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Determinants of Foreign Direct Investment in the Nigerian Telecommunication Sector

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Abstract

This paper investigated the key determinants of FDI in the Nigerian telecommunication sector. The study made use of data from 1986 to 2014. Annual data on infrastructure, government expenditure, trade openness and market size, were sourced from the World Development Indicators (WDI) of the World Bank. FDI flow into telecommunication sector, foreign exchange rate, interest rate and inflation, were sourced from Central Bank of Nigeria Statistical Bulletin. Data were analyzed using graphs, t-test and Autoregressive Distributed Lag (ARDL). The results showed that the key determinants of FDI in the sector are market size and trade openness ($t = 5.75$ to 9.05; $p < 0.05$) on positive side, as well as Inflation and real interest rate ($t = -0.05$ to -4.03; $p < 0.05$) on negative side. The study therefore concludes that the key determinants of FDI flow into the Nigerian telecommunication sector are market size, trade openness, government expenditure, inflation and interest rate.

Keywords

Determinants of FDI, Expenditure, Trade

1. Introduction

Foreign Direct Investment (FDI) has emerged as the most important source of external resource flows to developing countries over the years and has become an integral part in the formation of capital in these countries. Therefore, attempts have been made by Nigerian authorities to try to attract FDI via various reforms. The reforms included the deregulation of the economy, the new industrial policy of 1989, the establishment of the Nigeria Investment Promotion Commission (NIPC) in early 1990s, and the signing of Bilateral Investment Treaties (BITs) in the late 1990s. The benefits of foreign direct investment include promoting economic growth, technology transfer and job-creation in the

local economies. Also, FDI can serve to integrate domestic markets into the global economic system far more effectively than could have been achieved only by traditional trade flows.

FDI flow into Nigerian economy has increased over the years from $6 billion in 2009 to $7.03 billion in 2013. The percentage share of telecommunication sector to total FDI increased from 0.9% in 1986 to 2.3% in 1990. Among 1999 to 2006, its share decreased to 1.7% and it increased to 24% between 2007 and 2013 (CBN, 2014). In order to attract more FDI, there is need to improve on the factors that can influence the inflow of FDI into the host country. Many studies have been conducted on the factors responsible for inward FDI into a host country. Pfeffermann and Madarassy [1] identified the size of the domestic market, inflation, exchange rate volatility, interest rate and macroeconomic policies as critical variables that determines foreign direct investment in developing countries. According to Iyela [2], corruption increases the cost of doing business and as such foreign investors would prefer to invest in countries with lower rates of corruption. Meanwhile, Ezeanyeji and Ifebi [3] found out that stable political environment, improved infrastructural facilities, policy consistency and stabilized exchange rate are fundamental in attracting FDI to an economy. Most of these studies on determinant of FDI did not place emphasis on a specific sector and very few made use of indicators or measurements for these factors. The factors that influence FDI flow varies per sector, a factor that is of great importance to a foreign investor in a sector may be less important to the other in another sector. Hence, the need is to investigate these factors for specific sectors.

Among foreign investments, telecommunication is one of most strategic industries of national economic control. This is because telecommunication covers many other industrial sectors including the sectors of manufacture, entertainment and communication. Foreign investment is not merely a provider and improvement of local telecommunication equipments. The banking and finance sector is reaping the benefits of deregulation of telecommunication as this has created more opportunities for investment. Also, foreign investments in the telecommunication subsector have contributed to the creation of job in the economy. As a result of these great benefits derived from this sector, there is need to attract FDI flow to the sector.

Several factors have been identified in literature to determine the inflow of FDI into telecommunication sector. These includes, market size, per capita income, competition, infrastructure, trade openness, political instability, employment and skill level, technology diffusion and knowledge transfer and linkages, exchange rate rules and regulations, resource endowment, among others [4] [5] [6] [7]. According to these studies some of these factors have impacted negatively on the inflow of FDI while some factors have impacted FDI positively. However, most of these studies considered a few factors for investigation which could have resulted in the neglect of some other important factors. Based on this, there is need to do more thorough study in this area. This paper will there-

fore investigate the determinants of FDI in the Nigerian telecommunication sector.

2. Review of Empirical Literature

Generally speaking there is a wide range of variables that can influence a foreign investors to invest in a certain location but the truth is not all of them have equal degree of importance to each foreign investor, therefore it is wise to note that some of these determinants may have more weight to one foreign investor and less to the other at a certain period of time. Several studies have articulated empirically the determinants of foreign direct investment in a country, some of which buttressed on FDI at national level and others on FDI in a specific sector.

