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Sensitivity of Foreign Direct Investment to Macroeconomic Variables in Nigeria*

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ABSTRACT

This study investigated the sensitivity of foreign direct investment to macroeconomic variables in Nigeria for the 1986 to 2016 period. The study adopted foreign direct investment as the dependent variable, while gross domestic product, unemployment rate, inflation, government expenditure, exchange rate, interest rate, population and openness to trade were proxies for independent variables. The Ordinary Least Square (OLS) estimates revealed that inflation rate, population and openness to trade have significant positive influence on foreign direct investment, while economic growth has a negative though significant influence on FDI. Furthermore, unemployment, exchange and interest rates exert negative and insignificant influence on FDI inflows into Nigeria all in the short run. Therefore, FDI inflow to Nigeria is sensitive to changes in economic growth, inflation, population and openness to trade, hence the sensitivity of FDI to population size is of greater magnitude. From this findings, it is recommended, among other things, that the government should tackle unemployment and corruption problems frontally, while the managers of the Nigerian economy should also focus on controlling interest rate and maintaining the stability of exchange rates in order to attract, enhance and improve FDI inflows to the country.

Keywords: Population, Unemployment, Sensitivity,FDI Inflows, Trade Barriers, Nigeria

INTRODUCTION

In the process of economic growth, investment cannot be sidelined as it is needed to improve productivity, production methods leading to the emergence of capital goods and consequently capital accumulation (Esubalew, 2014). As a result, investment serves as a catalyst for capital stock accumulation (Majeed& Khan, 2008). Investment can occur in various forms in an economy; private, public or foreign, however, in whichever form, investment has the nature of improving the economic conditionsof a country. Ordinarily, foreign direct investment (hereafter, can appear as FDI) is viewed as the international firm partnership that propels equity holding and proper management control in the home country (Sun, Tong & Yu, 2002).

However, the totality of foreign direct investment is not only determined by the multinational firms but it is seen as an outcome of the game between the host government and the multinational firms' involved (Okafor, 2014). This is made possible as a result of the influencing capacity of the policies made by the government and the incentives given to the local industry (Faeth, 2009). These policies range from exchange rate regulation, tariffs and

trade barriers to restriction of the inflow of capital, technology and any other form of investment into the host country.

From the Nigerian perspective, the authorities have sought to attract foreign investment through various means which ranges from implementation of some policies to the enactment of some decrees or acts. The most prominent of such measures include the deregulation of the 1980s (Njogo, 2013), most especially the Structural Adjustment Programme(SAP) that was aimed at encouraging foreign direct investment in Nigeria which was part of the financial liberalization scheme as at that time. Furthermore, other measures include the New Industrial Policy of 1989, the establishment of the Nigerian Investment Promotion Commission in the early 1990s, the establishment of the Nigerian Investment Promotion Council (NIPC) in 1995 which embraces the basic exploration of foreign investment and new businesses in Nigeria. Correspondingly, the NIPC was established in 1995 during the late General SaniAbacha's regime, tagged itself as the one-stop-shop for exploring and planning foreign investment and new business in Nigeria. The NIPC is armed with the mandate of facilitating foreign investments and advocating on behalf of foreign investors in the areas of ensuring that favourable policies are made,and it also ensures that it creates an investment friendly environment as investor outside the country can consider Nigeria a safe haven for investment (Njogo, 2013).

However, several studies(See, Wuhan &Khurshid, 2015; Ayeni, 2014; Enu, Havi&Attah-Obeng, 2013; Duruechi&Ojeigbe, 2015; Asamoah, 2012; Mercylyne, 2014) have been carried out to examine the viability of investment in the economy taking into cognizance the macroeconomic variables existing in the economic environment, or as to whether investment is propelled by these variables or the other way round, as a result, policy makers are in a quandary over which one to accord priority to knowing fully well that investment is instrumental to the growth of any economy.Although it cannot exist in isolation without other macroeconomic variables. Hence, this study examines whether or not foreign direct investment is sensitive to macroeconomic variables in Nigeria.The existence of macroeconomic variables and their attendant influence on foreign direct investment has been examined in various contributions in literature (See Enu, *et al*., 2013; Duruechi&Ojeigbe, 2015; Asamoah, 2012; Mukhiddin& Jalal, 2012; Bin-Amir, Zaman& Ali, 2012). However, considering the mixed results in literature as regards the subject matter whereby (Wuhan &Khurshid, 2015;Jimoh, 2013) discovered a negative relationship between interest rate and foreign direct investment and Asamoah (2012) discovered otherwise, meanwhile, Tamer (2012) discovered a positive relationship between exchange rate and foreign direct investment and Abdishu (2000) discovered otherwise to mention just a few.

Therefore, this study distinguishes itself by considering a dataset on certain macroeconomic variables that are more relevant for the Nigerian situation, henceunemployment rate and population size could scarcely be found in prior studies in Nigeria. In addition, the use of the classical ordinary least square technique in this study will help to re-affirm the results of previous studies in Nigeria that used the same estimator, but bridge a gap in the choice of dataset in the examination of how foreign direct investment can be sensitive to changes in the selected macroeconomic variables.

The extensive theoretical and empirical relationship between foreign direct investment and selected macroeconomic variables will be discussed in the section two of literature review. Section three assesses the methodology, data issues and pre-estimation analyses. Thediscussion of empirical results are dealt with insection four, while the final section presents the concluding remarks and recommendations.

LITERATURE REVIEW

Conceptual Literature

Foreign Direct Investment and Economic Growth

Foreign direct investment is a form of cross-border investment that embraces injecting foreign funds into an enterprise that do not exist in the same country as the country of origin (Njogo, 2013). Foreign direct investment is also a long term investment that shows the interest and control by a foreign investor in another country other than that of the investor (International Monetary Fund, 1999). This investment can be in the form of acquisition of management interest in the enterprise in the home country (Nwillima, 2008 in Anaza, 2016). This investment has been found to be determined by various factors ranging from those factors relating to the profitability of the investment at the firm level to the profitability of investment at the economy-wide level (Krugell, 2005; Wang & Swain, 1997 in Njogo, 2013).

