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### Bivariate Causality Analysis on the Impact of FDI Inflows and Economic Growth in Nigeria

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#### Abstract

The aim of this study is to find out the direction of causality between foreign direct investment (FDI) and economic growth (GDP) in Nigeria for a period of 40 years, which is between 1970 to 2009. The study employed in its analysis, the use of Ordinary Least Square (OLS), the unit root test was used to test for stationarity of the time series, the Johansen Cointegration test was used to test for the existence of long-run relationship among the variables and finally, Granger causality test, to establish the causal relationship between the variables. The stationarity test (unit root) was carried out in order to ascertain the order of integration among the variables. The variables foreign direct investment (FDI) and gross domestic product (GDP) were found to be non-stationary at their level and first difference with 2 lags. They were thus integrated of order one  $I(1)$ . The Cointegration test which was done using Johansen Cointegration test, revealed that the variables were cointegrated and had a unchanging relationship in the long-run. To check for the direction of causality, the Granger causality test was employed and it indicated that a causality relationship ran from FDIs to GDP which

showed a uni-directional relationship. From the result of this work, it was ascertained that during the period under study, that there was a positive relationship between FDI and GDP which is a strong indication that FDI leads to economic growth in Nigeria.

**Keywords: Foreign Direct Investment (FDI), Economic Growth, Nigeria, Causality and Cointegration**

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## **INTRODUCTION**

The integration of developing countries with the global economy increased sharply in the 1990s with changes in their economic policies and lowering of barriers to trade and investment which have been experienced in Nigeria for some years now, especially through the inflow of FDI.

Foreign Direct Investment (FDI) is assumed to benefit a country like Nigeria, not only by supplementing domestic investment, but also in terms of employment creation, transfer of technology, increased domestic competition, and other positive externalities. The importance of technology for economic growth provides an important link between FDI inflows and host country economic growth.

It is theoretically straightforward to argue that inflows of FDI have a potential for increasing the rate of economic growth in the host country. While there is considerable evidence on the link between FDI and economic growth, the causality between them remains a subject of investigation. In the mid 1970s, Africa's share of global FDI was about 6%, a level that fell to the current 2–3%. Amidst the underdeveloped countries, the share of Africa's FDI in 1976's was about 28%; it is now less than 9% (UNCTAD, 2005).

There have been various studies on the direction of the causal link between FDI and economic growth. The empirical evidence is not clear for country groups. Some criticisms arose from the recent studies by Kholdy (1995) on the traditional assumption of a one-way causal link from FDI to growth. New studies have also considered the possibility of a two-way (bidirectional) or non-existent causality among variables of interest. In other words, not only FDI can drive economic growth, but economic growth can also drive FDI or there may not be any relationship between them.

There is conflicting evidence in the literature regarding the question as to how, and to what extent, FDI affects economic growth. FDI may affect economic growth directly because it contributes to capital accumulation, and the transfer of new technologies to the recipient country. In addition, FDI enhances economic growth indirectly where the direct transfer of technology augments the stock of knowledge in the recipient country through labour training and skill acquisition, new management practices and organizational arrangements (De Mello, 1999).

Authors like Chowdhury and Mavrotas (2005) suggested that it would be worthwhile to

have an individual country study which would help in ascertaining the causal links between FDI and economic growth in those countries since it is believed that the link is country specific.

The FDI inflow differential and economic growth disparity among developing countries have created much research interest among economists.

There is a large body of theoretical and empirical literature on the impact of FDI on economic growth. The existing evidence, however, is mixed. In theory, FDI can be expected to benefit the host country by transferring resources (the so-called resource transfer effects), increasing employment opportunities (employment effects), improving the balance of payments (balance of payments effects) and transferring technology (technology effects).

Researchers such as Findlay (1978); Lall (1974); Loungani and Razin (2001) and Romer (1990) among others, noted that FDI brings much needed physical capital, new technology, managerial and marketing talents and expertise, international best practices of doing business as well as increased competition. These resources may have the potential to be diffused into indigenous firms thereby creating more innovation and productivity growth.

FDI contributes more jobs to the local economy by directly adding new jobs and indirectly when local spending increases due to purchases of goods and services by the new increase in employees. All of these in turn are expected to have positive multiplier effects for an economy. The benefits from the balance of payments effects include improvement in the capital account due to the inflows of new capital into the host country and improvements in the current account balance because of possible decline in imports of goods and services which would otherwise have been imported. The additional taxes from multinational corporations also have the potential to improve the budget situation of the host country. Hymer (1976) suggested that the technological transfer benefits included, among other things, the direct benefits from adopting the product, process and organizational innovations initiated by the parent company.

