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Co-integration Analysis of Foreign Direct Investment Inflow and Development in Nigeria

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Abstract
The paper aimed at evaluating the co-integration analysis inflows of FDI from Ghana and South Africa to the growth of the Nigerian economy. Data are derived from UNCTAD (2008), the African Development Bank (2008) and the 2008 World Development Indicators of the World Bank (2008), and span from 1979 to 2007of the Sub-sahara Africa Region. We build vector Auto-regression models and compute bounds F-statistics to test for the absence of a long-run relationship between foreign direct investment and growth. We also construct vector autoregressive models and compute modified Wald statistics to test for the non-causality between FDI and economic growth. Granger test revealed that NGDP causes SAFDI and both SAFDI and GFDI granger cause which implied long run relationship between FDI inflows and development in Nigeria.
Keywords: Johnsen test, VAR, Jargue-Bera, Ramsey test, FDI, GDP.

1. Introduction

Governments have been trying to lift the country out of the economic doldrums without achieving success as desired. Each of these governments has not focused much attention on investment especially foreign direct investment which will not only guarantee employment but will also impact positively on economic growth and development. FDI is needed to reduce the difference between the desired gross domestic investment and domestic savings. (Jenkin & Thomas 2002) assert that FDI is expected to contribute to economic growth not only by providing foreign capital but also by crowding in additional domestic investment. By promoting both forward and backward linkages with the domestic economy, additional employment is indirectly created and further economic activity stimulated. According to (Adegbite &Ayadi 2010) FDI helps fill the domestic revenue-generation gap in a developing economy, given that most developing countries' governments do not seem to be able to generate sufficient revenue to meet their expenditure needs. Other benefits are in the form of externalities and the adoption of foreign technology.

2. Statement of Problem

Over the years, FDI has being view as majorly the activities that contributes to economic growth of any nation from the developed world. However, event has charged over time where foreign direct invest inflow is considered from countries within the region: such as FDI inflow into Nigeria economy from Ghana and South Africa. This paper critically evaluates the co-integrating relationship between FDI inflow and Nigeria economic performance. To test any existence of significance, contributes to the performance; we employed Economic Analysis procedure to investigate the empirically significance.

3. Objective

1. To examine the FDI inflow to Nigeria economy
2. To determine the relationship between FDI inflow into Nigeria economy
3. To determine to what extent does FDI inflow contribute to Nigeria economic performance

4. Hypothesis

Ho1: There is no significant relationship among the FDI inflow from Ghana, South Africa and Nigeria economy

Ho2: There is no significant relationship between FDI from others and Nigerian economy.

5. Literature Review

At the firm level, several studies provided evidence of technological spillover and improved plant productivity. At the macro level, FDI inflows in developing countries tend to crowd in other investment and are associated with an overall increase in total investment. Most studies found that FDI inflows led to higher per capita GDP, increase economic growth rate and higher productivity growth. As noted by (De Mello 1997), two channels have been advanced to explain the positive impact of FDI on growth. First, through capital accumulation in the recipient country, FDI is expected to be growth-enhancing by encouraging the incorporation of new inputs and foreign technologies in the production function of the recipient economy. Second, through technology transfer, FDI is expected to increase the existing stock of knowledge in the recipient economy through labour training and skill acquisition (Borensztein et al., 1998) and (Mastromarco & Ghosh, 2009), on the one hand and through the introduction of alternative management practices and organization arrangements, on the other. Essentially, the extent to which FDI is growth-enhancing depends on the economic and technological conditions of the host country.

For example, (Borensztein et al 1998) suggested that there is a strong complementary effect between FDI and human capital, that is, the contribution of FDI to economic growth is enhanced by its interaction with the International Journal of Economics and Finance Vol. 2, No. 2; May 2010 169 level of human capital in the host country. Moreover, the magnitude of the FDI-growth link depends on the degree of complementarities and substitution between FDI and domestic investment (De Mello 1999), and depends on institutional matters, such as the recipient economy's trade regime, legislation, political stability, urbanization rate (Hsiao & Shen 2003), etc.

