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The Impact of Exchange Rate on Foreign Private Investment in Nigeria

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Abstract
The study examined the impact of exchange rate on foreign private investment using quarterly time series date from Nigeria for the period 2007 to 2017. Foreign private investment in the study was disaggregated into foreign direct investment and foreign portfolio investment in order to ascertain their separate reactions to changes in the exchange rate of the naira against the US dollars. The empirical analysis was based on the VAR estimation procedure using three lagged periods adopted on the basis of various lag order selection criteria. The empirical result revealed that devaluation/depreciation of the naira adversely affects foreign direct investment and foreign portfolio investment in Nigeria. Increased in the size of the domestic market and development of the financial sector were found to stimulate foreign private investment while high inflation rate in the domestic economy discourages foreign private investment in Nigeria. The study, therefore, recommended among others that the Central Bank of Nigeria should continue to initiate more proactive policy intervention policies to stabilize the exchange rate of the naira in order to stimulate more foreign private investment in Nigeria.

Keywords: Foreign Direct Investment, Foreign Portfolio Investment, Foreign Private investment, Exchange rate, Financial Development.

JEL Classification: F21, F31, P45

1. Introduction

The importance of foreign capital inflows in the economic life of the host country cannot be over emphasized. Foreign capital plays a pivotal role in the economies of both developed and developing countries. Foreign capital inflows played a major role in the development of currently industrialized countries in their course of economic advancement. In the developing countries, foreign capital inflow can contribute significantly to the advancement of the host country by helping to fill the savings - investment gap.

In most countries of Sub-Sahara Africa including Nigeria, the domestic savings fall short of the required investment level needed to launch the economies to the path of sustainable development. This creates the problem of savings – investment gap. Also, there is the problem of foreign exchange shortage resulting from excessive demand for foreign goods occasioned by the weak productive base of these Sub-Sahara Africa countries. In order to close this dual gap between savings and foreign exchange, foreign capital inflow becomes very crucial. Hence, the government of most developing countries in their policy formulation have accorded stimulation of foreign capital inflow top priority.

According to Obadan (2004), external capital flows can be categorized into official development finance, export credit, and foreign private capital flows. Foreign private investment is a component of the foreign private capital flows. It provides a greater proportion of the needed finance to boost the use of existing capacity and stimulate new investment in the host countries. The inflow of foreign private investment helps to boost the stamina of the host country towards achieving its economic potentials.

Since the 1980's, there has been increased private capital flow across international borders globally. However, despite this increased global flow of capital, especially into developing economies, Sub-Sahara Africa countries still lag behind other regions in attracting foreign private capital (Osinubi & Amaghionyeodiwe, 2009). According to Obadan (2004), the distribution of private capital flow to regions and countries has been highly skewed against Sub-Sahara Africa countries. From the World Bank (1996), East Asia, Latin America, and the Caribbean dominated the inflow of the private capital flow in the 1990's. East Asia and the Pacific accounted for 43.1% of the total private capital inflow, Latin America and the Caribbean 35.6%, Europe, and Central Asia 13.2%, while Sub-Sahara Africa accounted for just 2.4%. The Middle East and North Africa accounted for 1.9%.

This disparity in the geographical distribution of foreign private capital inflow has become a source of worry to the authorities of Sub-Sahara Africa countries. This is based on the general assumption that foreign private investment is very crucial in stimulating growth in developing economies where domestic capital is grossly inadequate. Foreign private investment particularly FDI is not just a source of capital formation, it also serves as a source of technological development. Technological development result from the transfer of productive technology, innovative capacity, skills development and improvement in organizational and managerial capacities.

Given the importance of foreign private investment in developing countries, several studies have been conducted on the key determinants of foreign private capital inflow in developing countries. From both theoretical and empirical studies, several determinants of foreign private capital inflow into a host country have been identified. However, one of the key determinants that have been a source of prolonging controversy is the exchange rate. From available international economics literature, some empirical findings show that exchange rate volatility impacts positively on foreign private capital inflow, while others discover a negative impact.

However, a close study of available literature in this direction shows that majority of the study employed annual time series date which may not adequately capture the volatility of the exchange rate compared to high frequency data such a quarterly or monthly data. Most importantly, the majority of the studies only focused their attentions on Foreign Direct Investment (FDI) which is just a component of foreign private investment. Foreign portfolio investment which is an important part of the foreign private investment is often left out in their analysis. The non-inclusion of portfolio investment in these studies amount to telling only a part of the story. Although, FDI is a key source of technological transfer, however, portfolio investment plays a key role in the economy via the capital and money market. Moreover, portfolio investment is more volatile than FDI due to easy transfer. The reaction of FDI and portfolio investment to exchange rate volatility may differ significantly. Therefore, to assess the effect of exchange rate on foreign private capital inflow, an all embracing analysis covering FDI and foreign portfolio investment is necessary. This is the dimension this study wish to address. Therefore the objective of this study is to examine the impact of exchange rate on foreign private investment (disaggregated into FDI and foreign portfolio investment) using quarterly time series data from Nigeria for the period 2007 to 2017.

This paper is structured into five sections. Apart from section one which is the introduction, section two deals with the review of the relevant literature. Section three covers the theoretical framework and model specification, while section four contains the empirical analysis. The paper ends in section five with some policy recommendations and concluding remarks.

2. Literature Review

2.1 Theoretical Review

Theoretically, there is a divergence of opinions on the effect of exchange rate on foreign private investment inflow. The theoretical literature is examined here under the effect of exchange levels and exchange rate volatility.