Pfeffermann and Madarassy [1] identified the size of the domestic market, inflation, exchange rate volatility, interest rate and macroeconomic policies as critical variables that determines foreign direct investment in developing economies. Their findings indicate that the size of the domestic market and capacity utilization are positively related to foreign direct investment, an unstable exchange rate also creates foreign exchange risk and uncertain investment climate. Whereas, inflation and volatile exchange rates have negative effects on foreign investment while high and rising inflation rates heighten fears of rising costs of imported capital goods and inputs. However, Demirhan and Masca [8] used the cross-sectional data of 38 developing countries for the period of 2000 to 2004 to examine the determinants of FDI in developing countries. They used econometric model and found that per capita income, growth rate, existence of main telephone lines, and trade openness have significant positive impact on FDI inflows. Similarly, inflation rate and tax rate also significantly attract FDI, with negative sign. On the other hand, they analyzed that risk and labour cost is insignificant to FDI inflows in developing countries.

The study by Elijah [9] employed an econometric model to regress FDI on exogenous variables that include human capital, real exchange rate, annual inflation and openness of the Kenya economy. The author found that economic openness and human capital affect FDI inflows positively in the short-run. But inflation and real exchange were negatively related to FDI inflows in the short-run and long-run respectively. A similar econometric model of FDI was used by Fuat and Ekrem [10] to examine location related factors that influence FDI inflows into the Turkish economy. They discovered that the size of the host country's market, infrastructure (proxied by share of transportation, energy and communication expenditures in GDP) and the openness of the economy (as measured by the ratio of exports to imports) are positively related to FDI inflows. The results further revealed that both exchange rate instability and economic instability (measured by interest rate) have negative effects on FDI.

Aqeel and Nishat [11] empirically identified the variables of FDI growth in Pakistan for the period of 1961 to 2003. They used co-integration along with error correction techniques for identifying factors which influence level of FDI.

The results had shown that corporate tax rate, import tariffs, exchange rate, devaluation of rupee and liberalization measures had positive and significant relationship with FDI. Similarly, Zaman *et al.* [5] empirically investigated the economic determinants of FDI in Pakistan for the period from 1971-2003. He found that unit labour cost, inflation, market size, and trade balance revealed their significant impact, while service sector showed its insignificant contribution towards FDI.

Anyanwu [12] in his study on the determinant of FDI inflows to Africa concluded that there is a positive relationship between market size and FDI inflows, openness to trade has a positive impact on FDI inflows, higher financial development has negative effect on FDI inflows, high government consumption expenditure attracts FDI inflows to Africa, higher FDI goes where international remittances also goes in Africa, agglomeration has a strong positive impact on FDI inflows to Africa, natural resource endowment and exploitation (especially for oil) attracts huge FDI into Africa, East and Southern African sub-regions appear positively disposed to obtain higher levels of inward FDI. Rojid *et al.* [13] notes that natural resources, market size, labour cost, human capital, corporate tax and political instability are significant factors in attracting FDI to Africa. Meanwhile, Asiedu [14], using a panel data for 22 countries in Sub-Saharan Africa (SSA) over the period 1984-2000, find that countries that are endowed with natural resources or have large markets attract more FDI. In addition, good infrastructure, an educated labor force, macroeconomic stability, openness to FDI, an efficient legal system, less corruption and political stability promote inward FDI.

In Nigeria, a large number of empirical works have been carried out on FDI determinants. Using time series econometric technique on annual data of Nigeria, Soumyananda [15] examined the effect of the country's natural resource export, along with openness, market size and macroeconomic risk variables like inflation and foreign exchange rate on FDI inflow during 1970-2006. The study supports earlier literature except market size in case of Nigeria. Generally, the market size is considered as the major determining factor for FDI. It might be true for other country but not in Nigeria during 1970-2006. The study suggests that the endowment of natural resources, macroeconomic risk factors and policy variable like openness are significant determinants of FDI inflow to Nigeria. The findings suggest that the bulk of FDI inflow to Nigeria can be explained by resource-seeking FDI. Consequently, Akenbor and Tennyson [16] empirically analyzed the impact of natural assets, market size, infrastructure, human capital, investment policies, population health, reliability of legal system, corruption, and political risk on FDI in Nigeria during the period of 1999-2012, and also to determine the factor with the strongest and weakest impact. It was gathered in the study that market size, natural assets, infrastructure, domestic credit, exchange rate, legal system and population health of the country have a positive relationship with FDI; while corruption, human capital development, political

risk and trade openness have a negative relationship with FDI.

Donwa, Mgbame and Ezeani [17] examined the determinants of FDI flows into oil and gas sector in Nigeria. The study adopted a desk based library method where the knowledge gained from various literature as well as empirical studies reviewed form the basis for conclusion and recommendations. They concluded that the major determinants of Foreign Direct Investment flows into oil and gas sector in Nigeria are Domestic Market size, Trade openness, Inflation, Exchange rate and economic policies and necessary measures should be provided to combat inflation and exchange rate variability as these factors discourages FDI flow and in turn affects economic growth.