The primary goal of this paper is to make certain the direction of causality between foreign direct investment (FDI) and economic growth (GDP) in Nigeria, for the period 1970 to 2009. Therefore, this work seeks to find out if increased economic growth in Nigeria leads to an increase in foreign direct investment inflow and vice versa and also establish whether there is a long-run or bi-directional relationship between foreign direct investments and economic growth in Nigeria. Based on these objectives, the study will test for the relevant hypotheses.

This paper is divided into four sections. Apart from section one, which treated the introduction, objectives and hypotheses; section two reviews the related literature on FDI and economic growth. Section three presents the methodology and discussion of results while section four contains comments and conclusion.

## **REVIEW OF RELATED LITERATURE**

There are several ways in which FDI can stimulate economic growth as identified by different scholars. First, through capital accumulation, FDI is expected to be growth enhancing in that more new inputs are incorporated into production (Buckley, 2002). Economic growth may additionally result from a wider range of intermediate goods in FDI-related production (Feenstra and Markusen, 1994).

Second, FDI is considered to be an important source of technological change and human capital augmentation (Buckley et al, 2002). Technological change occurs simultaneously through the process of capital deepening, as new varieties of knowledge-based capital goods are introduced, and through the human capital augmentation, as productivity-increasing labour training, new skills acquisition, alternative advanced management practices and organisational innovations take place. More importantly, FDI leads to what is called “technology diffusion” – the transmission of ideas and new technologies, productivity spillovers, sharing and implementation of know-how, knowledge transfer (Borensztein et al, 1998), all of which are important factors of economic development. Technological change occurs not only within the FDI- recipient firm, but also in the overall economy, due to the spillover effects such as positive externalities, are enhanced by FDI.

Furthermore, FDI is believed to improve efficiency of the locally owned firms. Broadly speaking, the efficiency of firms in the host economy is supposed to be increased in direct and indirect ways. Though by the direct effect it meant that FDI will contribute to the productivity of the sector in which a foreign firm operates. Some studies (Schoors et al, 2002) find that whenever firms in open sector are owned domestically, productivity is not very high. They use cheap labour force as a source of comparative advantage. This is in contrast to the foreign-owned firms in the same sectors, which hire more expensive labour, but benefit from higher productivity. On the other hand, cross-sector, or indirect, effects are also present whenever labour and knowledge are moving from sector to sector, technology diffusion occurs. In addition, more productive foreign firms stimulate healthy competition in the domestic market.

In addition to the reasons mentioned above, FDI is believed to be especially important for economies in transition because these countries have much potential human capital, but lack the technology and capital necessary for development and growth. FDI is seen as serving as a stimulus for capital accumulation and technology transfer in these economies.

Moreover, as is widely known and understood, transitional economies lack capital and financial means, and they have to rely on foreign assistance. During the transition period, a country is faced with reorienting its production and consumption structures and rebuilding its capital stock as a whole, since the capital stock inherited from the past is old and inadequate for the new market situation. Consequently, the speed of the transition may be related to the ability of a country to stimulate capital inflows (Garibaldi et al, 2002).

Increasingly, attracting foreign direct investment has become very important because of its inherent benefits to the economies of host countries. Existing empirical studies show that foreign direct investment leads to technology spillover, enhances business entrepreneurship, contributes to trade integration across country boundaries, and

supports human capital formation; all of which are paramount for increased economic growth.

According to the study done by Agrawal (2000) on economic impact of foreign direct investment in South Asia by undertaking time-series, cross-section analysis of panel data from five South Asian countries; India, Pakistan, Bangladesh, Sri Lanka and Nepal, that there exist complementarity and linkage effects between foreign and national investment. Further, he argues that, the impact of FDI inflows on GDP growth rate is negative prior to 1980, mildly positive for early eighties and strongly positive over the late eighties and early nineties.

Most South Asian countries followed the import substitution policies and had high import tariffs in the 1960s and 1970s. These policies gradually changed over the 1980s, and by the early 1990s, most countries had largely abandoned the import substitution strategy in favour of more open international trade and generally, market oriented policies (Agrawal, 2000). Carkovic and Levine (2002) also concluded in their econometric study on FDI and GDP growth that the exogenous component of FDI does not exert a robust, independent influence on growth.

