficit in Nigeria: evidence from multivariate Granger causality test. *Journal of Economic Cooperation and Development*, 35(4), 85-112.
- Richards, A. (2005). Big fish in small ponds: the trading behavior and price impact of foreign investors in Asian emerging equity markets. *Journal of Financial and Quantitative Analysis*, 40(1), 1-27. <https://doi.org/10.1017/S0022109000001721>
- Sentana, E., & Wadhvani, S. (1992). Feedback traders and stock return autocorrelations: evidence from a century of daily data. *Economic Journal*, 102, 415-425. <https://doi.org/10.2307/2234525>
- Statista. (2021). Stock market performance in Africa 2020, by country. Retrieved from <https://www.statista.com/statistics/1247469/stock-market-performance-in-africa-by-country/>
- Tayde, M., & Rao, S. N. (2011). Do foreign institutional investors exhibit herding and positive feedback trading in Indian stock market? *International Finance Review*, 12, 169-185. [https://doi.org/10.1108/S1569-3767\(2011\)0000012009](https://doi.org/10.1108/S1569-3767(2011)0000012009)

The Nigerian Stock Exchange. (2020). The Nigerian Stock Exchange's Domestic & Foreign Portfolio Investment Report. December, 2020.

Vrieze, S. (2012). Model selection and psychological theory: discussion of the differences between the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). *Psychological Methods*, 17(2), 228-243. <https://doi.org/10.1037/a0027127>

Watson, J., & Wickramanaye, J. (2012). The relationship between aggregate managed fund flows and share market returns in Australia. *Journal of International Financial Markets*, 22(3), 451-472. <https://doi.org/10.1016/j.intfin.2012.02.001>