2.1.1 Effect of exchange rate level on Foreign Investment

The effect of the exchange rate level on foreign investment has been examined by the wealth creation theory and the Compa's model.

i. The Wealth Creation Theory

The wealth creation theory was advanced by Froot and Stein (1991). This approach claimed that depreciation (devaluation) of a host country's exchange rate attracts foreign investment. This is based on the fact that a depreciation (devaluation) of a host country's currency relative to the investors home country's currency increases the relative wealth of the foreign investor. This increases the attractiveness of the host country to foreign investment as the foreign investors are able to acquire assets relatively cheaper in the host country. On the basis of this theory, a fall in the value of a country's currency relative to the home country's country currency of the investor, all things being equal will increase foreign investment in the host country, while an appreciation of the host country's currency will reduce investment.

ii. The Compa's Model

This model was advanced by Compa (1993). The model states that a firm decision to invest in a foreign country depends on the expected future profitability of such a venture. In such a case, the more the exchange rate of the host country appreciates, the higher will be the expected future profit from investment in that country. Therefore, the model predicts that an appreciation of the host country currency will lead to an increase in the inflow of foreign investment. This is contrary to the prediction of the wealth crease theory.

2.1.2 Effect of exchange rate volatility on foreign investment

There are two broad views on the link between exchange rate volatility and foreign investment. These are the real options approach and the risk aversion approach.

i. The real option theory

This approach was popularized by Dixit and Pindyck (1994). It considered the effect of exchange rate uncertainty on investment, particularly when such investment is irreversible. This theory states that under exchange rate uncertainty, a firm has an option to invest oversea or not. This is based on the fact that changes in the exchange rate affect the price of the options. Another definition of the option is where a firm has plants in different countries which create the options to shift production among facilities in responds to exchange rate movement. This is called production flexibility.

The theory, therefore, suggests that investment will change in favour of the lowest cost location after an exchange rate movement. This means that it is profitable for a multinational enterprise to open plants at home and abroad, postponing production decision until after an exchange rate shock. All things being equal, investing in a country with a high degree of exchange rate volatility will have a higher risk in terms of a stream of profit. Hence, as long as the investment is partially irreversible, there are some benefits of holding back investment to acquire more information about the direction of the exchange rate movement. This theory, therefore, provides the argument of a negative effect of exchange rate uncertainty on foreign investment.

ii. Risk Aversion Theory

This theory was popularized by Goldberg and Kolstad (1995). According to the theory, exchange rate volatility lead to a decrease in foreign direct investment. Higher exchange rate volatility reduces the certainty equivalent expected exchange rate. Certainty equivalent level is employed in the firm's expected profit function to determine investment decision of today in order to realize a profit in a future period. Since firms are more concerned about their future expected profits, they will postpone their investment decision as the exchange rate becomes more volatile.

2.2 Empirical Review

There is a robust literature on the relationship between foreign capital inflow and exchange rate movement. However, there is no consensus among writers on the effect of exchange rate on foreign capital inflow. Some studies found a positive impact, while others discovered a negative impact.

Eregha (2017) examined the impact of exchange rate polices and inflation expectations on foreign direct investment (FDI) flow in the West Africa Monetary Zone (WAMZ) using annual time series data for the period 1980 – 2014. The Arellano panel correction for serial correlation and heteroscedasticity option of within estimate for the selected WAMZ countries were employed. From the empirical results, exchange rate uncertainty was found to hinder foreign direct investment inflow. Furthermore, the fixed exchange rate policy regime was found to adversely affect foreign direct investment inflow. On the other hand, the intermediate policy regime was found to have a positive impact on FDI inflow during the periods of the current account imbalance with changes in foreign exchange rate reserve as the channel. During this period, the study observed that the negative effect of the fixed exchange rate policy on FDI

increased. Hence, the study concluded that fixed exchange rate regime is not a good policy in a period of current account imbalance.

Ali, Mohammed and Zahir (2017) examined the impact of exchange rate on Foreign Direct Investment (FDI) in Somalia using annual time series data for the period 1980 – 2010. The Ordinary Least Square (OLS) estimation technique was adopted by the study. From the empirical result, the exchange rate has a significant and negative impact on foreign direct investment in Somalia.

Busse, Hefeker, and Nelgen (2010) examined the impact of exchange rate on FDI inflow in developed and developing countries for the period 1980 – 2014. The fixed effect model was specified for the study and estimated using the ordinary least square technique. The maximum likelihood estimator was also employed to check for the robustness of the estimates. From the empirical results, exchange rate levels were found to have a negative effect on FDI inflow in developing countries. In the developed countries, the exchange rate has a positive but insignificant effect on FDI inflow. The result from the study shows that a fixed exchange rate regimes have a positive and significant effect on FDI inflow in developed countries, while in the developing countries the impact was not statistically significant.

Abbott, Cushman and Vita (2012) employed Generalized Method of Moment (GMM) to examine the effect of exchange rate policy on FDI inflow in seventy developing countries for the period 1985 – 2004. From the empirical results of their study, it was found that fixed and intermediate policy regimes positively influence FDI inflow as compared with the floating policy regime.

Russ (2012) examined the effect of exchange rate volatility on FDI inflow using a panel of twenty eight OECD countries for the period 1980 – 2005. A combination of Ordinary Least Square (OLS), Generalized Least Square (GLS) and Generalizes Method of Moment (GMM) were employed in the study to estimate the specialized model. The result from the study revealed that the fixed exchange rate regime has a positive impact on FDI inflow.

Bilawal, Ibrahim, Abbas, Shuaid, Ahmed, Hussain and Fatima (2014) studied the impact of exchange rate on FDI in Pakistan for the period 1982 – 2013. The study employed the ordinary least square regression method to estimate the specified model. From their results, the exchange rate has a direct and significant impact on FDI in Pakistan. This implied that depreciation of the domestic currency encourages FDI inflow in Pakistan.

Jaratin, Mori, Dullah, Lim, and Rozilee (2014) investigated the effect of exchange rate on FDI in selected Asian countries for the period 1970 – 2011. The study covers the Philippines, Singapore, Malaysia, and Thailand. A combination of Autoregressive Distributed Lagged (ARDL) bounds test and ECM based autoregressive distributed lag approach for causality test was employed to ascertain the nature of the relationship between exchange rate and FDI. The empirical results from the study show that there exists a significant long term relationship between exchange rate and FDI in Malaysia, Singapore and Philippines with a negative coefficient. This implies that appreciation of the countries' currencies will lead to an increase in FDI inflow. The causality test result shows that there exists a bidirectional causality between exchange rate and FDI in Philippines and Singapore, while a long run unidirectional causality running from exchange rate to FDI exist for Malaysia.