However, no consensus has yet been reached on the steady state as well as dynamic effects of FDI on growth. While some studies argue that the impact of FDI on growth is highly heterogeneous across countries with relatively open economies showing statistically significant results, the other studies maintain that the direction of causality between the two variables depends on the recipient country's trade regime. However, most studies don't pay any serious attention to the possibility of a bi-directional link between the two variables in reference.

Renewed research interest in FDI stems from the change of perspectives among policy makers from "hostility" to "conscious encouragement", especially among developing countries. FDI had been seen as "parasitic" and retarding the development of domestic industries for export promotion until recently. However Bende-Nabende and Ford (1998) submit that the wide externalities in respect of technology transfer, the development of human capital and the opening up of the economy to international forces, among other factors, have served to change the former image.

Caves (1996) observed that the rationale for increased efforts to attract more FDI stems from the belief that FDI has several positive effects. Among these are productivity gains, technology transfers, introduction of new processes, managerial skills and know-how in the domestic market, employee training, international production networks, and access to markets.

Moreover, FDI has empirically been found to stimulate economic growth by a number of researchers (Borensztein et al., 1998; Glass and Saggi, 1998). De Mello (1997) presents a positive correlation for selected Latin American countries. Inflows of foreign capital are assumed to boost investment levels. Blomstrom et al. (1994) report that FDI exerts a positive effect on economic growth, but that there seems to be a threshold level of income above which FDI has positive effect on economic growth and below which it does not. The explanation was that only those countries that have reached a certain income level can absorb new technologies and benefit from technology diffusion, and

thus reap the extra advantages that FDI can offer.

Previous works suggest human capital as one of the reasons for the differential response to FDI at different levels of income. This is because it takes a well-educated population to understand and spread the benefits of new innovations to the whole economy.

Borensztein et al. (1998) also found that the interaction of FDI and human capital had important effect on economic growth, and suggest that the differences in the technological absorptive ability may explain the variation in growth effects of FDI across countries. They suggest further that countries may need a minimum threshold stock of human capital in order to experience positive effects of FDI. Balasubramanian et al. (1996) report positive interaction between human capital and FDI. They had earlier found significant results supporting the assumption that FDI is more important for economic growth in export-promoting than import-substituting countries. This implies that the impact of FDI varies across countries and that trade policy can affect the role of FDI in economic growth.

In summary FDI has either a positive or negative impact on output depending on the variables that are entered alongside it in the test equation. These variables include the initial per capita GDP, education attainment, domestic investment ratio, political instability, terms of trade, black market exchange rate premiums, and the state of financial development.

Examining other variables that could explain the interaction between FDI and growth, Olofsdotter (1998) submits that the beneficiary effects of FDI are stronger in those countries with a higher level of institutional capability. He therefore emphasized the importance of bureaucratic efficiency in enabling FDI effects. The neoclassical economists argue that FDI influences economic growth by increasing the amount of capital per person. However, because of diminishing returns to capital, it does not influence long-run economic growth. Bengos and Sanchez-Robles (2003) asserts that even though FDI is positively correlated with economic growth, host countries require minimum human capital, economic stability and liberalized markets in order to benefit from long-term FDI inflows.

Interestingly, Bende-Nabende et al. (2002) found that direct long-term impact of FDI on output is significant and positive for comparatively economically less advanced Philippines and Thailand, but negative in the more economically advanced Japan and Taiwan. Hence, the level of economic development may not be the main enabling factor in FDI growth nexus. On the other hand, the endogenous school of thought opines that FDI also influences long-run variables such as research and development (R&D) and human capital (Romer, 1986; Lucas, 1988).

FDI could be beneficial in the short term but not in the long term. Durham (2004), for example, failed to establish a positive relationship between FDI and growth, but instead suggests that the effects of FDI are contingent on the "absorptive capability" of host countries. Obwona (2001) notes in his study of the determinants of FDI and their impact on growth in Uganda that macroeconomic and political stability and policy consistency are important parameters determining the flow of FDI into Uganda and that FDI affects

growth positively but insignificantly. Ekpo (1995) reports that political regime, real income per capita, rate of inflation, world interest rate, credit rating and debt service explain the variance of FDI in Nigeria. For non-oil FDI, however, Nigeria's credit rating is very important in drawing the needed FDI into the country.