However, irrespective of the of determinants, foreign direct investment has been presumed to spur economic growth in mostly developing countries of the world like Nigeria as portrayed by the endogenous growth theory (Tong & Hu, 2003 in Okafor, 2014; Petrakos, Arvanitidis&Pavles, 2007). As a result, the government should enact policies in line with financial liberalization in a bid to present an encouraging environment that can stimulate the inflow of foreign direct investment in the host country (Popescu, 2010).

Moreso, Devrim (2009) posited that foreign direct investment is not just a capital movement but it involves a transfer of managerial skills, technology and other tangible and intangible assets. This is substantiated by the opinion of Ndiyo and Ebong (2003) as relayed by Anaza (2016) who described foreign direct investment to be an inflow of foreign resources in the form of technology, capital, management skills and marketing enterprises into the host country. Investment is needed for economic growth, hence growth depends largely on investment (Anaza, 2016). Furthermore, Todaro (1994) explicated the contributions of foreign direct investment to embrace filling the resource void between the desired level of investment and the current level of locally mobilized savings, filling the gap between targeted foreign exchange requirement and those derived from net export earnings plus net public foreign aid, imbue the gap between targeted government tax revenues and locally raised taxes and also filling the management, entrepreneurial and technological gaps in the local operations of private firms.

However, when considering the trend of foreign direct investment inflows to Nigeriaseveralpolicies have been implemented in a bid to foster foreign direct investment such as the Structural Adjustment Programme of 1986, the industrial development coordination decree of 1988, the Nigerian Enterprise Promotion Decree of 1972 and the Nigerian Investment Promotion Commission of 1995. Hence, the role of foreign direct investment cannot be overlooked in the process of fostering economic development.

Macroeconomic Variables affecting FDI

There exists several variables within the economy that affects foreign direct investment and some of the variables will be treated here:

Investment

Investment refers to the acquisition of capital goods that better the lot of the populace which may include the acquisition of goods that is used in the production of more goods as they spur output (Konor, 2014). However, investment can be influenced by some other macroeconomic variables such as Gross Domestic Product, Exchange Rate, Import, Export, Trade Openness, Inflation and some other variables existing in the economy. Correspondingly, Konor (2014)

discovered that macroeconomic variables affect investment while Ayeni (2014) discovered otherwise.

Exchange Rate

O'Sullivan and Sheffrin (2003) posited that exchange rate is the value of a country's currency in a bid to convert it to another. It is the most important price in any economy. There are mixed results on the relationship between exchange rate and FDI in both theoretical and empirical literature. However, Esubalew (2014) discovered that exchange rate affects investment negatively, also, Asamoah (2012) discovered the same result while considering exchange rate volatility on investment while Abdishu (2000) discovered otherwise.

Inflation Rate

Inflation is an economic concept that has both negative and positive effect on the economy (Mercylyne, 2014). However, the negative effects are more recognized as they reduce the value of money (Blanchard, 2000). Kimani and Mutuku (2013) viewed inflation to be the increase in the price of goods and services over time. Meanwhile, Mukhiddin and Jalal (2012) discovered that inflation rate has an insignificant relationship with investment while Bin-Amir, Zaman and Ali (2012) discovered otherwise.

Theoretical Literature

Simple Accelerator Theory

This theory as advanced by Clark (1971) assumes that thefirms' desired capital-output ratio is constant. However, the theory was criticized for not taking into cognizance other factors influencing investment such as the cost of capital and profitability. The theory assumes that investment is a function of growth of output only and that the intended stock of capital is achieved at that very point in time. As a result, a more flexible accelerator model to capture the influence of other uncertainties and variables and to explain that the addition in the stock of capital does not happen instantly (Twine, Kiiza&Bashaasha, 2015). However, the theory was criticized for focusing mostly on firms.

McKinnon and Shaw Theory

This theory which was advocated by McKinnon (1973) and Shaw (1973) assumes that increase in the demand for investment can occur if the real interest rate are set lower than the market equilibrium (Mercylyne, 2014). As a result interest rate should be strictly regulated by monetary authorities as savings tends to be an increasing function of interest rate. These proponents assume that government regulations prevent financial intermediaries from proper functioning.

Empirical Literature

Empirical Review from Developed Countries

Tang (2017) studied the macroeconomic determinants of foreign direct investment in thirteen European Union countries between 1994 and 2012. Employing two-stage least squares and the generalized method of moments regression techniques, the results revealed that bank credit, stock market size and country income have positive effects on foreign direct investment. The influence of some macroeconomic factors on foreign direct investments in FDI receiving countries was investigated by Taran, Mironiuc and Huain (2016), and by applying multiple regression and ANOVA analysis of variance, the findings of the study showed that the degree of economicfreedom is a significant factor of multi-regional inward FDI during the period 2012 to 2015,but this effect is caused by only fiscal freedom, government spending, monetary trade, andfinancial freedom.

In Wuhan and Khurshid(2015), the effect of interest rate on investment in China between 2003 and 2012 was examined. The results of the regression and vector error correction modelidentifiedthat there exist a long run negative relationship between interest rate and investment.WTamer (2012) studied the effects of macroeconomic factors on foreign direct investment in 24 OECD countries between 1999 and 2010. Descriptive statistics, correlation and regression analysis were employed in the study; it was found that market size has a strong effect on FDI while exchange rate and trade openness have positive significant relationship with FDI.