Keith [4] researched on FDI and telecommunication in India, he established that market size, level of support of infrastructure, education level of work force, economy's level of openness and poor governance in form of high levels of government debt are the most important factors that will determine inflow of FDI into Indian telecommunication sector. He established that Foreign direct investment in the Indian telecommunications sector would likely increase further if limits on investment were removed, regulations were clarified and the physical infrastructure was improved. Meanwhile, Sandeep and Surender [7] did a similar study and chose increase in trade, employment and skill level, technology diffusion and knowledge transfer and linkages and spillover of domestic firm to be the determinant factors. They find that a stable, transparent and non-discriminatory regulatory system is the best way to attract more foreign investment in India.

In the study of FDI flow into Pakistan telecommunication sector, Qaiser [6] identified political stability, fluctuation in GDP and rules and regulations. He found that there is negative association between political risk instability in Pakistan and inflow of FDI and a positive correlation between inflow of FDI and fluctuation in economic growth. Whereas Shumaila *et al.* [5] considered market size, competition, literacy rate, foreign trade and per capita income and concluded that all these factors are positively related to FDI.

3. Methodology

3.1. Model Specification

In an attempt to analyze the relationship between foreign direct investment in telecommunication and its determinant, this study used the OLI-paradigm (ownership, internalization and location) as a guide. However, the key determinant in decision making process to invest abroad is location advantages of the host country which is of paramount concern for this objective. These location advantages (determinants of FDI flow) includes market size, inflation, exchange rate, infrastructure, political stability, portfolio diversification, resource location, differential rate of return, foreign exchange reserves, internalization, openness, government policy, political stability, tax policies, regulatory environment, inflation, industrial organization, the level of external indebtedness, foreign exchange rate, among others.

This study selected some of the determinants noted by Soumyananda [15] and Anyanwu [12]. These studies were selected because they considered a wide range of factors for investigation. Soumyananda [15] examined the effect of the country's natural resource export, along with openness, market size and macroeconomic risk variables like inflation and foreign exchange rate on FDI inflow. The model is specified thus;

$$\begin{aligned}\text{FDI} = {} & \beta_0 + \beta_1 \text{marksize} + \beta_2 \text{exchrate}_t + \beta_3 \text{inf rate}_t \\ & + \beta_4 \text{openness} + \beta_5 \text{natresources}\end{aligned} \tag{3.1}$$

where FDI represents foreign direct investment, β_0 is Constant, marksize is market size, exchrate_t is the exchange rate, infrate_t is inflation rate, openness is the degree of openness and natresources is natural resources.

Anyanwu [12] identified first lag of FDI (FDI-1), urban population (Urban-Pop), GDP per capital (GDPPC), openness, financial development (Financial-dev), inflation, exchange rate, infrastructure, government consumption expenditure, remittances, political rights, oil exporters and regions as the determinants of FDI in African countries. The model is presented below;

$$\begin{aligned}\text{FDI}_{ijt} = {} & \beta_0 + \beta_1 \left(\text{Urban Pop}\right)_{ijt} + \beta_2 \left(\text{GDPPC}\right)_{ijt} + \beta_3 \left(\text{Openness}\right)_{ijt} \\ & + \beta_4 \left(\text{Financialdev}\right)_{ijt} + \beta_5 L\left(\text{Inflation}\right)_{ijt} + \beta_6 \left(\text{Exchange Rate}\right)_{ijt} \\ & + \beta_7 \left(\text{Infrastructure}\right)_{ijt} + \beta_8 \left(\text{Govcons exp}\right)_{ijt} + \beta_9 \left(\text{Re}\,mit\,\text{tan}\,ces\right)_{ijt} \\ & + \beta_{10} \left(\text{Political Rights}\right)_{ijt} + \beta_{11} \left(FDI - 1\right)_{ijt} + \alpha\beta_{12} \left(\text{Oilexporters}\right)_{ijt} \\ & + \psi \left(\text{Re gions}\right)_{ijt} + \varepsilon_{ijt}\end{aligned} \tag{3.2}$$

This study will select the factors incorporated from the above studies as the possible factors that determine FDI inflow into the Nigerian telecommunication sector. Some of these factors such as natural resources, political rights, regions, and financial development would be ignored in this study due to unavailability of data.

The model for this study is specified using ARDL model because it allows for the model to take a sufficient number of lags to capture the data generating process in a general-to-specific modeling framework [19];

$$\text{FDIT}_t = f\left(\text{INFR}_t, \text{OPN}_t, \text{MSZ}_t, \text{FEX}_t, \text{GEXP}_t, \text{INTR}_t, \text{INFL}_t\right) \tag{3.3}$$

The model expresses foreign direct investment in telecommunication(FDIT) as a function of infrastructure (INFR), trade openness (OPN), market size (MSZ), foreign exchange rate (FEX), government expenditure (GEXP), interest rate (INTR) and inflation (INFL).

