



## IMPACT OF MACROECONOMIC VARIABLES ON FOREIGN DIRECT INVESTMENT FLOW IN NIGERIA: ARDL MODEL

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**ABSTRACT:** *The study examined the impact of macroeconomic variables on foreign direct investment flow in Nigeria from 1986 to 2017. Data on foreign direct investment (FDI), gross domestic product (GDP), government size (GOVT), exchange rate (EXR), inflation rate (INF) and interest rate (INT) were sourced from CBN Annual report. ARDL cointegration bound test and error correction model estimation techniques were employed. The finding of the ARDL revealed that exchange rate, interest rate, gross domestic product and government size were all significantly related to foreign direct investment in Nigeria. The study concluded that there exists a long-run relationship between macro-economic variables and foreign direct investment in Nigeria and recommended that The Nigerian government should foster economic policy capable of attracting more foreign direct investment into the country.*

**KEYWORDS:** Macroeconomic, Foreign Direct Investment, ARDL Model, Inflation Rate, Exchange Rate, GDP, Nigeria

### INTRODUCTION

Demand for external capital is as a result of excessive aggregate investment over real savings. This became important due to investment with longer period of time which produces non-financial profits couple with bigger government budget which are non-tax financed and the developing state of financial market. Capital inflow from outside the local country could be categorized into official and private capital flows. Donations from foreign principals like World Bank and IMF could be referred to as multilateral official flows whereas flow from nations to nations in shape of advances/assistance could be referred to as bilateral official flows (Obidike & Uma, 2013). On the other hand, private flow could be in four types namely; foreign direct investment; portfolio investment, foreign bond and equity contributions and deposit money banks advances to domestic banks and private entities (Obidike & Uma, 2013).

Following the revelation made by UNCTAD (2015) that FDI inflow has recorded above 40% of outside development finance to maturing and transition countries, it is therefore essential for government to promote special rewards and bonuses that is capable of fascinating foreign investor into the home country (Nigeria). Agbonifob (2005) however stated that the stable and fluctuating parameters of macro-economic performance reflect the economic situation of a country, and the degree of business activities and growth determines the attractiveness of the inflow of foreign direct investments into the country. Therefore, if Nigerian government found its way to attracts FDI into the country, it will assist in provision of employment, training and development of human capital, development of skills and acquisition, technical



or managerial skills to Nigerians, standard of living of the citizens, technological advancement, export promotion etc (Ndubuisi, 2017). Chingarande and Karambakuwa (2011) affirmed that a balance economy with low inflationary business arena allure more foreign direct investment, this implies that inflation and other key macroeconomic indicators have the propensity to attract or distract the inflow of FDI into a system.

Different administrations among African nations formulated several policies towards energizing economic movements as a way to attract FDI. In particular, New Partnership for Africa's Development (NEPAD) was launched under one of these policies to accelerate the pace of capital accumulation via numbers of resources mobilization and conducive arena for FDI (Funke & Nsouli, 2013). Fatefully, attempt to attract the needed FDI into African countries proved abortive. Asiedu, (2001) and Okafor (2012) claimed that the pattern of existing FDI is skewed towards extractive industries, that is, the differential rate of FDI inflow into African countries has been adduced to natural resources (Asiedu, 2006; Okafor, 2012). In Nigeria, different administrations of government have tried to prepare a tradable and enabling environment for foreign investments due to low turnout of foreign investors into the home country. The emergence of this need became imperative as a result of deficiencies in macroeconomic performances. Despite the persistent effort of government to boost various macro-economic indicators to attract greater inflow of FDI, the effect of the indicators on the FDI is vague.

Empirical evidence (Obidike & Uma, 2013; Adeleke, Olowe & Fasesin, 2014; Ojong, Arikpo & Ogar, 2015; Achugamonu, Ailemen, Taiwo & Okorie, 2016, Ndubuisi, 2017) on the subject showed that there are mixed results or inconsistent findings. This could be attributed to econometric tests employed, sources of data and coverage of data. Hence, these discrepancies necessitate further study on macroeconomic determinants of FDI in Nigeria. The objective of the study is to ascertain the effect of macroeconomic variables (GDP, government size, exchange rate, inflation rate and interest rate) on foreign direct investment in Nigeria using Autoregressive-distributed lag (ARDL).