In addition to the benefits that FDI brings to investors, the interest in studying FDI lies in the area of the effects flowing from FDI. Although it seems to have become publicly accepted wisdom that FDI is beneficial rather than harmful in enhancing economic growth, empirical literature has not reached a consensus on whether FDI has a positive impact on economic growth. Since FDI represents a composite bundle of capital stock, technology, management, and know-how (Balasubramanyan et al, 1996), it is believed to have multidimensional impact on the recipient economy.

The experience of transition economies, however, suggests that such sources of external help as foreign aid and credits have proven themselves to not always be beneficial for the recipient countries, since much of the aid is being stolen or used ineffectively, whereas credits require interest payments. In this light, foreign direct investment plays an important role as an outward factor that can and does represent a real working financial injection into transitional economies (Balatsky, 1999). Another reason why transition economies may be interested in attracting FDI, in words of (Balatsky, 1999) is the ability of a foreign-owned sector to lead the economy out of a temporary shock or a short-run recession, provided it is not very deep in order not to affect domestic producers.

Furthermore, (Calvo et al., 1996) suggest that a large shift in capital flows to one or more large (or more developed) countries in the region (such as Hungary, Czech Republic, and Russia), may generate externalities for the neighbouring countries, by means of making investors more familiar with the emerging markets and more willing to invest into countries with similar economic prospects.

Finally, other important outcomes of FDI include increase in consumer choice, enabling household to smooth consumption over time, provision of support for pension funds and retirement accounts (Calvo et al., 1996), improving tax collection on the local and state levels (Carbaugh, 2000), as well as possible increase in domestic investment stemming from increased competition (de Mello, 1997). It is important to note, however, that not all researchers are so sanguine with regard to the impact of FDI on the host economy. For example, with respect to the spillover effects, some authors (Schoors et al, 2002; Blomstrom et al, 1998) draw attention to the fact that the initial stages of the development and/or transition to the market economies, FDI may have a negative impact on the recipient economy. This fact is referred to as a "market stealing" effect, when domestic firms are so unproductive compared to the foreign ones, that foreign-owned firms drive domestic producers out of the market.

Schoors et al., (2002), however, find that the positive effect outweighs the negative one. They also find that cross-section, or intersectional, spillover effects are more important than the spillover effects diffused within the sector into which FDI was injected. This happens because foreign-owned firms that operate on domestic markets usually come into contact with firms of other sectors, suppliers and consumers of these firm's products. And, as suggested by Blomstrom et al. (1998), since the foreign-owned firms

is producing a high-quality output, it requires its partners to comply with this quality, driving up production standards of the firms from different sectors of the economy. Nevertheless, it is not clear whether results obtained by Schoors et al. (2002) can be extended to other transitional economies, with which domestic production is still at the initial stages of development. And it is therefore, not unequivocal that FDI can be viewed as a remedy for unemployment since not only workers may be hired by foreign-owned firms, but also workers may be fired by domestically-owned firms that cannot compete. Similarly, it is not clear whether FDI can strengthen domestic competition in the short-run.

## METHODOLOGY AND DISCUSSION OF RESULT

The study is largely quantitative and builds on existing research studies and methodologies. In this study, the researcher used some methods to test the hypothesis on the various relationships between foreign direct investment and economic growth. The statistical methods used are the ordinary least squares method (OLS), unit root test, the cointegration test and the granger causality test. These methods are used in order to avoid a number of challenges and issues that normally crop up when qualitative methods are used especially in econometric studies. These include the issue of subjectivity and bias of responses and the inability to incorporate such biases in econometric models.

The linear regression equation for this model is:

$$GDP_i = \alpha_i + \beta_i FDI_i + \varepsilon_i \dots \dots \dots (1)$$

where;  $GDP_i$  and  $FDI_i$  represent the Gross Domestic Product and Foreign Direct Investment at a particular time respectively while  $\varepsilon_i$  represents the “noise” or error term;  $\alpha_i$  and  $\beta_i$  represent the slope and coefficient of regression. The coefficient of regression,  $\beta_i$  indicates how a unit change in the independent variable (Foreign Direct Investment – net inflow of FDI) affects the dependent variable (gross domestic product). The error,  $\varepsilon_i$ , is incorporated in the equation to cater for other factors that may influence GDP. The validity or strength of the Ordinary Least Squares method depends on the accuracy of assumptions. In this study, the Gauss-Markov assumptions are used and they include; that the dependent and independent variables (GDP and FDI) are linearly co-related, the estimators ( $\alpha$ ,  $\beta$ ) are unbiased with an expected value of zero i.e.  $E(\varepsilon_i) = 0$ , which implies that on average the errors cancel out each other.