From Equation (3.3), the hypothesized relationship between foreign direct investment in Nigerian telecommunication sector and its determinant is expressed in a linear form thus;

$$\begin{aligned}\text{FDIT} = {} & \alpha_0 + \alpha_1 \text{INFR}_t + \alpha_2 \text{OPN}_t + \alpha_3 \text{MSZ}_t + \alpha_4 \text{FEX}_t \\ & + \alpha_5 \text{GEXP}_t + \alpha_6 \text{INTR}_t + \alpha_7 \text{INFL}_t + \mu_t\end{aligned} \tag{3.4}$$

where $\alpha_0 \ldots \alpha_7$ are parameter estimates and μ is the error term.

To illustrate the ARDL modelling approach, Equation (3.4) will further be expressed as;

$$\begin{aligned}\Delta \ln \mathrm{FDIT} = {} & \alpha_0 + \sum_{i=1}^{q} \beta_j \Delta \mathrm{INFR}_{t-i} + \sum_{i=1}^{q} \gamma_l \Delta \mathrm{OPN}_{t-l} + \sum_{i=1}^{q} \varphi_k \Delta \ln \mathrm{MSZ}_{t-i} + \sum_{i=1}^{q} \lambda_m \Delta \mathrm{FEX}_{t-i} \\ & + \sum_{i=1}^{q} \eta_r \Delta \mathrm{GEXP}_{t-i} + \sum_{i=1}^{q} \pi_s \Delta \mathrm{INTR}_{t-i} + \sum_{i=1}^{q} \phi_n \Delta \mathrm{INFL}_{t-i} + \sum_{i=1}^{q} \xi_u \Delta \ln \mathrm{FDIT}_{t-i} \\ & + \delta_1 \mathrm{INFR}_{t-1} + \delta_2 \mathrm{OPN}_{t-1} + \delta_3 \ln \mathrm{MSK}_{t-1} + \delta_4 \mathrm{FEX}_{t-1} + \delta_5 \mathrm{GEXP}_{t-1} \\ & + \delta_6 \mathrm{INTR}_{t-1} + \delta_7 \mathrm{INFL}_{t-1} + \delta_8 \ln \mathrm{FDIT}_{t-1} + \varepsilon_t \end{aligned} \quad (3.5)$$

The terms with the summation signs in Equation (3.5) represent the Error Correction Model (ECM) dynamics. The coefficients δ_i are the long run multipliers corresponding to long run relationship and ln is the natural log operator. α_0 and ε_t represent the constant and the white noise respectively while $\beta_j, \gamma_l, \phi_k, \lambda_m, \eta_r, \pi_s, \varphi_n, \xi_u$ represents the short run effects. Δ is the first difference operator while q is the lag length for the ECM. Equation (3.5) is therefore estimated to obtain the relationship between FDIT and the explanatory variables.

3.2. Sources of Data

This study made use of secondary data. The data for the variables are annual in nature from 1986-2014. Data for infrastructure, trade openness, market size and government expenditure, would be sourced from the World Development Indicators (WDI) of the World Bank (2015); FDI flow into telecommunication sector, foreign exchange rate, interest rate and inflation, would be sourced from Central Bank of Nigeria Statistical Bulletin (2015).

3.3. Estimation Techniques

The Autoregressive Distributed Lag (ARDL) model will be used to achieve the objective of this study. The ARDL approach to cointegration which was introduced originally by Pesaran and Shin [18] was employed here to examine the relationship between foreign direct investment in Nigerian telecommunication sector and its determinant. The ARDL model does not require all variables to be I(1) as the Johansen framework and it is still applicable if we have I(0) and I(1) variables in our set. It also allows for the model to take a sufficient number lags to capture the data generating process in a general-to-specific modelling framework [19].

To test whether the lagged levels of the variables in the equation are statistically significant or not, the calculated F-statistics is compared with the critical value tabulated by Pesaran *et al.* [20]. If the F-statistics is above the upper critical value, the null hypothesis of no long run can be rejected, irrespective of the orders of integration for the time series. Otherwise, if the statistics fall below the lower critical values, then the null hypothesis cannot be rejected.

Once the long run relationship or co-integration has been established, the second stage of testing involves the estimation of the long run coefficients which

represents the optimum order of the variables. This can be done using selection criteria like Akaike's Information Criteria (AIC), Schwartz-Bayesian Criteria (SBC), Hannan Quinn Information Criteria (HQIC) and R-bar Square Criteria. However, the most consistent lag length chosen by the criterion will be used. Then the associated error correction is derived in order to calculate the adjustment coefficients of the error correction term. Therefore, the short run effects are captured by the coefficients of the first differenced variables in the ECM model.

Having done this, there is also the need to perform a series of diagnostic tests on the stochastic properties established in the model. This is because the existence of a long run relationship does not necessarily imply that the estimated coefficients are stable [21]. This therefore, involves testing of the residuals (homoskedasticity, serial correlation, functional form and normality), as well as stability tests such as the Cumulative Sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMsq) to ensure that the estimated model is statistically robust.