Empirical Review from Developing Countries

Hasli, Ibrahim and Ho (2017) investigated the effect of financial crisis and macroeconomic factors on foreign direct investment in 23 developing countries for the period of 1993 to 2013. By employing generalized least square estimator, the study found that the US financial crisis has a positive significance effectonthe inflow of FDI, and this validatedKrugman's theory on fire-sale FDI. However, country specific economic recession, lending rates and natural resources discourageinflow of FDI. Nonetheless, trade openness, domestic currency, money supply and domestic fixed investment encourage FDI in developing countries. Kurul and Yalta (2017) revisited the relationship between institutional factors and foreign direct investment inflows in 113 developing economies over the periodof 2002 to 2012. The result of the dynamic panel methodology- system GMM revealed that some institutional factors matter more than others in attracting more FDI flows; hence the control of corruption, government effectiveness, and the voice and accountability have significant positive impacts on FDI flows. In addition, exercising policies to enhance the participation of citizens in a political system, for example by selecting theirgovernment, as well as the protection of civil rights, may increase FDI flows.

Fantaye (2016) scrutinized the macroeconomic determinants of foreign direct investment in Ethiopia between 1982 and 2014. Adopting the regression technique, he observed that certain macroeconomic variables (real GDP, gross fixed capital formation and ratio of trade to GDP) determineforeign direct investment. Kingu (2016) identified the determinants of foreign direct investment in Tanzania for the period1970 to 2012. The results of Johansen's and Engle-Granger's approaches to co-integration test revealed that the variables are co-integrated. Furthermore, the regression result suggested that gross domestic product, openness, and inflation rate are the main determinants of FDI inflows to Tanzania.

Using correlation and regression analysis,Samontaray, Nugali and Sasidhar (2014) found for Saudi Arabia that a positive long run relationship existsbetween stock market and macroeconomic variables in their study on the effect of macroeconomic variables on the stock market (investment) for the period 2003 to 2013.In Ghana, Enu, *et al*., (2013) examined the macroeconomic determinants of foreign direct investment between 1980 and 2012. The regression technique and vector autoregressive model and Granger causality test showed that there exists no relationship between macroeconomic variables and foreign direct investment, while a unidirectional causality was discovered between real GDP, FDI and exchange rate.Mercylyne (2014) studied the effect of macroeconomic variables on growth in real investment in Kenya between 2000 and 2013. The results of the regression analysis showed that there wasastrong positive relationship between real estate investment growth and macroeconomic variables. The study of Konor (2014) on the determinants of private investment in Ghana between 1970 and 2011 by employing the autoregressive distributed lag model, revealed that economic growth affects private investment in the long run, but it is affected by inflation in the short run while exchange rate affects private investment in both the short-and long run.

In a study between 1992 and 2013 period, the impact of macroeconomic variables on foreign direct investment was examined byHunjra, Raza and Asif (2013) for Pakistan, and by employing descriptive statistics and regression analysis.The regression result revealed that economic growth and interest rate are the macroeconomic variables that exert significant relationship with FDI.Shahzad and Al-Swidi (2013) also examined the role of macroeconomic variables on foreign direct investment inflows in Pakistan between the periods between 1991 and 2011. The regression result showed that there exists a long run relationship between macroeconomic variables and foreign direct investment.

Empirical Review from Nigeria

In Nigeria, Ndubusi (2017) investigated the impact of macroeconomic variables on foreign direct investment for the period 1981 to 2014. The result of the VECM Granger causality test employed in the study revealed that there is a longrun unidirectional causality between FDI and real GDP, whereas, in the short run causality do not run from anydirection. There is bidirectional causality between FDI and exchange rate. However; there is no causal relationshipinthe short run. There is also a noticeable unidirectional causality running from inflation rate captured by consumer price indexto FDI in the short run. Bidirectional causality between FDI and oil price was reported in the long run. The study of Duruechi and Ojeiegbe (2015) on the determinants of foreign direct investment in Nigeria between 1990 and 2013 using regression techniques, revealed that government expenditure is the most important factor that spurs investment.

Agwu (2015) examined the determinants of investment in Nigeria for the periods from 1981 to 2013 by employing the autoregressive distributed lag model. The result showed that the past income level, capitalinvestment, government size and interest rateare the major determinants of domestic investment in Nigeria, hence these variables have a positive effect on private investment in Nigeria, while exchange rate and inflation have aninsignificant effect on private investment inNigeria. Gharaibeh (2015) assessed the determinants of foreign direct investment in Bahrain for the period, 1980 to 2013. The result of the OLS estimates showed that government expenditure, inflation rate, interest rate, trade openness, labour force, and population have statistically significant relationships with FDI inflows into Bahrain.

The contribution of macroeconomic factors to the private sector investment in Nigeria between 1979 and 2012 was examined by Ayeni (2014). Using regression technique and the autoregressive distributed lag model, it was found that the macroeconomic variables in the model for the study do not spur private investment in Nigeria.Imoughele and Ismaila (2014) also studied the determinants of private domestic savings in Nigeria between 1981 and 2012. The regression result revealed that interest rate has a positive but insignificant relationship with private savings in Nigeria, meanwhile, population and budget deficit has insignificant relationship with private savings. Also, terms of trade and inflation have negative but significant relationship with private savings.

Jimoh (2013) investigated the sensitivity of interest rate to bank investment in Nigeria between 1980 and 2012. By employing regression analysis, it was revealed that there exists a negative relationship between interest rate and investment. Obidike and Uma (2013) assessed the effect of macroeconomic variables on foreign direct investment in Nigeria as a liberalized economy for the periods between 1975 and 2009. The result of the Johansen's approach to co-integration revealed the existence of a long run relationship between the selected macroeconomic variables and FDI. Furthermore, the results showed that macroeconomic variables in the study have significant impact on FDI, hence the latter is sensitive to changes in the selected macroeconomic variables.