Choi, Chung, and Kim (2013) examined the impact of exchange rate volatility on FDI in Korea using monthly data for the period 1990 – 2011. A combination of markov switching model estimation technique and multivariate GARCH-in-mean model and the impulse responds function were employed in studying the nature of the relationship between exchange rate volatility and capital inflow. From the empirical result, all kinds of capital inflows increase under low volatile exchange rate regimes. On the other hand, all capital inflow except FDI decreases under high volatile exchange rate regimes. The study thus concluded that medium level exchange rate volatility is most favorable for economic stability and growth.

Rashid and Fazal (2010) examined the nature of the relationship between exchange rate volatility and capital inflow in Pakistan using monthly data for the period 1990 – 2007. The linear and non-linear co-integration analysis was employed. From the empirical results, the causality runs from capital inflow to exchange rate. According to the results, monetary expansion emanating from capital inflow fuel exchange rate volatility.

Brozozoneski (2003) conducted a study on the impact of exchange rate risk on foreign direct investment using a panel of 32 countries. A combination of fixed effect ordinary least square, the Generalized Method of moment (GMM) and Arellano-Bond model was employed. The result of the estimation revealed that exchange rate volatility negatively affects foreign direct investment.

Studies based on Nigeria include Amasoma, Nwosa and Fasoranti (2015), Nwosa and Amassoma (2014), Osinubi and Amaghionyeodiwe (2009) and Tokunbo and Lioyd (2009). All the studies employed annual time series data and their results were mixed. Nwosa and Amassoma (2014) found that the exchange rate only affects FDI in the long run. Their result suggested that an increase in the exchange rate will lead to a fall in FDI in the long run. This was corroborated by the findings of Amasoma, Nwosa, and Fasoranti (2015). On the contrary results from the study of Osinubi and Amaghionyeodiwe (2009) revealed that an increase in the exchange rate will lead to an increase in the flow of FDI. Tokunbo and Lioyd (2009) concluded based on their results that the impact of exchange rate on FDI inflow is not statistically significant.

A close observation shows that on both theoretical and empirical ground there is no consensus on the possible effect of the exchange rate on foreign private investment. While some found a positive relationship between both variables, others found a negative relationship, even a third variant concluded that there is no significant relationship between the exchange rate and foreign private investment.

Also, with the exception of Choi, Chung, and Kim (2013) which employed monthly data in their study on Korea and Rashid and Fazal (2010) which employed monthly data in their study on Paskistan, other empirical studies employed the annual time series data. Specifically, all the study in Nigeria were based on annual time series data. The annual time series data is normally the annual average of the data which may smoothen the data thereby omitting some actual fluctuations which would have been captured by higher frequency data.

Finally, the majority of the studies captured foreign private investment using FDI. It is important to note that foreign private investment is made up of both FDI and foreign portfolio investment. Each of this component of foreign investment may react differently to changes in the exchange rate. The non-inclusion of foreign portfolio investment in most of the studies amount to only telling a part of the story.

3. Theoretical Framework and model specification

3.1 Theoretical Framework

The empirical model of this study is based on the portfolio balance framework developed by Fernandez-Arias & Montiel ((1995) and popularized by Taylor & Sarno (1997) and Moody, Taylor & Kim (2001). Their framework is based on the fact that a foreign investor will exploit all the possibility of arbitrage across his home and host country. Factors influencing capital flows can be grouped into domestic or pull factors and global or push factors. The pull factors represent a country's specific investment risk and returns which attract foreign investors to invest in a country. On the other hand, the push factors represent external factors which push investment towards the host country. The pull or domestic factors can further be categorized into those which operates at the country level and those that operate at the project or asset level.

Assuming capital inflows are represented by transactions in different types of assets in the host country, the expected returns on investment can be said to be a function of the domestic business environment (DBE). Therefore, for a foreign investor to consider investing in a country, he will consider the domestic business environment of the host country (DBE), the credit worthiness of the country (Credit) and the financial and economic opportunities in his own (source) country (FEO). From the group of factors, domestic business environment (DBE) and credit worthiness of the host country (Credit) represent the pull factors, while the financial and economic opportunities (FEO) in the source country represent the push factors. The above can be captured in the following equation:

FI = FI (DBE, Credit, FEO) - - - - - - - 1

Where: FI = foreign investment.

The domestic business environment (DBE) can be influenced according to Fernandze-Arias & Montiel (1996) by numerous factors. This include among others exchange rate, exchange rate volatility, interest rate, inflation rate, foreign investment policy, cost of doing business, institutional factors, output growth rate and macroeconomic policy.

The link between the exchange rate and foreign capital inflow can be seen from the argument advanced by Froot and Stein (1991). Using the imperfect capital market framework, they argued that the exchange rate operates on foreign private capital inflow through the wealth effect. As the host country currency depreciates, it automatically increases

the wealth of foreigners, allowing them to make higher bids for domestic assets in the host country. In this case, host country currency depreciation stimulates inflow of foreign private capital.

However, there may be an exchange rate risk associated with the timing between investment and profit. If the exchange rate depreciates to a lower level to source country currency at the time of profit repatriation relative time of investment, it will lower the return of the foreign investor. This exchange rate risk is a factor in the cost of investment. Firms will invest abroad when the expected returns equal the cost of operation and payment for the degree of risk introduced by exchange rate volatility. The greater the exchange rate volatility, the higher the exchange rate risk. Hence, exchange rate volatility has an inverse relationship with foreign private capital inflow.