## LITERATURE REVIEW

FDI as a concept has been viewed indifferently by prominent number of scholars around the globe ranging from direct to inverse ends with basic features attached to it. United Nations (1999) described FDI as an investment involving a long-term relationship which reflects a greater interest and control of an entity in an economy. Similarly, World Bank (2007) contributed that investment made to acquire long standing ownership and control of firm operating outside the investor's home nation is referred to as FDI. Haruna-danja (2012) opined that FDI is among the fastest growing economic activities in the world which closes the savings gaps in emerging economies.

Going by the studies of Dinda (2009); Asiedu (2006) and Anyanwu (1998), Neo-classical theory became the basis for theory underpinning. The theory necessitated the need for factor of production as a determinant of steady economic growth. Dinda (2009) stipulated that macro-economic determinants such as consumer price index and exchange rate were contributive factors that attract FDI into an economy. Aseiedu (2006) disclosed that exchange rate and low inflation do not only affect FDI into an economy but also a nation which is free



from corruption, basic infrastructures and amenities, employment rate, stability in political governance and tradable environment also serve as major determinants of FDI inflows. On the other hand, Anyanwu (1998) opined that savings ratio, gross fixed capital formation, domestic production and openness to trade were the major factors attributing to FDI.

In Nigeria, Ndubuisi (2017) analyzed the relationship between macroeconomic variables (economic growth, exchange rate, inflation and oil price) and FDI between 1981 to 2014. Johansen co integration and VECM causality methods were applied in the study. The study indicated that there was evidence of long run relationship among the variables. VECM showed evidence of unidirectional causality between FDI and economic growth; bidirectional causality between FDI and exchange rate; unidirectional causality running from inflation rate to FDI in the short run and bidirectional causality between FDI and Oil price.

A study researched on short and long run effect of capital flows and macroeconomic variables over the period of twenty-nine years by Nwinee and Olulu-Briggs (2016) applied granger causality and cointegration tests to evidently showed longrun nexus in the model and found causality test of uni and bi-direction in the model. Specifically, uni-directional causality co-move from interest rate (logINT) to foreign portfolio investment (FPI) as well as from inflation rate (INF) to foreign exchange rate (FEXR) whereas bi-directional causality moves from INF to INT and INT to logINF. The study concluded that in as much as interest rate affect portfolio inflow in the economy, inflation played a frustrating role on foreign exchange and interest rates. Achugamonu, Ailemen, Taiwo and Okorie (2016) employed Johansen cointegration analytical technique to determine the constraining factors towards the inflow of FDI in Nigeria for the period covering 1980-2015. The study discovered that government external and domestic debts, inflation rate and exchange rate have significant long run relationship with foreign direct investment in Nigeria. Imoghele (2016) examined macroeconomic factors influencing FDI inflow in Nigeria for the period of 1986 through 2012. By employing Johansen cointegration and ECM tests, the study showed that truly long run association existed between inflow of FDI and the macroeconomic factors. The study further discovered and established that credit to private sector, GDP and exchange rate were the major indicators that could help attract FDI inflow into the nation.

Ojong, Arikpo and Ogar (2015) evaluated the determinant flow of FDI in Nigeria. Data on domestic investment, openness to trade, market capitalization, gross domestic product and foreign direct investment were sourced from CBN statistical bulletin. Discoveries from the ordinary least square indicated that market capitalization and gross fixed capital formation have inverse effect on FDI inflow while trade openness and gross domestic product have direct effect on FDI inflow in Nigeria. Adaramola and Obisesan (2015) examined the influence of foreign direct investment on the capital market of Nigeria. The study applied OLS, ADF and Johansen co-integration techniques, the study discovered absence of co-integration between FDI and market capitalization. Based on that, OLS was made to conclude the generalize the finding, hence market capitalization has significant influence on FDI. Agya, Amadi and Wunuji (2015) reviewed the contributing factors affecting FDI in Nigeria over the years of 1980-2013 by employing OLS and ADF unit root test. The study discovered that Per capita, gross domestic product, education and trade openness have positively contributed to FDI, whereas wage rate, infrastructure and depreciation of Naira have not positively contributed to FDI in the country.