4. Empirical Results

4.1. Descriptive Statistics of Data Series

All data series used in the study covers the period from 1986 to 2014. Table 1 shows the descriptive statistics of the annual data series used in the analysis. The skewness and kurtosis statistics are particularly of great importance since they were used in the computation of Jarque-Bera statistic, which was used in testing for the normality or asymptotic property of a particular series. It is observed that the values of mean and median are close. This indicates that the data are distributed symmetrically [22]. The Jarque-Bera statistics significantly accept the normal distribution for all variables, indicating normality of their conditional distributions.

4.2. Unit Root Tests

Time series data are characterized to be either stationary or non stationary. However, regressing a stationary time series variable on a non stationary time series variable or a non stationary variable on a non stationary variable will result to a spurious regression. Unit root tests such as the Augmented Dickey Fuller (ADF) test and Philips-Perron (PP) test were carried out to ascertain if the variables are stationary or not. In conducting the unit root test, the variables can be I(0), I(1) or I(2). However, auto regressive distributed lag (ARDL) technique does not accommodate I(2) variables. This is because the bound test is based on the assumption that the variables are either I(0) or I(1).

It is observed in Table 2 that using ADF test variables logmsz and infl are I(1) series. dinfra, rintr, opn, infl and fex are significant at levels while logfdi is neither significant at I(0) nor I(1). PP test reveals that all other variables are significant at I(0) except logfdit, logmsz and infl which are significant at I(1).

Table 1. Descriptive statistics of data series.

(a)

	LOGFDIT	LOGMSZ	RINTR	INFL
Mean	21.13594	6.516062	−0.628649	20.82815
Median	20.52518	6.343662	2.767927	12.21701
Maximum	25.17303	7.001282	25.28227	72.83550
Minimum	18.14097	6.203019	−43.57266	5.382224
Std. Dev	1.888953	0.273519	18.20473	19.34185
Skewness	0.382659	0.614375	−0.819032	1.427361
Kurtosis	2.330839	1.658278	3.169784	3.579496
Jarque-Bera	1.248799	3.999634	3.277100	10.25302
Probability	0.535583	0.135360	0.194262	0.005937
Sum	612.9422	188.9658	−18.23083	604.0164
Sum Sq. Dev	99.90798	2.094748	9279.537	10475.00
Observations	29	29	29	29

(b)

	INFRA	FEX	GEXP	OPN
Mean	0.482854	109.8392	8.780584	22.31429
Median	0.373598	89.65000	8.200050	21.49798
Maximum	1.177806	272.3700	17.94384	36.48173
Minimum	0.102674	49.73417	4.833249	10.40073
Std. Dev	0.278451	60.43724	3.135207	7.574603
Skewness	1.063896	1.692839	1.057334	0.461189
Kurtosis	3.083853	4.716055	3.722030	2.280494
Jarque-Bera	5.479223	17.40925	6.033386	1.653568
Probability	0.064595	0.000166	0.048963	0.437454
Sum	14.00276	3185.337	254.6369	647.1144
Sum Sq. Dev	2.170982	102274.5	275.2266	1606.489
Observation	29	29	29	29

Source: Author's Computation from EViews 9 (2017).

4.3. Determinants of Foreign Direct Investment in the Nigerian Telecommunication Sector

The aim of this study is to investigate the determinants of FDI in the Nigerian telecommunication sector over the study period, the ARDL approach was employed in achieving this objective. There is need to determine the optimal lag structure in the ARDL models, followed by the bounds test to show if the variables are cointegrated.

The lag order selection is determined using the Akaike Criterion (AIC), Schwartz Bayesian Criterion (BIC) and Hannan-Quinn Criterion (HQC). As

Table 2. Unit root tests.

Augmented Dickey-Fuller (ADF) Test				Philips-Perron (PP) Test		
Variable	Level	1st Difference	Status	Level	1st Difference	Status
logfdit	−1.019524 (0.7301)	−2.506344 (0.3224)		−1.433259 (0.5517)	−12.35701*** (0.0000)	I(1)
logmsz	0.594886 (0.9870)	−5.235247*** (0.0013)	I(1)	0.538953 (0.9851)	−5.217091*** (0.0013)	I(1)
fex	−3.733436*** (0.0090)		I(0)	−3.833681*** (0.0071)		I(0)
dinfra	−3.383578** (0.0207)		I(0)	−3.383578** (0.0207)		I(0)
infl	−2.510853 (0.1237)	−3.435291* (0.0712)	I(1)	−2.598355 (0.1052)	−5.767097 (0.0004)	I(1)
rintr	−5.308931*** (0.0002)		I(0)	−5.308896*** (0.0002)		I(0)
opn	−3.243412** (0.0279)		I(0)	−3.154872** (0.0338)		I(0)
gexp	−3.373271** (0.0208)		I(0)	−3.426223** (0.0185)		I(0)

Source: Author's Computation from EViews 9 (2017). Note: *, ** and *** denotes significance at 10%, 5% and 1% levels respectively.

shown in Table 3, the AIC, BIC and HQC suggested three lags and as such any of the criteria can be used since they all chose the same lag length.