3.2 Model Specification

On the basis of the theoretical framework above, foreign private capital inflow is a function of the exchange rate, exchange rate volatility, and other control variables. This can be specified as

FPCI = FPCI (EXCH, EXCHV, Z) - - - - - - 2

Where:

FPCI = Foreign Private Capital Inflow

EXCH = Exchange rate

EXCHV = Exchange rate Volatility

Z = other control variables affecting Foreign Private Capital Inflow

This can be specified explicitly in econometric form as

$FPCI_t = \beta_0 + \beta_1 EXCH_t + \beta_2 EXCHV_t + \eta_1 Z_t + U_t$ - - - - 3

In order to examine the effect of exchange rate on each component of foreign private capital inflow, the foreign private capital inflow is disaggregated into Foreign Direct Investment (FDI) and foreign portfolio investment. Therefore, the disaggregate model is as follows:

$FDI_t = \alpha_0 + \alpha 1 EXCH_t + \alpha 2 EXCHV_t + \eta 1 Z_t + U_t$ - - - - 4

Where:

FDI = Foreign Direct Investment

$FPI = \Phi_0 + \Phi_1 EXCH_t + \Phi_2 EXCHV_t + \eta 1 Z_t + U_t$ - - - - 5

Where:

FPI = Foreign Portfolio Investment

In the above models, the Z is a vector of control variables that influence the dependent variable. The selected variables here include interest rate (INT), Real Gross Domestic Product (RGDP), Inflation rate (INF), Financial Development (FD) and degree of openness (OPEN). These variables were selected based on their popular usage in economic literature. (for example, Eregha, 2017; Alobari, Paago, Igbara, Felix & Emmah, 2016; Bilawal, Ibrahim, Abbas, Shuaib, Ahmed, Hussain & Fatima, 2014; Osinubi & Amaghionyeodiwe, 2009).

The above model is converted into a VAR model as follows

$$FPCI_t = \beta_0 + \beta_1 \sum_{n=1}^{k} FPCI\ t-n + \beta_2 \sum_{n=1}^{k} EXCH\ t-n + \beta_3 \sum_{n=1}^{k} EXCHV\ t-n + \beta_4 \sum_{n=1}^{k} INTt-n$$
$$\beta_5 \sum_{n=1}^{k} RGDPt-n + \beta_6 \sum_{n=1}^{k} INFt-n + \beta_7 \sum_{n=1}^{k} OPENt-n + \beta_8 \sum_{n=1}^{k} FDt-n + U_t \quad (6)$$

$$FDI_t = \beta_0 + \beta_1 \sum_{n=1}^{k} FDI\ t-n + \beta_2 \sum_{n=1}^{k} FPIt-n + \beta_3 \sum_{n=1}^{k} EXCH\ t-n + \beta_4 \sum_{n=1}^{k} EXCHV\ t-n$$
$$+ \beta_5 \sum_{n=1}^{k} INTt-n + \beta_6 \sum_{n=1}^{k} RGDPt-n + \beta_7 \sum_{n=1}^{k} INFt-n + \beta_8 \sum_{n=1}^{k} OPENt-n +$$
$$B_9 \sum_{n=1}^{k} FDt-n + U_t \quad (7)$$

$$FPI_t = \beta_0 + \beta_1 \sum_{n=1}^{k} FPI\ t - n + \beta_2 \sum_{n=1}^{k} FDIt - n + \beta_3 \sum_{n=1}^{k} EXCH\ t - n + \beta_4 \sum_{n=1}^{k} EXCHV\ t - n + \beta_5 \sum_{n=1}^{k} INTt - n + \beta_6 \sum_{n=1}^{k} RGDPt - n + \beta_7 \sum_{n=1}^{k} INFt - n + \beta_8 \sum_{n=1}^{k} OPENt - n + B_9 \sum_{n=1}^{k} FDt - n + U_t \quad (8)$$

The description of variable and their sign expectations are contained in the table 1 below:

Table 1: Description of Selected Variables

Variables	Description	Measurement	Sign expectation
FPCI	Foreign private capital inflow		
FDI	Foreign Direct Investment		
FPI	Foreign Portfolio Investment		
EXCH	Exchange rate	Naira to one US dollar(₦ / US$1)	+
EXCHV	Exchange rate volatility	Mean deviation of the exchange rate	-
INT	Interest rate	Prime rate	+
RGDP	Real GDP	GDP at constant market price	+
INF	Inflation rate	12 months moving average inflation. (To control to the level of economic stability of the economy)	-
FD	Financial Development	The ratio of money supply to GDP (M2/GDP)(To control for financial sector development)	+
OPEN	Degree of openness	The ratio of total trade to GDP $\left(\frac{IMPORT+EXPORT}{GDP}\right)$ (a proxy for trade policy)	+

The causal relationship between the dependent variables and the explanatory variables will be examined using the Vector Autoregressive modeling technique. This will allow the study to be able to ascertain the direction of causality between all the variables in the model.

4. Empirical Analysis

The econometric analysis begins with the test of the time series properties of the variables. This involves the unit root test and the co-integration test. This is aimed at establishing whether or not the time series is stationary. This is followed by the estimation of the specified model and then the test of the hypothesis.

4.1 Unit Root Test

The unit root test is based on the Augmented Dickey Fuller (ADF) statistics. The result is presented in the table below:

Table 2: Unit root test of variables

Unit root test for variables in levels				Unit root test for variables in first order difference			
Variables	Computed ADF	Critical ADF at 5%	Remark	Variables	Computed ADF	Critical ADF at 5%	Remark
FPCI	-2.1419	-2.9369	Non-stationary	D(FPCI)	-11.4492	-2.9369	Stationary

FDI	-4.2671	-2.9350	Stationary	-	-	-	-
FPI	-1.8564	-2.9369	Non-stationary	D(FPI)	-7.6640	2.9389	Stationary
EXCH	1.5986	-2.9458	Non-stationary	D(EXCH)	-3.7869	-2.9458	Stationary
EXCHV	1.9035	-2.9369	Non-stationary	D(EXCHV)	-5.9144	-2.9369	Stationary
INT	-1.2657	-2.9369	Non-stationary	D(INT)	-5.3269	-2.9369	Stationary
RGDP	-1.8348	-2.9434	Non-stationary	D(RGDP)	-3.0045	-2.9434	Stationary
FD	-2.3420	-2.9540	Non-stationary	D(FD)	-2.9625	-2.9540	Stationary
INF	-3.0382	-2.9458	Stationary	-	-	-	-
OPEN	-2.4246	-2.9350	Non-stationary	D(OPEN)	-7.0696	-2.9389	Stationary

From the table 5 above, only FDI and inflation rate were stationary in levels. Hence, these two variables can be said to be integrated of order one. The other variables were stationary in their first order difference, hence they are said to be integrated of order one.