METHODOLOGY, DATA ISSUES AND PRELIMINARY ANALYSES

This study employs the classical ordinary least square regression technique in the investigation of the sensitivity of foreign direct investment to macroeconomic variables in Nigeria. The study period spans from 1986 to 2016, hence the raw data on (foreign direct investment, gross domestic product, unemployment rate, inflation, government expenditure, exchange rate, interest rate, population and openness to trade) collected from the Central Bank of Nigeria statistical bulletin, Nigeria Bureau of Statistics Fact Book and the World Bank Development Indicators Database for this period are transformed to their natural logarithms to avoid spurious results, thus the transformation will also make interpretation easy. The pre-estimation analyses in this study are descriptive statistics and correlation matrix. *Table 1* reports the descriptive summary of the variables in the model built for this study.

Table 1: Summary of Descriptive Statistics

Series	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
FDI	21.51151	23.39490	19.07931	1.091941	-0.075242	2.228008	0.799048*
GDP	8.696371	11.45241	4.902307	2.012061	-0.300806	1.989727	1.785844*
UR	2.204229	3.349904	0.641854	0.838520	-0.277011	1.587896	2.972097*
INFR	2.714926	4.288204	1.683102	0.745173	0.784908	2.510511	3.492568*
GEXP	6.454571	8.802456	2.786245	1.851541	-0.519715	2.032733	2.604024*
EXGR	3.880449	5.721008	0.703394	1.383177	-0.715198	2.229834	3.408952*
INTR	3.115161	3.586016	2.484907	0.205697	-0.371912	4.659841	4.273281*
POP	18.65534	19.04126	18.27123	0.233190	0.022622	1.805693	1.845038*
OPEN	3.935493	4.404434	3.166182	0.325304	-0.795456	2.651854	3.425769*

Note: * implies rejectionof null hypothesis of normal distribution at 1% significance level.

Source: Authors' Computation

From Table 1, all the series except INFR and POP are negatively skewed, hence they are skewed to the left. This implies that there is every tendency of obtaining negative extreme values than positive extreme values for all the series except INFR and POP. The kurtosis statistics revealed that except for INTR, all other series have a platykurtic (low-peaked and thin-tailed) probability distribution. INTR has a leptokurtosis (thick-tailed probability distribution, implying that the excess kurtosis is positive. The Jarque-Bera statistic shows that all the series come from a normally distributed.

Table 2: Correlation Matrix

	FDI	GDP	UR	INFR	GEXP	EXGR	INTR	POP	OPEN
FDI	1.000000	0.898038	0.701892	-0.157244	0.887787	0.835837	0.256197	0.912347	-0.107750
GDP	0.898038	1.000000	0.796004	-0.320152	0.989170	0.942823	0.225686	0.987947	-0.107003
UR	0.701892	0.796004	1.000000	-0.512027	0.801397	0.805594	0.091700	0.842800	-0.280790
INFR	-0.157244	-0.320152	-0.512027	1.000000	-0.349821	-0.299618	0.232435	-0.354279	0.048193
GEXP	0.887787	0.989170	0.801397	-0.349821	1.000000	0.969109	0.244055	0.976161	-0.025255
EXGR	0.835837	0.942823	0.805594	-0.299618	0.969109	1.000000	0.306241	0.927446	0.067993
INTR	0.256197	0.225686	0.091700	0.232435	0.244055	0.306241	1.000000	0.218711	0.138160
POP	0.912347	0.987947	0.842800	-0.354279	0.976161	0.927446	0.218711	1.000000	-0.197189
OPEN	-0.107750	-0.107003	-0.280790	0.048193	-0.025255	0.067993	0.138160	-0.197189	1.000000

Source: Authors' Computation

In Table 2, the results of pairwise correlation on the series was presented. It is obvious that POP as one of the macroeconomic variables and foreign direct investment have the highest (r = 0.91) correlation among all pairs, this is quite acceptable since it is expected that increasing population drives human capacity development, thereby increasing economic productivity. Economic growth, which in turn attracts FDI inflows from multinational enterprises (MNEs) that seek to increase their profits in the international markets. However, foreign direct

investment is sensitive and negatively correlatedwithinflation rate and degree of trade openness.

Model Specification

The model built for this study specifies foreign direct investment as a function of gross domestic product, unemployment rate, inflation, government expenditure, exchange rate, interest rate, population and openness to trade. This macroeconomic variables determine FDI inflows into Nigeria. Therefore, the model can be presented mathematically as:

$$FDI = f(GDP, UR, INFR, GEXP, EXGR, INTR, POP, OPEN, \mu) \text{ ……..Equa. 3.1}$$

Where;

FDI = Foreign Direct Investment, GDP = Gross Domestic Product, UR= Unemployment Rate, INFR= Inflation Rate, GEXP= Government Expenditure, EXGR= Exchange Rate, INTR= Interest Rate, POP= Population, OPEN= Openness to Trade, and μ= Error Term.

Equation 1, can be transformed to its econometric form to be:

$$FDI_t = B_0 + B_1LogGDP_t + B_2LogUR_t + B_3LogINFR_t + B_4LogGEXP_t + B_5LogEXGR_t + B_6LogINTR_t + B_7LogPOP_t + B_8LogOPEN_t + \mu_t \text{……..Equa. 3.2}$$

B_0 is the intercept, B_1– B_8 are theestimationcoefficients. Theoretically, we expect that B_1,>0, B_2><0, B_3<0,B_4-B_5>0, B_6<0,and B_7-B_8>0.

RESULTS AND DISCUSSION

The ordinary least square regression technique which was employed in the analysis of this study,will reveal the sensitivity of foreign direct investment to changes in macroeconomic variables in the short run. *Table 3* reports the result of the OLS estimation method.