Ndem, Okoronkwo and Nwamuo (2014) examine the factors of FDI and their effects in Nigeria. The study employed OLS, co-integration and error correction method (ECM) to disclose that market size, openness and exchange rate have positive effect on FDI inflow while political risk and infrastructural investment have negative and significant impact on FDI. Nwankwo, Olukotun & Olorunfemi (2013) applied descriptive narrative methods to study the influence of globalization on FDI in Nigeria. The study showed that Nigeria has benefited tremendously from FDI on employment, technology transfer, local enterprise development. Oladipo (2013) studied the indicators of FDI in Nigeria over the period of 1985 to 2010. Generalised Method of Moment (GMM) estimate was employed and the result showed that EXR, INR, MS and OP have significant influence to determine foreign direct investment in Nigeria while GRE and previous FDI impact negatively. Uwubanmwen and Ajao (2012) analyzed the influence of FDI in Nigeria from 1970 to 2009 with the aid of Cointegration. The empirical study disclosed that consumer price index, exchange rate, trade openness and interest rate were the significant variables influencing FDI inflow into Nigeria. More importantly, the study revealed that government size as well as GDP exhibited an insignificant positive effect on FDI. The analysis showed the presence of a long-run equilibrium relationship between FDI and GDP, but FDI has an insignificant influence on the growth of Nigeria.

## RESEARCH METHOD

### Data

In order to ensure an adequate and comprehensive research for the study, Annual time series data on foreign direct investment (FDI) represented as the dependent variables while gross domestic product (GDP), government size (GOVT), exchange rate (EXR), inflation rate (INF) and interest rate (INT) represented as the explanatory variables were secondarily sourced from Nigerian CBN statistical Bulletin for the period of 1986-2017. Aside government size (GOVT) which was measured as the ratio of government consumption to GDP, other variables were directly collated from Central Bank of Nigeria Statistical Bulletin.

### Model Specification

The model used by Ndubuisi (2017) was relevant and serve as guide for the present study.

The model was stated as;

$$FDI_t = GDP, EXR, INF, OILP \quad 1$$

By augmenting, the study included government size and interest rate to replace oil price in addendum with the remaining variables in the model, the modified model for the study was stated in equation 3.2 as:

$$FDI_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 GOVT_t + \alpha_3 EXR_t + \alpha_4 INF_t + \alpha_5 INT_t + \mu_t \quad 2$$

Where:

$FDI_t$  = Foreign Direct Investment;

$GDP_t$  = Gross domestic product;




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$GOVT_t$	=	Government Size;
$EXR_t$	=	Exchange Rate;
$INF_t$	=	Inflation Rate;
$INT_t$	=	Interest Rate;
$\mu_t$	=	Error Term
$\alpha_1-\alpha_5$	=	coefficients of explanatory variables

It is expected that at the end of the analysis, gross domestic product, government size exchange rate and interest rate will have positive effect on foreign direct investment while inflation is expected to have negative effect on foreign direct investment.

This can be summarized as;

$$\alpha_1 > 0; \alpha_2 > 0; \alpha_3 > 0; \alpha_4 < 0; \alpha_5 > 0$$

### Estimation Technique

Autoregressive Distributed Lag model (ARDL) was employed in the study. The technique of ARDL became essential for the study because it can simultaneously establish shortrun and longrun relationship at a time. More so, ARDL is superior to Johansen cointegration based on mixed stationarity level i.e. I(0) and I(1) but must not exceed I(1) unlike Johansen cointegration which rule stated that all variables should be associated of the same order.

### Test for Stationarity or Unit Root Test

Prior to testing for cointegration, the time series properties of the variables need to be examined. The study made use of Augmented Dickey-Fuller (ADF) test for unit root regression test which was estimated by equation (3.3) as follow:

$$\Delta Y_t = \alpha_0 + \beta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \gamma_3 \Delta Y_{t-3} + \gamma_4 \Delta Y_{t-4} + \gamma_k \Delta Y_{t-k} + \varepsilon_t \quad 3$$

Where  $\Delta$  is the difference operator,  $Y_t$  the series to being tested,  $k$  is the number of lagged differences, and  $\varepsilon_t$  is error term. The standard Augmented Dickey-Fuller (1979) test for a unit autoregressive root tests the null hypothesis  $H_0: \delta=0$  against the one side alternative,  $H_1: \delta < 0$  in the regression. Under the null hypothesis  $Y_t$  has a stochastic trend; under the alternative hypothesis  $Y_t$  is stationary. The ADF statistic is the OLS  $t$ -statistic testing  $t$ -statistic  $\delta=0$ . The lag length  $k$  can be estimated using the BIC or AIC (Stock & Watson, 2003). The rule of the thumb stated that the series must be mixed with I(0) and I(1) and significant at either 1%, 5% and 10%.