4.2 Co-integration Test

The unit root test shows that most of the variable are non-stationary. Regressing non-stationary variables on each other may lead to spurious regression. Therefore, it is important to ascertain if there exists a long run or equilibrium relationship between the variables. If there is a long run or equilibrium relationship between the variables then it means that although the variables are non-stationary, their linear combination is stationary, hence they drift together over time. This can be established by conducting a co-integration test.

The Johansen co-integration test is employed to ascertain the existence of a long run or equilibrium relationship between the variables. The Johansen co-integration test is based on trace statistics and maximum Eigenvalue statistics at a 5% significance level. The results are presented in the tables below

Table 3: Johansen co-integration rank test based on trace statistics

Hypothesized No. of Co-integrated equations	Eigenvalue	Trace statistics	0.05 critical value	Probability
None *	0.8693	206.5283	159.5297	0.0000
At most 1*	0.6494	125.1318	125.0154	0.0434
At most 2	0.4878	83.2009	95.7536	0.2658
At most 3	0.4159	56.4338	69.8188	0.3607
At most 4	0.2785	34.9261	47.8561	0.4519
At most 5	0.2359	21.8639	29.7970	0.3061
At most 6	0.2191	11.0992	15.4947	0.2055
At most 7	0.0296	1.2049	3.8414	0.2723

Trace test indicates 2 co-integrating equations at 0.05 level

Table 4: Johansen co-integration rank test based on maximum eigenvalue statistics

Hypothesized No. of Co-integrated equations	Eigenvalue	Max-Eigen statistics	0.05 critical value	Probability
None *	0.8693	81.3964	52.3626	0.0000
At most 1*	0.6494	41.9308	40.2314	0.0346
At most 2	0.4878	26.7670	40.0775	0.6494
At most 3	0.4159	21,5076	33.8768	0.6456
At most 4	0.2785	13.0622	27.5843	0.8815
At most 5	0.2359	10.7646	21.1316	0.6708
At most 6	0.2191	9.8942	14.2646	0.2190
At most 7	0.0296	1.2049	3.8414	0.2723

Maximum Eigenvalue test indicates 2 co-integrating equations at 0.05 level

From the results in tables 7 and table 8 above, both the trace test and the maximum eigenvalue test indicates the existence of two co-integrating equations at a 5% significance level. This is a clear indication that the variables are

co-integrated. Hence there exist a long run or equilibrium relationship between the variables. On this basis, it can be concluded that although the variables are stationary on an individual basis, a linear combination of the variables is stationary. Therefore regressing the variables on each other will not produce a spurious regression.

4.3 Selection of lag length

In order to estimate the VAR model, there is the need to ascertain the VAR lag length. In this study, the lag length selection is based on five criteria. These include Sequentially modified LR test statistics, Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ). The result of the various test is presented in the table below:

Table 5: VAR Lag Order Selection Criteria

Lag	Logl	LR	FPE	AIC	SC	HQ
0	-1771.771	NA	6.00e+29	91.2703	91.6115	91.39.27
1	-1541.135	354.8256	1.25e+26	82.7248	85.7960*	83.8267
2	-1430.173	125.1881	1.73e+25	80.3165	86.1176	82.3979
3	-1312.304	84.6234*	4.44e.24*	77.5540*	86.0851	80.6149*

*indicates lag order selected by the criterion

From table 9 above, four out of the five criteria selected lag order of three while one criterion selected one lag length. Specifically, Sequentially modified LR test statistics, Final prediction error (FPE), Akaike information criterion (AIC) and Hannan-Quinn information criterion (HQ) selected lag order of three, while Schwarz information criterion (SC) selected one lag order. Therefore, this study in the estimation of the VAR model adopted the lag order of three.

4.4 Vector Autoregressive Estimates

The estimation of the vector autoregressive model was conducted in three stages. The first stage is the estimation of the aggregate foreign private investment inflow model. This is followed by the disaggregate model comprising of foreign direct investment and foreign portfolio investment.

i. Estimates of the aggregate foreign private investment model

The result of the estimation of the vector autoregressive model for the foreign private investment is presented in the table below:

Table 6: Estimates of aggregate foreign private investment model

Regressors	FPCI	EXCH	EXCHV	INT	RGDP	INF	OPEN	FD
FPCI(-1)	0.136*	1.168**	1.090	8.323**	0.090*	-5.350	-5.350	6.950*
	(6.831)	(1.894)	(1.029)	(1.730)	(8.657)	(-0.506)	(0.506)	(2.752)
FPCI(-2)	0.066**	7.359	7.030	-5.925	9.960*	-4.650	-4.650	7.340**
	(1.857)	(0.898)	(0.501)	(-0.092)	(4.978)	(-0.331)	(-0.331)	(2.190)
FPCI(-3)	0.417**	-4.426	2.660	-6.720	0.500*	3.310	3.310	6.210
	(1.963)	(-0.057)	(0.202)	(-1.119)	(4.976)	(0.251)	(0.251)	(0.197)
EXCH(-1)	-0.255**	1.032**	9.136**	0.046	-1.608	-0.023***	-0.0004	-0.004**
	(-2.382)	(2.191)	(2.247)	(1.269)	(-0.517)	(-1.395)	(-0.568)	(-2.224)
EXCH(-2)	-0.184**	0.996*	-3.043*	-0.048	7.639	-0.008	7.370	-7.550
	(-2.022)	(15.575)	(-2.779)	(-0.963)	(0.181)	(-0.385)	(0.0006)	(-0.028)
EXCH(-3)	-0.351	0.058*	3.968	0.027	1.113	0.028**	7.810	0.0009
	(-0.227)	(4.017)	(0.659)	(0.991)	(0.480)	(2.341)	(0.129)	(0.668)
EXCHV(-1)	-1.712**	-0.005***	0.629*	-0.0004	-2.716**	1.700	7.170	2.150***
	(-2.381)	(-1.460)	(3.322)	(-1.585)	(-2.122)	(0.123)	(0.106)	(1.342)
EXCHV(-2)	-1.905*	0.006	1.109*	0.0008***	-5.701	0.0002	6.390	-1.130
	(-6.638)	(0.997)	(3.489)	(1.655)	(-0.132)	(0.915)	(0.571)	(-0.424)
EXCHV(-	-2.347*	0.004	1.168	3.400	.7.717**	-	-5.790	-1.640
	(-8.594)	(0.652)	(1.098)	(0.070)	(-1.882)	0.0003***	(-0.544)	(-0.645)
EXCHV(-	1.203	3.852	6.014	0.891*	1.626	(-1.382)	0.008**	0.014