In order to estimate the regression model, E-views econometrics and statistical package was used. The procedure involved specifying the dependent and independent variables; in this case, GDP is the dependent variable while FDI is the independent variable. The programs were run and from the output, the values of the constant,  $\alpha$  (slope), coefficient of regression,  $\beta$  and the error term,  $\varepsilon$  are obtained. In addition, the output showed the t-statistic and p-values for the coefficients which results in either rejecting or failure to reject the hypothesis at a specified level of significance. The p-value is the probability of getting a result that is at least as extreme as the critical value. The null hypothesis is rejected if the p-value is less than or equal to the critical value. The output will show the coefficient of determination ( $r^2$ ), which measures the proportion of the dependent variable that is explained by the regression model.



To determine whether the series used in the regression process is a difference stationary or a trend stationary, the Augmented Dickey-Fuller (ADF) test is used. The unit root test tests for the existence of a unit root in three cases: without intercept and trend, with intercept only and with intercept and trend to take into the account the impact of the trend on the series. The ADF test simply runs a regression of the first-difference of the series against a first-lagged value, constant, and a time trend as the following:

Without Intercept and Trend  $\Delta Y_t = \delta Y_{t-1} + U_t \dots \dots \dots (2)$   
 With Intercept  $\Delta Y_t = \alpha + \delta Y_{t-1} + U_t \dots \dots \dots (3)$   
 With Intercept and Trend  $\Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + U_t \dots \dots \dots (4)$

It was ascertained that many macro time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be *cointegrated*. The stationary linear combination is called the *cointegrating equation* and may be interpreted as a long-run equilibrium relationship among the variables. The purpose of the cointegration test is to determine whether a group of non-stationary series is cointegrated or not. We therefore deployed the Johansen's cointegration test to enable us determine if there is a long-run relationship between foreign direct investments and economic growth. Finally, the Granger Causality test was used to determine the direction of relationship.

This Granger test is implemented by running the following regression:

$$\Delta y_t = \alpha + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \sum_{i=1}^p \gamma_i \Delta x_{t-i} + \varepsilon_t \dots \dots \dots (5)$$

and testing the joint hypothesis  $H_0: \gamma_1 = \gamma_2 = \dots \gamma_p = 0$  against  $H_1: \gamma_1 \neq \gamma_2 \neq \dots \gamma_p \neq 0$ . Granger causality from the  $y$  variable to the coincident variable  $x$  is established if the null hypothesis of the asymptotic chi-square ( $\chi^2$ ) test is rejected. A significant test statistic indicates that the  $x$  variable has predictive value for forecasting movements in  $y$  over and above the information contained in the latter's past.

We followed Seabra and Flach, (2005) method, and adopted the model:

$$LOGGDP = \gamma_0 + \sum_{i=1}^{k+d} \alpha_{1i} LOGGDP_{t-i} + \sum_{i=1}^{k+d} \beta_{1i} LOGFDI_{t-i} + \varepsilon_{1t} \dots \dots \dots (6)$$

$$LOGFDI = \gamma_0 + \sum_{i=1}^{k+d} \alpha_{2i} LOGFDI_{t-i} + \sum_{i=1}^{k+d} \beta_{2i} LOGGDP_{t-i} + \varepsilon_{2t} \dots \dots \dots (7)$$

where  $LOGGDP$  and  $LOGFDI$  are, respectively, the natural logarithm of GDP growth (proxy for economic growth) and of Foreign Direct Investment.  $k$  is the optimal lag order,  $d$  is the maximal order of integration of the variables in the system and  $\varepsilon_1$  and  $\varepsilon_2$  are

error terms that are assumed to be white noise.

To ascertain if increased economic growth in Nigeria leads to an increase foreign direct investment inflow and vice versa, we conducted the ordinary least square regression test for the time series data, to test for the first hypothesis as stated below:

H<sub>0</sub> Increased economic growth in Nigeria does not lead to an increase in foreign direct investment inflow.

H<sub>A</sub> Increased economic growth in Nigeria leads to an increase in foreign direct investment inflow.