The bounds test results are presented in Table 4. The F-statistic approximately fell above the upper critical bound at 10%, 5% and 1% level of significance. The F-statistic also fell above the lower critical bound at 10%, 5% and 1% level of significance. The results therefore indicated that there existed a long run relationship among the variables.

4.4. Analysis of the Determinants of Foreign Direct Investment in the Nigerian Telecommunication Sector

The result of the long run and short run relationship among the variables is presented in Table 5. In the long run, the coefficient of market size (5.09) showed that it has positive significant relationship with FDI in telecommunication. This implies that a unit increase in market size would increase FDI flow into telecommunication by 5.09%. Likewise in the short run the current year value of market size had a positive and significant effect on FDI in telecommunication with a coefficient value of 3.92. A unit increase in market size would increase FDI flow into telecommunication by 3.92%. Also, its last two years value had a positive but insignificant impact on FDI in telecommunication. Therefore, it can be concluded that market size is a major factor that can attract FDI flow into the Nigerian telecommunication sector. This positive effect of market size as expected is consistent with studies by Asiedu [14]; Soumyanada [15] and Qaiser

Table 3. Lag length selection criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−478.857	NA	11363110	38.94856	39.3386	39.05674
1	−375.179	132.7077	622491.7	35.77433	39.28469	36.74795
2	−217.829	100.7039*	2948.781*	28.30634	34.93702	30.14541
3	5061.736	0	NA	−388.9389*	−379.1879*	−386.2344*

Source: Author's Computation from EViews 9 (2017). Note: * denotes lag order selection by the criterion. LR: sequential modified LR test statistic (each test at 5% level); FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion.

Table 4. ARDL bounds test.

Model	F-statiatic	No. of Regressors (K)
f (logmkz, dinfra, fex, gexp, opn, infl, rintr)	16.57586	7
Critical value bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.03	3.13
5%	2.32	3.5
1%	2.96	4.26

Source: Author's Computation from EViews 9 (2017).

[6] which reported that market size has a positive and significant relationship with FDI. Theoretically, the investment incentive for market seeking FDI such as telecom firms who seek to expand their market presence by increasing their penetration in local markets is the market size.

Similarly, in the long run, trade openness has a positive and significant effect on FDI in telecommunication with coefficient value of 0.12 at 1% significant level. This implies that a unit increase in trade openness would increase FDI flow into telecommunication by 12%. This also applies in the short run where the current year value of trade openness had positive but insignificant impact on FDI in telecommunication while its last one year value is negatively related to FDI. From this result a deduction can be made that trade openness is positively related to the inflow of FDI in telecommunication sector. This is supported by Anyanwu [12] and Sandeep and Surender [7] that the more open an economy is, the greater the FDI it can attract. Also, the gravity model applied to trade, in its simplest form [23] states that the volume of trade between any two countries is positively correlated with the economic volumes of the exporter and importer countries.

Likewise, the coefficient of infrastructure is positive (0.10) but insignificant in the long run. This implies that one percent increase in infrastructure does not have significant impact on FDI in telecommunication. Also, in the short run the current year value of infrastructure had positive (0.61) and insignificant impact on FDI flow in telecommunication. Meanwhile its last one year value had a

Table 5. (a) Long run and (b) short run relationships.

(a)

Long Run Coefficients			
Variable	Coefficient	t-Statistic	Prob.
LOGMSZ	5.08705	9.054031***	0.0008
DINFR	0.099051	0.114501	0.9144
FEX	−0.000204	−0.13285	0.9007
GEXP	−0.074958	−1.43759	0.2239
OPN	0.117488	5.745742***	0.0045
INFL	−0.051712	−3.61493**	0.0225
RINTR	−0.062692	−4.02929**	0.0157
C	−12.547069	−3.11259**	0.0358

(b)

Short Run Coefficient			
Variable	Coefficient	t-Statistic	Prob.
D(LOGRFDI(−1))	−0.358012	−4.29152**	0.0127
D(LOGRFDI(−2))	−0.923824	−12.3211***	0.0002
D(LOGMSZ)	3.916468	4.336566**	0.0123
D(LOGMSZ(−1))	2.560737	1.902323	0.1299
D(DINFR)	0.614838	1.41994	0.2286
D(DINFR(−1))	2.017467	3.736869**	0.0202
D(FEX)	−0.000162	−0.13317	0.9005
D(GEXP)	0.054205	1.84342	0.139
D(GEXP(−1))	0.135455	3.610545**	0.0225
D(OPN)	0.013376	1.06752	0.3459
D(OPN(−1))	−0.022726	−2.21049*	0.0916
D(INFL)	−0.033872	−4.19254**	0.0138
D(INFL(−1))	0.010541	2.782017**	0.0497
D(RINTR)	−0.024514	−5.53679***	0.0052
ECT(−1)	−0.796752	−6.91415***	0.0023
	R^2 = 0.998706		
	Adjusted R^2 = 0.991913		
	F-statistic = 147.0178		
	Prob (F-statistic) = 0.000100		