3)	(0.835)	(1.175)	(1.072)	(3.489)	(0.075)	0.326*	*	(1.066)
	-0.269	-3.609	-6.917*	-0.109	-5.111	(2.831)	(1.594)	-0.019
INT(-1)	(-0.121)	(-0.715)	(3.428)	(-0.278)	(-0.153)	-0.223	-0.006	(-0.923)
	0.179	-1.291	-17.132	-0.067	16.235	(-1.263)	(-0.756)	0.020
INT(-2)	(0.297)	(-0.352)	(-0.027)	(-0.236)	(0.671)	0.139	-0.003	(1.399)
	0.164**	-2.762**	0.0001	5.670	0.967*	(1.086)	(-0.587)	4.120*
INT(-3)	(1.945)	(-2.041)	(0.168)	(0.205)	(4.153)	-1.260	7.170	(2.851)
	0.833*	-1.123**	-0.0001	1.220	0.384**	(-0.101)	(1.184)	1.530
RGDP(-1)	(4.654)	(-2.377)	(-0.226)	(0.038)	(2.278)	7.400	-4.290	(0.917)
	0.298**	2.552	-0.001	1.420	0.639*	(0.051)	(-0.614)	-1.880
RGDP(-2)	(1.854)	(0.069)	(-0.260)	(0.496)	(2.647)	-1.560	-3.730	(-1.252)
	-0.528	9.755	1.962**	-0.125**	-3.783**	(-1.207)	(-0.594)	-0.032
RGDP(-3)	(-0.171)	(1.392)**	(1.925)	(-2.230)	(-2.306)	1.360*	-0.014	(-1.118)
	-3.708**	*	-2.021	-0.219	-2.158**	(5.526)	(-1.202)	0.087**
INF(-1)	(2.342)	-12.533	(-1.132)	(-0.270)	(-2.001)	-0.383	0.025**	(2.054)
	-2.129	(-1.201)	9.540	0.326	-1.444*	(-1.045)	*	-0.054**
INF(-2)	(-0.748)	5.239	(0.860)	(0.646)	(-5.352)	-0.198	(1.452)	(-2.068)
	6.924*	(0.809)	-3.054*	-	3.374*	(-0.872)	-0.006	0.910
INF(-3)	(2.568)	-184.090	(-2.550)	18.563***	(2.615)	9.249***	(-0.608)	(1.270)
	2.038**	(-1.051)	-2.513*	(-1.359)	7.382**	(1.502)	0.305*	-0.112
OPEN(-1)	(1.849)	74.990	(-9.853)	27.648**	(1.918)	2.437	(2.774)	(-0.184)
	5.177	(0.502)	-	(2.374)	7.973*	(0.464)	0.181*	-1.139**
OPEN(-2)	(0.767)	-154.359	3.697***	0.654	(7.321)	-9.543***	(3.250)	(-1.815)
	7.818*	(-1.005)	(-1.407)	(0.054)	1.169*	(-1.769)	0.042	0.605*
OPEN(-3)	(3.055)	-27.103*	-3.036	3.374	(2.667)	3.217***	(0.159)	(2.542)
	1.812	(-3.296)	(-0.304)	(0.743)	3.379	(1.572)	0.135**	0.039
FD(-1)	(0.587)	-56.827*	-1.189	-6.089	(0.729)	2.313	*	(0.137)
	6.032**	(-2.809)	(-0.989)	(-1.112)	1.132**	(0.937)	(1.361)	-0.085
FD(-2)	(1.764)	21.204	-3.442*	-2.471	(2.208)	2.768	-0.067	(-0.268)
	5.373	(0.272)	(-2.521)	(-0.407)	-2.638	(1.012)	(-0.560)	0.324**
FD(-3)	(0.261)	-1.096	-2.760	-1.096	(-0.085)	-2.959**	-0.066	(1.699)
		(-0.301)	(-0.345)	(-0.301)		(-1.803)	(-0.502)	
C							0.120** * (1.505)	
R-Squared	0.753	0.979	0.926	0.964	0.969	0.994	0.876	0.848
F-Statistics	5.780	27.382	7.301	15.724	18.433	99.585	4.133	3.278

*significant at 1% ** significant at 5% *** significant at 10%

Colum two of the above table shows the estimates of the foreign private capital inflow equation. From the result, all sign expectations were met and the test statistics show good performance. From the result, the lagged values of the foreign private capital inflow have a significant impact on its current period value. With the positive sign of the lagged period values, an increase in the previous level of foreign private capital inflow will lead to an increase in its current period value. This was statistically significant at 1% judging by the values of the t-ratios.

The exchange rate has a negative sign and the impact on foreign private capital inflow was statistically significant in the first and second lagged periods. However, the impact was not significant in the third lagged period. With the negative sign, an increase in the exchange rate (devaluation/ depreciation of the naira) will lead to a fall in foreign private capital inflow.