### ARDL Approach to Co-Integration

ARDL estimated the long run relationship in the model. To do this, Autoregressive-distributed lag (ARDL) model proposed by Pesaran, Shin and Smith (2001) was employed. The rule of the thumb was that should the F-statistic exceeds the upper critical bounds value, then the  $H_0$  (null hypothesis) is rejected; should the F-statistic falls between the bounds, it is inconclusive and should the F-statistic fall below the lower critical bounds value, it is no co-integration. When long-run relationship exists, the F-test indicates which variable should be normalized.



$$\begin{aligned}
 \Delta \ln(FDI)_t = & \lambda_0 + \sum_{i=1}^n \lambda_1 + \Delta \ln(FDI)_{t-1} + \sum_{i=1}^n \lambda_2 + \Delta \ln(GDP)_{t-1} + \sum_{i=1}^n \lambda_3 \\
 & + \Delta \ln(GOVT)_{t-1} + \sum_{i=1}^n \lambda_4 + \Delta \ln(EXR)_{t-1} + \sum_{i=1}^n \lambda_5 + \Delta \ln(INF)_{t-1} + \sum_{i=1}^n \lambda_6 \\
 & + \Delta \ln(INT)_{t-1} + \beta_0 \ln(FDI)_{t-1} + \beta_1 \ln(GDP)_{t-1} + \beta_2 \ln(GOVT)_{t-1} + \beta_3 \ln(EXR)_{t-1} \\
 & + \beta_4 \ln(INF)_{t-1} + \beta_5 \ln(INT)_{t-1} \\
 & + \mu_{it}
 \end{aligned} \tag{4}$$

Where Ln (FDI) the natural logarithm of foreign direct investment deflator is, Ln (GDP, GOVT, EXR, INF, INT) were the natural logarithm of gross domestic product, government size, exchange rate, inflation and interest rate,  $\Delta$  is the change in each operator and  $\mu_{it}$  is the i.i.d stochastic error term. In investigating the long run association with restriction of coefficients  $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$  the null hypothesis in long run was written as follow:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

However, for policy reasons, the short-run adjustment of foreign direct investment, gross domestic product, government size, exchange rate, inflation rate, interest rate to changes in its determinants is necessary. The significance of error correction model lies in its ability to correct spurious regression results on time series data. The error correction model (ECM) is specified as:

$$\begin{aligned}
 \Delta \ln(FDI)_t = & \alpha_0 + \sum_{i=0}^n \lambda_i \Delta \ln(FDI)_{t-1} + \sum_{i=0}^n \lambda_i \Delta \ln(GDP)_{t-1} + \sum_{i=0}^n \lambda_i \Delta \ln(GOVT)_{t-1} \\
 & + \sum_{i=0}^n \lambda_i \Delta \ln(EXR)_{t-1} + \sum_{i=0}^n \lambda_i \Delta \ln(INF)_{t-1} + \sum_{i=0}^n \lambda_i \Delta \ln(INT)_{t-1} \\
 & + (ECM)_{t-1}
 \end{aligned} \tag{5}$$

Where;  $ECM_{t-1}$  = Error correction term;  $t - 1$  shows variables were lagged by one period;  $\Delta$  = Changes in ECM coefficient.

## RESULTS AND DISCUSSION

### Unit Root Test

Table 4.1 Showed the result of the Augmented Dickey-Fuller unit root test. The result showed that foreign direct investment, gross domestic product attained stationarity at level, government size, and exchange rate attained stationarity at first difference, inflation and interest rate attained stationarity at level and at 1% and 10% respectively.

**Table 4.1: Unit Root Test**

Items	Test statistics	Critical value	Order of Integration
FDI	-3.098518	-1.952910	I(0)**
GDP	-3.278383	-3.689194	I(1)**





GOVT	-8.188302	-1.953381	I(1)**
EXR	-4.095864	-1.953381	I(1)**
INF	-3.780915	-2.674290	I(0)*
INT	-4.228863	-2.622989	I(0)***

Note: \* (\*\*, \*\*\*) denotes 10%, 5% and 1% level of significant respectively

Source: E-view 9.0

### Cointegration

Null Hypothesis: No long-run relationships exist

With no doubt, F-stat of 14.60065 was much higher than the I(1) table value at any % level of significance. The study rejected the null hypothesis. Hence, evidence of long-run relationship among the variables was found among the variables.