**Table 1: OLS Regression**

Dependent Variable: LOG(GDP)

Method: Least Squares

Date: 09/13/11 Time: 21:34

Sample: 1970 2009

Included observations: 38

Excluded observations: 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.156113	0.842111	7.310333	0.0000
LOG(FDI)	0.825409	0.101943	8.096750	0.0000
R-squared	0.645521	Mean dependent var		12.61804
Adjusted R-squared	0.635674	S.D. dependent var		2.744294
S.E. of regression	1.656440	Akaike info criterion		3.898415
Sum squared resid	98.77662	Schwarz criterion		3.984604
Log likelihood	-72.06988	F-statistic		65.55735
Durbin-Watson stat	1.625593	Prob(F-statistic)		0.000000

Estimation Command:

=====  
 LS LOG(GDP) C LOG(FDI)

Estimation Equation:

=====  
 LOG(GDP) = C(1) + C(2)\*LOG(FDI)

Substituted Coefficients:

=====  
 LOG(GDP) = 6.156113028 + 0.8254086429\*LOG(FDI)

The table shows that the probability value 0.0000 is lower than 0.5 which suggest the rejection of the null hypothesis for a two tailed test at 5% significance level. By this, the null hypothesis that increased economic growth in Nigeria leads to an increase foreign direct investment inflow is rejected. This by implication shows that it is Foreign Direct Investment that drives economic growth in Nigeria.

To establish whether there is a long-run or bi-directional relationship between foreign direct investments and economic growth in Nigeria, the unit root test, cointegration test and Granger causality test was employed.

The second hypothesis tested is:

H<sub>0</sub> There is no long-run or bidirectional relationship between foreign direct investment and economic growth in Nigeria.

H<sub>A</sub> There is a long-run or bidirectional relationship between foreign direct investment and economic growth in Nigeria.

**The Augmented Dickey Fuller Test for Unit Root**

From the result in table 2 below, if the statistic  $t_{\alpha}$  value is greater than the critical values, we do not reject the null at conventional test sizes and vice versa. The analysis started by the test of the statistical properties of the data series used. First, the order of integration in each of the GDP and FDI series were tested. The stationarity test, which is the unit root, showed that the included variables were non-stationary at their level and first difference. The exception is LOGGDP in its first difference, which is 1(0), but others are integrated of order one 1(1) at the 1%, 5% and 10% significance levels. This indicates that the test failed to reject the null hypothesis of non-stationarity. The lag lengths were chosen using Akaike Information Criteria (AIC). This means that the null of a unit root for the individual series was not rejected for all of the series tested. Given the short span of the individual series, we do not reject the unit root null of unit roots for the 40 observations.

**Table 2: Summary of the Unit Root Test**

ADF Test Statistic	1.534851	1%	Critical Value*	-3.6496
		5%	Critical Value	-2.9558
		10%	Critical Value	-2.6164
ADF Test Statistic	-0.683952	1%	Critical Value*	-3.6171
		5%	Critical Value	-2.9422
		10%	Critical Value	-2.6092
ADF Test Statistic	-1.889360	1%	Critical Value*	-3.6661
		5%	Critical Value	-2.9627
		10%	Critical Value	-2.6200
ADF Test Statistic	-5.575087	1%	Critical Value*	-3.6228
		5%	Critical Value	-2.9446
		10%	Critical Value	-2.6105

**Test for Cointegration with Johansen Cointegration Test**

Having established that the various series are integrated of the first order, the second step in testing the relationship between FDI and GDP is to test for the cointegration relationship between the variables, in order to determine if there is a long-run relationship between the two variables. The test for the long-run relationship between both variables was done using Johansen cointegration test.

**Table 3: Result of Johansen cointegration test**

Date: 09/13/11 Time: 23:25

Sample: 1970 2009

Included observations: 32

Test assumption: Linear deterministic trend in the data

Series: LOG\_FDI LOG\_GDP

Lags interval: 1 to 2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.342561	16.74036	15.41	20.04	None *
0.098534	3.319444	3.76	6.65	At most 1

\*(\*\*) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

LOG_FDI	LOG_GDP
-0.232083	0.196796
0.078945	0.012049

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LOG_FDI	LOG_GDP	C
1.000000	-0.847956	3.046916
	(0.08335)	
Log likelihood	-104.3954	

The table 3 reports the cointegration test results. It can be seen from the test results in table 3 that there is one cointegrating equation at 5% significance level. This implies a long run relationship among the variables. That is, there is a long-run steady-state relationship between FDI and GDP for Nigeria in the period 1970 to 2009 (40years). Once we have established a cointegration relationship between the variables, then we may conclude that there exists a long-run relationship between them, even if they are individually non-stationary. Also, if the trace statistics or the Likelihood ratio is greater than the critical value as is seen in 5% level of significance, then there is a cointegration.