Source: Author's Computation from EViews 9 (2017). Note: *,** and *** denotes significance at 10%, 5% and 1% levels respectively.

positive and significant impact on FDI in telecommunication. Overall, it can be deduced that an increase in infrastructure does not necessarily imply an increase in FDI flow into the Nigerian telecommunication sector. This contradicts the

view of Keith [4]; Asiedu [14] and Akenbor and Tennyson [16] which reported that infrastructure promote inward FDI. The contrary result from this study can be traced to the nature of the sector (telecommunication). Infrastructures in Nigeria have improved over the years but this may not be significant in attracting FDI into telecommunication sector as most of the infrastructures needed in the sector are made available by foreign investors.

Table 5 indicates that the inflation has a negative and significant impact on FDI in telecommunication in the long run with coefficient value of −0.05. This implies that a unit increase in inflation would decrease FDI flow into telecommunication by 5%. Also, in the short run there exists a negative and significant relationship between the current year value of inflation and FDI in telecommunication. The coefficient value of inflation (−0.03) implies that a unit increase in inflation would decrease FDI in telecommunication by 3%. However, its last one year value had a positive effect on FDI flow into the sector. Therefore, increase in inflation would discourage the flow of FDI into the Nigerian telecommunication sector which is in conformity to the study of Elijah [9]. This is also supported by Fisher equation which explains that when inflation is low, the nominal interest rate is also low. Therefore, financial cost on FDI is low, and rate of return on investment is high.

Furthermore, the coefficient value of government expenditure (−0.07) in the long run showed that it had negative and insignificant effect on FDI in telecommunication. This implies that government expenditure is unimportant in attracting FDI in the long run. However, in the short run the current year value of government expenditure had a positive but insignificant impact on FDI in telecommunication. Meanwhile its last one year value had a positive and significant impact with coefficient value of 0.14, implying that an increase in government expenditure will increase FDI flow into the sector by 14%. Therefore it can be concluded that government expenditure is vital in attracting FDI into telecommunication sector. The finding is supported by Anyanwu [12]. The Keynesian theory posited that there exists a multiplier effect of a change in expenditure on the national income. Hence an increase in the government expenditure would lead to increased employment and investment which would improve aggregate output.

In addition, the coefficient values and p-values of foreign exchange rate indicates that it had negative and insignificant impact on FDI flow into telecommunication both in the long and short run. This implies that foreign exchange rate is not an important determinant of FDI flow into the Nigerian telecommunication sector. A possible reason for this result is that the exchange rate effects of third countries come through correlations that affect location choice of risk averse firms, which invest in countries whose exchange rates are negatively correlated to other exchange rates as a way of diversifying FDI [20]. This finding contradicts some studies [11] [24] which concludes that foreign exchange rate is essential in attracting FDI into an economy as increase in exchange rate would

increase FDI inflow.

Consequently, Table 5 showed that interest rate had a negative and significant impact on FDI in telecommunication in the long run with coefficient value of −0.06 at 1% significant level. This implies that a unit increase in interest rate would decrease FDI flow into telecommunication by 6%. Similarly, in the short run there exists a negative and significant relationship between current year value of interest rate and FDI inflow. The coefficient value of interest rate was −0.02, implying that an increase in interest rate would decrease FDI inflow by 2%. Therefore it can be reported that the higher the interest rate of Nigeria, the less attractive its telecommunication sector would be to FDI inflow. From Fisher equation, when inflation is low, the nominal interest rate is also low. Therefore, financial cost on FDI is low, and rate of return on investment is high. This also agrees with study by Fuat and Ekrem [10].

The Error Correction Term (ECT) for this cointegrating relationship was negative as expected (−0.80) and significant which showed that about 80% of short run deviations would be corrected for annually. Also from the ARDL regression result, the various tests (R^2, Adjusted R^2, F-statistic, and p-value) of significance on the model showed good result. The R^2 of 0.998 indicated high explanatory power of the independent variables. The adjusted R^2 value of the model also supported this fact. F-statistic which measures the overall significance of the model suggests that all estimated regression model is statistically significant. This is indicated by the F-statistic (147.0178) and *p*-value (0.000100).

4.5. Diagnostic Tests

Table 6 showed the various diagnostic tests conducted to assess the robustness of the ARDL model. These include serial correlation, heteroskedasticity, normality, cusum and cusum of squares. The Breusch-Godfrey serial correlation LM test result showed that the estimated model was free from serial correlation since the F-statistic and probability value are insignificant. For heteroskedasticity, the Breusch-Godfrey test result also indicated insignificant F-statistic and probability values which imply that there is no heteroskedasticity.