Exchange rate volatility variable was statistically significant in the first, second and third lagged periods and the coefficients have negative signs. Hence, the increase in exchange rate volatility leads to a fall in foreign private capital inflow.

ii. Estimates of the disaggregate foreign private investment model

The result of the estimation of the vector autoregressive model for the disaggregated foreign private investment is presented in the table below:

Table 7: Estimates of disaggregate foreign private investment model

Variables	FDI	FPI	EXCH	EXCHV	INT	RGDP	INF	OPEN	FD
FDI(-1)	0.938*	0.501	-1.380*	-3.680	-6.990	0.009*	-9.980	-4.871	3.701
	(2.877)	(0.465)	(-4.649)	(-0.681)	(-0.331)	(2.534)	(-0.913)	(-1.150)	(0.336)
FDI(-2)	0.230**	1.605**	-3.480*	2.730	2.714***	0.001**	-5.280	-	-3.931
	(1.932)	(1.678)	(-2.608)	(0.005)	(1.446)	(1.850)	(-0.544)	4.911***	(-0.402)
FDI(-3)	0.076**	0.800	-5.951*	-8.510	-1.400	0.003**	9.830	(-1.307)	1.941**
	(1.964)	(0.867)	(-2.501)	(-0.184)	(-0.776)	(2.223)	(1.051)	9.361*	(2.060)
FPI(-1)	0.133**	0.410***	-4.031*	1.680	1.270**	5.570**	-	(2.585)	-7.801*
	(1.672)	(1.554)	(-7.309)	(1.268)	(2.454)	(2.131)	4.380***	-1.341	(-2.899)
FPI(-2)	0.015***	0.350**	-5.770	7.080	-7.650	0.001	(-1.631)	(-0.129)	-
	(0.136)	(1.930)	(-0.054)	(0.370)	(-1.024)	(0.179)	-6.600**	1.721	5.611***
FPI(-3)	0.055	0.707**	-.5.059*	9.730	-1.150**	3.510**	(-1.704)	(1.148)	(-1.442)
	(0.604)	(2.314)	(-8.409)	(0.063)	(-1.916)	(1.971)	5.891	8.401	9.411
EXCH(-1)	-1.339**	-2.121**	1.231**	1.242**	0.068**	1.006	(0.190)	(0.699)	(0.302)
	(-1.899)	(-2.098)	(2.291)	(1.974)	(1.810)	(0.321)		-	-0.006*
EXCH(-2)	-1.585**	-2.761*	-0.683		-0.110**	-2.275	0.027***	0.001***	(-3.190)
	(-2.252)	(-2.512)	(-0.822)	6.847***	(-1.880)	(-0.472)	(1.390)	(-1.450)	0.003
EXCH(-3)	-2.721	-6.645*	0.251	(1.454)	0.047***	1.181	4.140**	0.001***	(1.032)
	(-0.618)	(-4.430)	(0.625)	4.001	(1.661)	(0.507)	(2.001)	(1.589)	0.004
EXCHV(-1)	-2.315**	-1.336*	-0.007***	(0.548)	-0.007**	-6.541**	0.026**	-0.005	(0.299)
	(-2.274)	(-13.204)	(-1.646)	-0.970	(-2.139)	(-2.023)	(1.816)	(-0.955)	4.300*
EXCHV(-2)	-1.256**	-3.217*	0.013***	(-1.130)	0.001*	5.866	6.450	7.760	(2.466)
	(-2.022)	(-8.543)	(1.467)	1.845	(2.456)	(1.085)	(0.371)	(1.154)	-6.060**
EXCHV(-3)	-3.315**	-1.178*	-0.001	(1.090)	-0.005	-5.839**	0.001	-1.500	(-1.761)
	(-2.147)	(-39.863)	(-0.235)	1.203	(-1.000)	(-1.934)	(0.305)	(-1.129)	-1.210
	-1.008**	-7.002	7.878**	(0.812)	1.319*	8.210	-0.002	7.830	(-0.400)
INT(-1)	(2.044)	(-0.431)	(1.755)	1.102***	(4.152)	(0.315)	(-0.996)	(0.674)	-0.008
	-	3.080		(1.355)	-0.901**	-1.166	0.363**	0.006	(-0.052)
INT(-2)	1.210***	(1.185)	11.121***	-1.380	(-1.777)	(-0.281)	(2.207)	(1.063)	0.005
	(-1.548)	-8.950	(1.551)	(-1.061)	0.422	2.795	-0.263	0.001	(0.201)
INT(-3)	-2.319	(-0.478)	3.338	2.466	(1.155)	(0.934)	(-1.002)	(0.186)	0.002
	(0.410)	6.180*	(0.646)	(0.263)	1.730	0.087	0.106	-0.015	(0.116)
RGDP(-1)	1.065**	(3.730)	9.318*	0.003	(0.053)	(0.331)	(0.559)	(-2.108)	4.580*
	(2.125)	8.120*	(4.606)	(0.417)	-1.950	-0.387	6.750	1.720*	(2.712)
RGDP(-2)	1.263**	(4.552)	8.167*	-0.005	(-0.558)	(-1.359)	(0.401)	(2.640)	2.160
	(2.341)	1.897**	(4.906)	(-0.655)	5.080***	0.602*	-5.750	-8.890	(1.190)
RGDP(-3)	16.488	(1.869)	3.780*	-1.610	(1.609)	(2.330)	(-0.317)	(-1.270)	-
	(0.337)	-1.070*	(4.506)	(-0.019)	-0.186	-8.455**	-1.490	-	2.590***
INF(-1)	-1.601**	(-11.888)	9.421*	1.173	(-0.333)	(-1.846)	(-0.909)	9.900***	(-1.573)
	(-1.845)	-4.100*	(7.907)	(0.818)	-0.103	9.772***	1.447*	(-1.561)	-0.003
INF(-2)	-3.201**	(-2.926)	11.844*	-1.171	(-0.118)	(1.373)	(4.987)	-0.007	(-0.137)
	(-2.378)	-2.150**	(12.285)	(-0.525)	0.259	-	-0.479	(-0.690)	0.041
INF(-3)	-2.560*	(-2.085)	4.902*	1.896	(0.436)	6.424***	(-1.062)	0.020	(0.911)
	(-2.785)	7.001**	(8.392)	(0.124)	-3.122	(-1.321)	-0.178	(1.167)	-0.024
OPEN(-1)	6.350*	(2.000)	4.080**	2.466	(-0.185)	8.093	(-0.579)	-0.008	(-0.776)
	(2.600)	5.790*	(2.372)	(0.573)	2.094***	(0.589)	1.174***	(-0.732)	0.208
OPEN(-2)	4.130**	(2.412)	5.360	3.108	(1.674)	2.632	(1.349)	0.400	(0.237)
	(2.173)	1.001***	(0.030)	(0.970)	-1.096	(0.257)	0.923	(1.187)	-0.511
OPEN(-3)	6.160*	(1.546)	2.655***	-	(-0.867)	1.021**	(0.142)	-0.138	(-0.784)
	(3.080)	3.061**	(1.487)	5.014***	0.381	(1.987)	-1.182**	(-0.553)	-
FD(-1)	8.010**	(1.800)	-3.738	(-1.548)	(0.071)	2.497	(-1.804)	-0.013	0.946***
	(1.971)	3.600*	(-0.049)	8.400	-1.141**	(0.572)	3.057	(-0.054)	(-1.437)
	1.110	(2.769)	-1.064*	(0.061)	(-1.764)	2.316	(1.107)	0.211**	0.467**
	(1.105)	8.111**	(-9.133)	-	7.215	(0.437)	1.209	(1.976)	(1.684)