Table 3: Ordinary Least Square (OLS) Regression
Dependent Variable: FDI

Variables	Coefficient	Standard Error	T-Statistics	*P*-Value
GDP	-0.740943	0.403678	-1.835479	0.0800*
UR	-0.049826	0.237028	-0.210211	0.8354
INFR	0.382849	0.136309	2.808693	0.0102**
GEXP	0.265659	0.469882	0.565374	0.5775
EXGR	-0.413266	0.304297	-1.358101	0.1882
INTR	-0.123755	0.409958	-0.301873	0.7656
POP	11.65457	3.111074	3.746157	0.0011***
OPEN	0.885483	0.388648	2.278367	0.0328**
C	-193.6048	55.70878	-3.475302	0.0021***

R^2=0.904679 Adj. R^2= 0.870016 F-Statistics= 26.1 Durbin Watson=2.47 (P-Value=0.000000)

Notes:*'** and *** denotes the rejection of null hypothesis of statistical significance at 10'5 and 1percents' respectively, while the value in parenthesis ( ) represent the exact value of F-test.

Source: Authors' Computation

From Table 3, the coefficient of the intercept in the model is -193.6048. This implies that holding the regressors constant in the short run, foreign direct investment will decrease by approximately 194 percent. Also, in the short run, gross domestic product (real GDP) has a negative coefficient of 0.740943, which satisfies the economic *apriori*expectation. The negative relationship between economic growth and foreign direct investmentimplies that a 1 percent

increase in real GDP will lead to about 0.74 percent decrease in FDI. Similarly, unemployment rate (UR) is negatively related with foreign direct investment. The coefficient of unemployment rate is -0.049826. In terms of magnitude, it implies that every 1 percent increase in UR will on the average, lead to about 0.05 percent decrease in FDI.

Conversely, inflation rate (INFR) is positively related to foreign direct investment, in that it has a positive coefficient of 0.382849. This implies that a 1 percent increase in INFR will result in about 0.38 percent increase in FDI. Also, the coefficient of government expenditure (GEXP) is positive with a value of 0.265659, which implies that a 1 percent increase in GEXP will lead to about 0.27 percent increase in FDI. Exchange rate (EXGR) coefficient is -0.413266. This reveal an inverse relationship between EXGR and FDI, hence a 1 percent increase in EXGR will cause FDI to decrease by 0.41 percent.

On the relationship between interest rate (INTR) and FDI, the negative coefficient of INTR is 0.123755, and this suggest that a negative relationship between these two variables, hence a 1 percent increase in the value of INTR will result in a decrease in FDI by about 0.12 percent. The coefficient of population (POP) is 11.65457, which implies that a direct relationship exist between POP and FDI. Therefore, FDI will increase by about 11.7 percent following a 1 percent increase in population growth. Finally, the coefficient of openness to trade (OPEN) is 0.885483. This reveal that a positive relationship exist between OPEN and FDI, consequently, a 1 percent increase in openness to trade will increase FDI by about 0.88 percent.

STOP The R-squared statistics explain the level at which the explanatory variables account for the systemic variation in the explained variable (FDI), hence (GDP, UR, INFR, GEXP, EXGR, INTR, POP and OPEN) all account for about 90.5 percent of the variation in the dependent variable (FDI). Therefore, this high explanatory power simply suggest that the macroeconomic variables selected for this study are good predictors of FDI inflows to Nigeria, hence FDI is highly sensitive to changes in these macroeconomic variables.The adjusted R-squared (0.870016) which is very close to the R-squared implies that there is less penalty for irrelevant variables in the model for this study. The overall goodness of fit of the model is satisfactory for this study, since the probability value attached to the F-statistics computed in the OLS estimates show an exact significance at a 0.01 percent threshold level. The Durbin Watson statistics is 2.47, this value falls in the area of no autocorrelation, hence the absence of AR(1), which is the first-order serial correlation.

Model Diagnostic Checks

The model diagnostics was conducted in order to ensure that the assumptions of the classical ordinary least square estimator are not violated. Therefore, model robustness, reliability and stability checks was carried out using various tests in order to overcome the problem of biased and inconsistent estimation, and the invalidation of conventional inference procedures.

Table 4:Model Robustness, Reliability and Stability Checks

Diagnostic Tests	Approach	F-Statistics	*P-Value*
Linearity Test	Ramsey Reset Test	0.734038	0.4710*
Serial Correlation	Breusch-Godfrey LM Test	1.135663	0.3411*
Heteroscedasticity Test	ARCH LM Test	0.026462	0.8719*
Normality Test	Jarque-Bera statistics	0.354227	0.8377*
Multicollearity Test	Variance Inflation Factors	Less than 0.1 threshold level	
Stability Test	CUSUM and CUSUM Tests	Lies within bounds	

Source: Authors' Computation

Notes: * signifies the rejection of null hypothesis at 10% significance level

Table 4 reports the diagnostics check on the model built for this study. The study passed the diagnostic test against regression misspecification error, hence the model in the study was correctly specified. The null hypothesis of Breusch-Godfrey LM test that there is no serial correlation is accepted, hence the residuals in the model for this study are serially uncorrelated. This study also satisfyand passed the homoscedastcity assumption of the regression results. The *p*-value attached to the Jarque-Bera statistics is greater than the threshold of 0.1, hence the regression residuals are normally distributed. The study also passed the test against multicollearity, since the coefficient variance of all the residuals falls below 0.1 threshold level. Furthermore, the plot of cumulative sum ofrecursive residual (CUSUM) and cumulative sum of squares of recursive residual (CUSUMQ) of the model arein-between and does not surpasses the critical boundaries at 5percentsignificance level. This confirms the structural stability property of the shortrunmacroeconomic parameters which coordinates FDI inflows into Nigeria, hence signifying that the model seem to be steady and specified appropriately during the estimation period.