Consequently, the result of the normality test indicated that the JB statistic and the probability value are insignificant which implies that the model is well specified. The CUSUM and CUSUMsq are stability tests were conducted to test for recursive residuals in mean and variance of the series. The result in Figure 1 showed that the model is stable at 5% level of significance since there is no

Table 6. ARDL diagnostic tests.

Test Statistic	F-statistic	*P*-value
Breusch-Godfrey Serial Correlation LM Test	3.590	0.366
Breusch-Godfrey Heteroskedasticity Test	2.512	0.239
Jarque-Bera (JB) Normality Test	0.322	0.851

Source: Author's Computation from EViews 9 (2017).

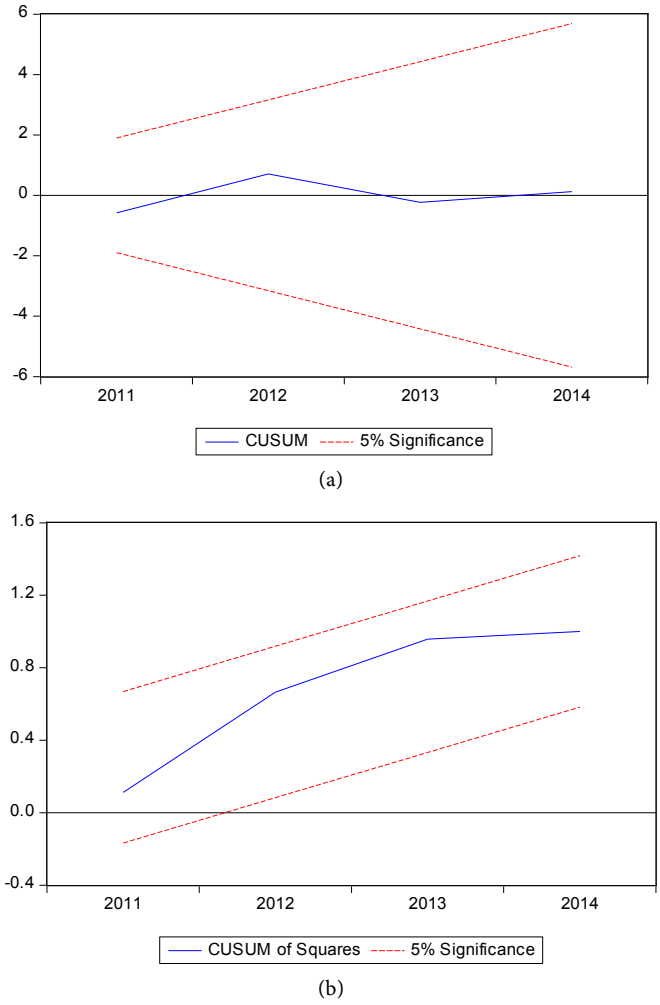

Figure 1. (a) Cusum and (b) Cusum of squares of stability tests.

evidence of recursive residuals in both mean and variance.

5. Recommendations

Based on the findings of this study, the following recommendations are thereby suggested in order for Nigeria to attract more foreign direct investment in the Telecommunications sector and harness its benefits better.

The Nigerian government needs to make more effort in the expansion of market by instituting agency (ies) or regulatory bodies to bring about transparency in the market, hence encourage the flow of FDI into the telecommunication sector.

Government should remove structural barriers by offering incentives such as tax holidays, import duties exemptions and subsidies to foreign firms. This will lead the sector to higher level of openness and internationalization and consecutively attract more FDI.

Low inflation is considered to be a sign of internal economic stability in a host country whereas higher interest rate would discourage the flow of FDI in the

telecom sector. Therefore, government should improve on the close monitoring of these macroeconomic stability indicators by balancing the budget and restricting the money supply so as to put them under control.

More government expenditure should be channeled towards creation of investment friendly and enabling environment for foreign investors. This includes addressing the issue of insecurity in the country, giving of incentives and reducing the bureaucracy associated with starting a business.

6. Conclusion

Having investigated the determinants of FDI in the Nigerian telecommunication sector, this study revealed a number of factors that can attract or discourage the flow of FDI into the sector. These factors include, market size, trade openness, inflation, interest rate and government expenditure. Ultimately, the study found that market size, trade openness and government expenditure had a positive and significant effect on FDI flow into the sector while inflation and interest rate had negative and significant relationship with FDI flow in the sector. However, infrastructure had a positive but insignificant effect on FDI flow while foreign exchange rate had a negative and insignificant effect on FDI, making these factors less important in attracting FDI into the sector. The study therefore concludes that the key determinants of FDI flow into the sector are market size, trade openness, government expenditure, inflation and interest rate.

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