**Table 4.2: ARDL Bound Test Result**

NULL HYPOTHESIS	F - STATISTIC	CRITICAL VALUES BOUNDS		
		SIG...	I(0)	I(1)
No long-run relationships exist	14.60065	10%	2.75	3.79
		5%	3.12	4.25
		2.5%	3.49	4.67
		1%	3.93	5.23

Source: E-view 9.0

### Long and Short Run Estimation

Table 4.3 showed that the coefficient of foreign direct investment was statistically negative. Hence, when all the explained variables were held constant, foreign direct investment decreased by 91.39%. The gross domestic product was positive and statistically significant which implied that a percent change in gross domestic product increased foreign direct investment inflow by 84.96%. Government size was positive and statistically significant which implied that government size has a long run relationship with foreign direct investment in Nigeria. Hence, 1% change in government size yielded 16.7% increase in foreign direct investment. Exchange rate and inflation rate portrayed a significant negative relationship with foreign direct investment which implied that the rate of exchange and inflation decreased foreign direct investment by 11.31% and 15.37% respectively. Lastly, interest rate significantly affected foreign direct investment in Nigeria. Hence, 1% increase in interest rate accelerated the pace of foreign direct investment inflow by 61.94%.

**Table 4.3: Long Run Co-Integrating Coefficients**

Items	Coefficient	Standard Error	Probability
FDI	-91.390619	13.350405	0.0064
GDP	8.496175	1.294613	0.0072
GOVT	0.160759	0.089926	0.1718
EXR	-1.131567	0.342028	0.0454
INF	-0.015373	0.008420	0.1653
INT	6.194955	0.427294	0.0007

Source: E-view 9.0

### Error Correction Model

The Error Correction Model (ECM) intends to validate the presence of long-run relationship and incorporate the short-run dynamics into the long-run equilibrium relationship. Evidence from Table 4.4 explored that the coefficient of ECM is correctly signed and significant. The value of the coefficient is estimated to be -0.547153 and this implied 54.71% of the disequilibrium in the level of FDI of last year's shock adjusted back to the long run equilibrium in the present year. The short run effect showed that exchange rate and inflation rate had direct impact on foreign direct investment in Nigeria, this implied that the exchange rate and inflation brought about 25% and 30% changes to foreign direct investment in Nigeria. Interest rate, gross domestic product and government size also brought about an increase estimated to 66%, 23% and 42% in foreign direct investment in Nigeria. Exchange rate and government size were significant at 10%, interest rate and gross domestic product were significant at 5% while inflation was insignificant.

**Table 4.4 ECM Results**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI)	0.550556	0.384770	3.224150	0.0484
D(EXR)	2.536513	0.958435	2.646515	0.0772
D(INF)	0.030989	0.014272	2.171297	0.1183
D(INT)	6.693509	1.124204	5.953999	0.0095
D(LGDP)	23.210647	6.409518	3.621278	0.0362
D(GOV)	0.422203	0.147781	2.856955	0.0647
ECM(-1)	-0.547153	0.556635	-6.372489	0.0078

Source: E-view 9.0

### DISCUSSION OF FINDINGS

The ARDL result revealed that government size, gross domestic product and interest rate have positive influence on foreign direct investment in the long run while exchange rate and inflation rate have negative impact on foreign direct investment in the long run respectively. On the short run, all the explained variables attained significant direct influence on foreign direct investment except inflation which was insignificant but positive. More so, ECM was





significant with the correctness of its sign and with a large magnitude. The study therefore is connected with the study of Oladipo (2013) who found that macro-economic variables significantly affect foreign direct investment flow in Nigeria.

## CONCLUSION

The study empirically investigated the impact of macro-economic variables on foreign direct investment flow in Nigeria under the period of 32 years (1986-2017). The study employed ARDL estimation technique to test the relationship existing between the dependent variable and the explained variables. The findings of the ARDL recorded that real gross domestic product, government size and interest rate positive affected foreign direct investment while exchange rate and inflation rate negatively affected foreign direct investment inflow in Nigeria. The result of the finding of the short-run dynamic explored that the ECM was correctly signed and significant at 5% level of significance leading to an all-time 54% increase, all the variables were positively related to foreign direct investment in Nigeria. However, exchange rate, interest rate, gross domestic product and government size were all significantly related with foreign direct investment while inflation was insignificantly related to foreign direct investment in Nigeria. Based on the findings, the study concluded that there exists long-run relationship between macro-economic variables and foreign direct investment in Nigeria. Government should foster economic policy for an enabling business environment which is capable of attracting foreigners into the country; put in place economic measures aimed at stabilizing exchange rate fluctuations in the country which is considered germane in any business environs.

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