IMPLICATION OF FINDINGS

The implication of the sensitivity of FDI to changes in the selected macroeconomic variables in this study has the following implication for policy makers:

The significantly negativerelationship between gross domestic product and foreign direct investment, which is in discordance with the theoretical expectation is unexpected, and stand in stark contrast to the findings ofprevious studies. However, the inverted U-shaped relationship between FDI and domestic market size could be explained with the reasons that most of the FDI inflows to Nigeria are solely attracted to the oil, mining and manufacturing sectors, the prevalence of vertical FDI inflows to Nigeria, the lack of positive spillover effects from FDI to human capital and the higher levels of FDI leading to reduction of export revenues and increases in the current account imbalance. Though, it significance supports the applicability of the acceleration theory of investment inNigeria.Therefore, FDI is sensitive to changes in gross domestic product in Nigeria. This finding is similar tothe one found in the studies of (Maralgua, Baerbig, &Tsolmon, 2017;Sadaf, Kiran, Saman, &Shabib, 2016). However, (Kingu, 2016, Agwu, 2015; Kaur&Sharma, 2013) studies found something contrary to this. A negative relationship exist between unemployment and foreign direct investment, this which is in tandem with the economic expectation of either positive or negative implies that increasing rate of unemployment may scare away foreign investors, in that they will not want to consider future investment or developing an existing one in an environment where there are signs of macroeconomic instability. Though, the insignificance of the variable confirm that FDI inflows is not sensitive to the rate of unemployment in Nigeria- a result which is consistent with the findings of Göçer,MercanandPeker(2013), but varies away from the study of Ciftcioglu, Fethi and Begovic, (2007) where there exist a positive relationship between unemployment and FDI inflows.

The degree of openness to trade exerts a positive and significant influence foreign direct investment as expected in the short run. Therefore, this implies that as a small open economy, Nigeria have been able to attract FDI inflows into her economy. However, FDI is sensitive to the openness of the emerging Nigerian economy. The findings here is consistent with that of (Makun, 2016; Tamer, 2012).It is also non consistent with the short run results of (Kingu, 2016; Gharaibeh, 2015).Contrarily, inflation rate (INFR) does not meet with the theoretical expectation, because it is positively signed. The implication of this is that the inflation rate in the domestic economy is not affecting international transactions, as there was so much money in the economyoccasioned by the oil exports. Therefore, foreigners do not mind Nigeria's domestic monetary conditions, as they see Nigeria as an oil-rich nation. Consequently, FDI inflows is not sensitive to the level of inflation in Nigeria. This result is in agreement that which

was found in the studies of(Makun, 2016; Malik &Ali-Malik, 2013), but in discordance with the studies of (Kingu, 2016; Gharaibeh, 2015).

The positively signed coefficient of government expenditure, matches with economic expectations, this implies that as the expenditure of the government increases, especially in the area of providing infrastructural facilities, the availability of these infrastructures may attract expatriates to investment in the domestic economy. The non-significance of government expenditure means that it is not a good predictor of FDI inflows to Nigeria, hence FDI is not sensitive to the increase in government expenditure in the short run. This findings is in line with the studies of Agwu (2015).In non-conformity with the economic expectation, exchange rate has a negative and insignificant influence on foreign direct investment. This result is contrary to that of (Agwu, 2015; Tamer, 2012) whose studies found that exchange rate exert a positive influence on FDI inflows to Nigeria. Maralgua, *et al*., (2017) and Makun's (2016) studies confirm the negative influence found in this study.

Interest rate was found to be negatively related to foreign direct investment, and this corresponds with the economic expectation. In Nigeria, interest rate is higher in relative comparison with those of the developed economies. Higher interest rate will reduce the level of investment, hence a low interest rate is needed to stimulate economic growth and encourage FDI inflows into the host country. The study of Agwu (2015) also found a negative relationship between these two variables. However, this result deviates from the findings of Gharaibeh (2015). Population is directly related to foreign direct investment in conformity with economic expectation. The implication of this is that MNEs may consider the population of the country as a factor in their decision to invest in a country. Furthermore, for the period under investigation, FDI inflows to Nigeria is highly sensitive to the large population size of the country than it is to any other variables in the model for this study, since foreign investors see the cheap availability of skilled labour as an important factor that increase firm productivity, and this will in turn increase profitability. This is consistent with the results of (Gharaibeh, 2015; Aziz &Makkawi, 2012).

CONCLUSION AND RECOMMENDATION

This study investigated the sensitivity of foreign direct investment to macroeconomic variables in Nigeria between 1986 and 2016. The study adopted foreign direct investment as the dependent variable, while gross domestic product, unemployment rate, inflation, government expenditure, exchange rate, interest rate, population and openness to trade are proxies for macroeconomic variables. It was found that foreign direct investment is sensitive to changes in inflation rate, population and openness to trade, as these variables maintained significantly positive influence on FDI, while the influence of economic growth on it issignificantlynegative. Unemployment, exchange and interest rates are not good predictor of FDI inflows to Nigeria, and their influence on FDI are negative. It can be concluded that FDI is sensitive to changes in economic growth, inflation, size of population and openness to trade for the period under investigation, hence it is not susceptive to changes in unemployment, exchange and interest rates. The high predictive power of R-squared statistics confirm that the macroeconomic variables in the model for this study are sufficient enough to capture the subject matter. This study passed all post-estimation test, hence none of the assumptions of the OLS estimate was violated. Following the conclusion drawn from the study, it is recommended, among other things, that the government should tackle the problem of unemployment and corruption at their root cause, while the managers of the Nigerian economy should also focus on controlling interest rate and maintaining the stability of exchange rates in order to attract, enhance and improve FDI inflows to the country. Furthermore, fiscal policy actions, such as increasing

government expenditure on infrastructures should play a crucial role in stimulating and smoothing foreign direct investment and business cycle respectively.