To make sure that the presence of serial correlation is not in the residuals of the

estimated equation, we need to perform a more general Breusch-Godfrey test for serial correlation in the residuals This is basically because, if the estimates are uncorrected, serial correlation in the residuals will lead to incorrect estimates of the standard errors, and invalid statistical inference for the coefficients of the equation.

**Table 4: Test for Serial Correlation**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.848868	Probability	0.436767
Obs*R-squared	1.807229	Probability	0.405103

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 09/13/11 Time: 21:39

Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.471684	0.935604	0.504149	0.6174
LOG(FDI)	-0.063068	0.115623	-0.545460	0.5890
RESID(-1)	0.200118	0.178171	1.123176	0.2692
RESID(-2)	0.116282	0.189487	0.613670	0.5435
R-squared	0.047559	Mean dependent var	-1.25E-15	
Adjusted R-squared	-0.036480	S.D. dependent var	1.633903	
S.E. of regression	1.663438	Akaike info criterion	3.954951	
Sum squared resid	94.07893	Schwarz criterion	4.127329	
Log likelihood	-71.14408	F-statistic	0.565912	
Durbin-Watson stat	1.966377	Prob(F-statistic)	0.641238	

From the probability figure above, test indicates an absence of serial correlation. If this probability value is less than the size of the test, say 0.05, we reject the null hypothesis.

**Granger Test**

The result obtained from our granger test is as shown in the table below:

**Table 5: Result of Granger Causality Tests**

Pairwise Granger Causality Tests

Date: 09/13/11 Time: 23:29

Sample: 1970 2009

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Probability
LOG_GDP does not Granger Cause LOG_FDI	32	0.45247	0.71783 A N

LOG_FDI does not Granger Cause LOG_GDP	3.99431	0.01877 R Y
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From the result above, the F-statistic and the probability values indicate if the null hypothesis should be accepted or rejected. In the second row where we have the null hypothesis LOGGDP does not Granger cause LOGFDI. We have the F-statistic as 0.45247 with a probability value of 0.71783 which indicates no causality. On the other hand, the null hypothesis that LOGFDI does not Granger Cause LOGGDP has 3.99431 as the F-statistics with a probability value of 0.01877 indication that there is causality. From the above observation, the null hypothesis that LOGGDP does not Granger cause LOGFDI cannot be rejected.

This shows that the null hypothesis that there is a bi-directional relationship between economic growth as proxied by GDP and FDI in Nigeria is rejected thereby accepting the alternate hypothesis that there is a unidirectional relationship between GDP and FDI in Nigeria. The result show that there is a causality between economic growth and Foreign Direct Investment in Nigeria for the period under review and the causality runs for FDI to GDP indicating a unidirectional relationship.

## CONCLUSION

This paper has empirically attempted to ascertain the relationship between foreign direct investment and economic growth in Nigeria by using the OLS, unit root, cointegration and granger causality test, using a time series annual data within the scope of 1970 to 2009.

The unit root test showed that the included variables (FDI and GDP) were non-stationary at their level and first difference, the cointegration test showed one cointegrating equation which implied a long-run relationship between the foreign direct investments and economic growth and the Granger causality test result shows that there is a unidirectional relationship between the variable, indicating a causality which runs from only FDI to GDP.

Strong evidence emerging from this study shows that economic growth as measured by GDP in Nigeria is Granger caused by FDI, which shows that Nigeria's capacity to progress on economic growth will depend on the country's performance in attracting Foreign Direct Investment. This study supports the impact of FDI on GDP growth in Nigeria. These findings confirm the relevance of the economic reform programmes in Nigeria to reduce macro-economic instability, remove economic distortions, promote exports and restore sustainable domestic investment for economic growth.

Finally from the findings of this study, the conservative views that the direction of causality runs from FDI to economic growth was confirmed in the case of Nigeria. This supports the validity of policy guidelines which stipulates the importance of Foreign Direct Investment for the growth and stability of developing countries under the assumption of FDI led growth.

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