FD(-2)	1.500**	(2.211)	1.126	2.172***	(1.005)	1.318**	(0.360)	-0.124	0.251
	(2.139)	-0.998	(1.111)	(-1.311)	-0.968	(2.244)	2.739	(-0.962)	(0.747)
FD(-3)	9.950**	(-0.554)	-7.464	4.172	(-0.274)	-1.571	(0.736)	-	-0.437
	(1.824)		(-0.149)_	(0.226)		(-0.545)	-	0.223***	(-1.170)
C				-2.050			2.390***	(-1.551)	0.390**
				(-0.227)			(-1.308)	0.175*	(2.126)
								(2.485)	
R-Squared	0.865	0.855	0.982	0.932	0.975	0.980	0.994	0.930	0.899
F-Statistics	2.615	2.417	23.497	5.595	16.499	20.667	78.151	5.454	3.654

From the results in table 11 above, column 2 shows estimates of FDI equation. Form the result, the sign expectations were met for all the variables except for interest rate and exchange rate. Also, all the test statistics show good performance. The coefficient of the determination was 0.86. This means that about 86% of the systematic variation in FDI was explained by the model. The F-Statistics has a coefficient of 2.615. This was significant at the 5% level. This shows that the group of the selected explanatory variable are significant determinants of FDI inflow.

The significance of individual variables was tested using the t-statistics. From the estimates, previous levels of FDI has a positive and significant impact on the current level of FDI inflow. The impact was significant at the 1% level in the first lagged period, while the second and third lagged period were significant at the 5% level. This shows that the higher the previous value of FDI inflow, the more the FDI inflow in the current period.

The exchange rate has a negative sign. The impact of exchange rate on FDI was significant for all the lagged periods at 5% level. This shows that an increase in the exchange rate (devaluation/depreciation of the naira) will lead to a fall in FDI inflow. Similarly, exchange rate volatility also has a negative sign in the three lagged periods. The impact was also significant at 5% in all the lagged periods. This shows that high volatility of the exchange rate leads to a fall in FDI inflow.

Also, in the foreign portfolio investment equation, the exchange rate has negative signs in all the lagged periods. Also, the impact of exchange rate on FPI was significant 5% in lagged period one but in lagged period two and three the impact was significant at 1% level. This shows that an increase in the value of the exchange rate (devaluation of the naira) will lead to a fall in FPI inflow. Closely related is the change rate volatility. Exchange rate volatility has a negative sign in as all the lagged periods and its impact on FPI inflow was highly significant even at 1% level. This shows that volatility in exchange leads to a fall in FPI inflow into Nigeria.

On the whole, findings from the estimation of the specified models can be summarized as follows:

i. Devaluation of the naira has a negative impact on foreign private capital (both foreign direct investment and foreign Portfolio investment) inflow in Nigeria.
ii. The volatility of the exchange rate of the naira reduces foreign private capital inflow in Nigeria. Hence, a stable exchange rate promotes foreign private capital inflow.
iii. Increase in the size of the domestic market promotes foreign private capital inflow in Nigeria. The bigger the size of the economy the more attractive it is to foreign investors.
iv. Increase in the rate of inflation discourages foreign private capital inflow in Nigeria.
v. Development of the financial sector is a significant factor in promoting foreign private capital inflow in Nigeria.
vi. Increase in the size of the domestic market stimulates the appreciation of the domestic currency of a country. This means the sustained growth of the Nigerian economy can lead to an appreciation of the naira.
vii. Increase in the level of financial development will lead to a fall in the exchange rate. This means that an improvement in the operations of the financial sector of the economy will lead to an appreciation of the naira.

5. Policy Recommendations

On the basis of the above findings, the followings are possible recommendations.

i. The government through the central bank should put in place policies to stabilize the exchange rate of the naira. This can be done through regular Central Bank intervention foreign exchange market. A more stable exchange rate will promote foreign capital inflow into the economy.

ii. An appropriate macroeconomic policy framework should be put in place to boost the size of the domestic market. An increase in the real Gross Domestic Product (GDP) will stimulate foreign capital inflow into the economy. Increase in the size of the domestic economy will also empower the naira to appreciate.

iii. The government through the central bank should employ appropriate macroeconomic policies to control the inflationary pressure in the economy. The current 15% inflation rate is on the high side. As the empirical result from this study revealed, increasing rate of inflation discourage foreign capital inflow and also adversely affect the exchange rate of the naira.

iv. A sound financial sector is a basic pre-requisite for assessing the absorptive capacity of the domestic economy to the inflow of foreign capital. Therefore, the Nigerian government through the various financial sector regulatory agencies should step up their supervisory role in the sector in order to boost the soundness of the financial sector of the economy.

6. Conclusion

Foreign private capital inflow is a significant determinant of economic growth in Nigeria. In attempting to stimulate economic growth which is a key macroeconomic goal of the Nigerian state, the economy must be made attractive for foreign capital inflow. From the empirical results, the stable exchange rate is a key determinant of foreign private capital inflow in Nigeria. Therefore, an appropriate exchange rate policy aimed at stabilizing the exchange rate of the naira is needed. In order to achieve this, the recommendations above would be helpful.

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