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APPENDIX A: DESCRIPTIVE STATISTICS

	FDI	GDP	UR	INFR	GEXP	EXGR	INTR	POP	OPEN
Mean	21.51151	8.696371	2.204229	2.714926	6.454571	3.880449	3.115161	18.65534	3.935493
Median	21.35136	8.838581	2.533697	2.555410	6.925625	4.717992	3.109953	18.65191	4.055101
Maximum	23.39490	11.45241	3.349904	4.288204	8.802456	5.721008	3.586016	19.04126	4.404434
Minimum	19.07931	4.902307	0.641854	1.683102	2.786245	0.703394	2.484907	18.27123	3.166182
Std. Dev.	1.091941	2.012061	0.838520	0.745173	1.851541	1.383177	0.205697	0.233190	0.325304
Skewness	-0.075242	-0.300806	-0.277011	0.784908	-0.519715	-0.715198	-0.371912	0.022622	-0.795456
Kurtosis	2.228008	1.989727	1.587896	2.510511	2.032733	2.229834	4.659841	1.805693	2.651854
Jarque-Bera	0.799048	1.785844	2.972097	3.492568	2.604024	3.408952	4.273281	1.845038	3.425769
Probability	0.670639	0.409458	0.226265	0.174421	0.271984	0.181868	0.118051	0.397516	0.180345
Sum	666.8567	269.5875	68.33111	84.16270	200.0917	120.2939	96.57000	578.3155	122.0003
Sum Sq. Dev.	35.77003	121.4516	21.09345	16.65851	102.8461	57.39535	1.269333	1.631327	3.174685
Observations	31	31	31	31	31	31	31	31	31

APPENDIX B: CORRELATION MATRIX

	FDI	GDP	UR	INFR	GEXP	EXGR	INTR	POP	OPEN
FDI	1.000000	0.898038	0.701892	-0.157244	0.887787	0.835837	0.256197	0.912347	-0.107750
GDP	0.898038	1.000000	0.796004	-0.320152	0.989170	0.942823	0.225686	0.987947	-0.107003
UR	0.701892	0.796004	1.000000	-0.512027	0.801397	0.805594	0.091700	0.842800	-0.280790
INFR	-0.157244	-0.320152	-0.512027	1.000000	-0.349821	-0.299618	0.232435	-0.354279	0.048193
GEXP	0.887787	0.989170	0.801397	-0.349821	1.000000	0.969109	0.244055	0.976161	-0.025255
EXGR	0.835837	0.942823	0.805594	-0.299618	0.969109	1.000000	0.306241	0.927446	0.067993
INTR	0.256197	0.225686	0.091700	0.232435	0.244055	0.306241	1.000000	0.218711	0.138160
POP	0.912347	0.987947	0.842800	-0.354279	0.976161	0.927446	0.218711	1.000000	-0.197189
OPEN	-0.107750	-0.107003	-0.280790	0.048193	-0.025255	0.067993	0.138160	-0.197189	1.000000

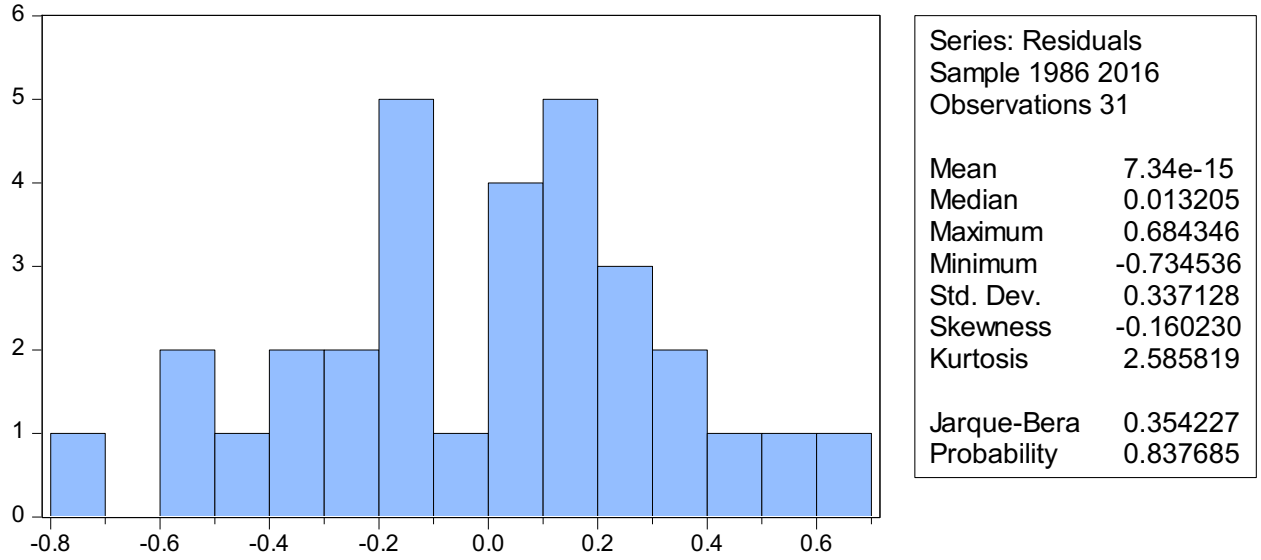
APPENDIX C: ORDINARY LEAST SQUARE ESTIMATES

Dependent Variable: FDI
Method: Least Squares
Date: 10/13/17 Time: 11:39
Sample: 1986 2016
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	-0.740943	0.403678	-1.835479	0.0800
UR	-0.049826	0.237028	-0.210211	0.8354
INFR	0.382849	0.136309	2.808693	0.0102
GEXP	0.265659	0.469882	0.565374	0.5775
EXGR	-0.413266	0.304297	-1.358101	0.1882
INTR	-0.123755	0.409958	-0.301873	0.7656
POP	11.65457	3.111074	3.746157	0.0011
OPEN	0.885483	0.388648	2.278367	0.0328
C	-193.6048	55.70878	-3.475302	0.0021

R-squared	0.904679	Mean dependent var	21.51151
Adjusted R-squared	0.870016	S.D. dependent var	1.091941
S.E. of regression	0.393680	Akaike info criterion	1.211145
Sum squared resid	3.409652	Schwarz criterion	1.627464
Log likelihood	-9.772749	Hannan-Quinn criter.	1.346855
F-statistic	26.09975	Durbin-Watson stat	2.474602
Prob(F-statistic)	0.000000		

APPENDIX D: NORMALITY TEST



APPENDIX E: SERIAL CORRELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.135663	Prob. F(2,20)	0.3411
Obs*R-squared	3.161515	Prob. Chi-Square(2)	0.2058

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 10/13/17 Time: 12:02
Sample: 1986 2016
Included observations: 31
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	-0.182430	0.421865	-0.432437	0.6701
UR	-0.089046	0.244966	-0.363501	0.7200
INFR	0.009588	0.139942	0.068514	0.9461
GEXP	0.124895	0.491499	0.254111	0.8020
EXGR	-0.177763	0.368157	-0.482846	0.6344
INTR	-0.313664	0.472466	-0.663887	0.5143
POP	1.948851	3.370518	0.578205	0.5696
OPEN	0.253042	0.449292	0.563202	0.5796
C	-34.73843	60.36001	-0.575521	0.5714
RESID(-1)	-0.464422	0.321572	-1.444222	0.1642
RESID(-2)	-0.146062	0.296916	-0.491932	0.6281

R-squared	0.101984	Mean dependent var	7.34E-15
Adjusted R-squared	-0.347023	S.D. dependent var	0.337128
S.E. of regression	0.391275	Akaike info criterion	1.232610
Sum squared resid	3.061920	Schwarz criterion	1.741444
Log likelihood	-8.105449	Hannan-Quinn criter.	1.398477
F-statistic	0.227133	Durbin-Watson stat	2.017982
Prob(F-statistic)	0.989977		

APPENDIX E: ARCH LM TEST FOR HETEROSCEDASTICITY

Heteroskedasticity Test: ARCH

F-statistic	0.026462	Prob. F(1,28)	0.8719
Obs*R-squared	0.028326	Prob. Chi-Square(1)	0.8663

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/13/17 Time: 12:03
Sample (adjusted): 1987 2016
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.116300	0.033939	3.426767	0.0019
RESID^2(-1)	-0.030719	0.188836	-0.162673	0.8719

R-squared	0.000944	Mean dependent var	0.112836
Adjusted R-squared	-0.034736	S.D. dependent var	0.142294
S.E. of regression	0.144745	Akaike info criterion	-0.963352
Sum squared resid	0.586628	Schwarz criterion	-0.869939
Log likelihood	16.45028	Hannan-Quinn criter.	-0.933468
F-statistic	0.026462	Durbin-Watson stat	1.940832
Prob(F-statistic)	0.871944		

APPENDIX F: LINEARITY TEST

Ramsey RESET Test
Equation: UNTITLED
Specification: FDI GDP UR INFR GEXP EXGR INTR POP OPEN C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.734038	21	0.4710
F-statistic	0.538811	(1, 21)	0.4710
Likelihood ratio	0.785356	1	0.3755

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.085295	1	0.085295
Restricted SSR	3.409652	22	0.154984
Unrestricted SSR	3.324356	21	0.158303

LR test summary:

	Value	df
Restricted LogL	-9.772749	22
Unrestricted LogL	-9.380072	21

Unrestricted Test Equation:
Dependent Variable: FDI
Method: Least Squares
Date: 10/13/17 Time: 12:04
Sample: 1986 2016
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	2.556035	4.510055	0.566741	0.5769
UR	0.120355	0.333371	0.361024	0.7217
INFR	-1.246641	2.224169	-0.560497	0.5811
GEXP	-0.905794	1.665060	-0.544001	0.5922
EXGR	1.452501	2.560323	0.567312	0.5765
INTR	0.452007	0.887080	0.509545	0.6157
POP	-39.53323	69.80540	-0.566335	0.5772
OPEN	-2.798853	5.034619	-0.555922	0.5841
C	703.2534	1223.111	0.574971	0.5714
FITTED^2	0.100200	0.136506	0.734038	0.4710

R-squared	0.907063	Mean dependent var	21.51151
Adjusted R-squared	0.867233	S.D. dependent var	1.091941
S.E. of regression	0.397873	Akaike info criterion	1.250327
Sum squared resid	3.324356	Schwarz criterion	1.712904
Log likelihood	-9.380072	Hannan-Quinn criter.	1.401116
F-statistic	22.77330	Durbin-Watson stat	2.430642
Prob(F-statistic)	0.000000		

APPENDIX G: MULTICOLLEARITY TEST

Variance Inflation Factors
Date: 10/13/17 Time: 12:00
Sample: 1986 2016
Included observations: 31

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GDP	0.162956	2592.725	127.6989
UR	0.056182	62.24596	7.646469
INFR	0.018580	29.38989	1.997078
GEXP	0.220789	1986.383	146.5137
EXGR	0.092596	313.1809	34.29126
INTR	0.168065	327.5990	1.376470
POP	9.678778	673855.6	101.8765
OPEN	0.151047	471.0293	3.094042
C	3103.468	620757.1	NA

APPENDIX H: STABILITY TEST