However, studies in the line of (Carcovic & Levine 2003) do not lend support to the view that FDI promotes growth. Moreover, (Hanson 2001) has found weak evidence that FDI generates positive spillovers for host countries. Recently, comprehensive discussions at the firm level have been provided by (Gorg & Greenaway 2004). Another strand of the literature has focused more directly on the causal relationships between FDI and growth.
For example, (Chowdhury & Mavrotas 2006) examines the causal relationship between FDI and economic growth by using time-series data covering the period 1969-2000 for three developing countries, namely Chile, Malaysia and Thailand. They follow the Toda and Yamamoto causality test approach. Their empirical findings clearly suggest that GDP causes FDI in the case of Chile and not vice versa, while for both Malaysia and Thailand, there is strong evidence of a bi-directional causality between the two variables. Furthermore, in (Hansen & Rand 2006), the causal relationship between FDI and GDP is analysed in a sample of 31 developing countries covering the period 1970-2000. Their conclusions regarding the direction of causation between the two variables seem to vary significantly depending on the econometric approach adopted and the sample used. In addition, looking at time series on 11 countries, (Zhang 2001) evidences strong Granger-causal relationship between FDI and GDP growth.

In summary, despite the truly enormous amount of research that has been undertaken on FDI there remain serious methodological issues. Moreover, probably due to relatively small level of foreign direct investment to
Africa, when compared with other regions, e.g. Latin America and Asia, not many studies has been reported on the effects of FDI on economic growth.

The paper contributes to the empirical literature on the relationship between foreign direct investment and economic growth, for ten Sub-Saharan African countries, namely Angola, Cameroon, Congo, Cote d'Ivoire, Ghana, Kenya, Liberia, Nigeria, Senegal and South Africa. To this end, we employ two newly introduced methods in applied economics: the Pesaran et al. (2001) approach to cointegration and the (Toda & Yamamoto 1995) causality procedure. Pesaran et al. (2001) approach has at least two major advantages over the traditional approaches (Engle & Granger, 1987) used by a wide range of studies. The first advantage is that it is applicable irrespective of whether the underlying regressors are purely stationary, purely integrated or mutually cointegrated. The second advantage is that it has superior statistical properties in small samples. The bounds test is relatively more efficient in small sample data sizes as is the case in most empirical studies on African countries. Furthermore, Toda & Yamamoto (1995) propose an interesting yet simple procedure requiring the estimation of an augmented vector autoregressive (VAR) which guarantees the asymptotic distribution of the Wald statistic, since the testing procedure is robust to the integration and cointegration properties of the process. Data are derived from UNCTAD (2008), the African Development Bank (2008) and the 2008 World Development Indicators of the World Bank (2008), and span from 1970 to 2007.

6. Model Variable Specification

To investigate the flow of Foreign Direct Investment from Ghana and South Africa into Nigeria to contributing to the economic growth, the model for the study is specified as:

$NGDP$ = Nigerian Gross Domestic Product, $GFDI$ = Ghana Foreign Direct Investment

$SAFDI$ = South Africa Foreign Direct Investment and Others= F(externalities and the adoption of foreign technology)

7. Data and variables

This paper uses annual time series data on ten Sub-Saharan African countries, namely, Angola, Cameroon, Congo, Cote d'Ivoire, Ghana, Kenya, Liberia, Nigeria, Senegal, and South Africa. These African countries benefit large foreign direct investment inflows and are characterized by high levels of the per capita gross domestic product during the last two decades. In addition, these countries are viewed as having strong prospects over the near term in attracting large volumes of global FDI flows because of a successful implementation of reforms. That is why this study focuses on three African countries. The series comprise yearly observations between 1980 and 2007, namely real gross domestic product per capita (GDPC) as a measure for economic growth and the ratio of foreign direct investment (FDI) inflows to GDP (RFDI). Data on real GDP per capita and GDP are from the 2008 World Development Indicators of the World Bank (2008) and from the Selected International Journal of Economics and Finance.

Statistics on African Countries of the African Development Bank (2008), and time series on FDI inflows come from the 2008 World Investment Report Dataset of the United Nations Conference on Trade and Development (UNCTAD, 2008).

Most African countries, since years, depend largely on the export of commodities like cocoa, coffee, rubber and mineral resources. However, efforts have been made to increase economic activity, incomes and general welfare.
Economic reforms largely been aimed at attracting FDI. As part of the most African governments' effort to attract FDI, various policies and institutional structures have been developed in many countries. For instance, the Structural Adjustment Programme (SAP) has undertaken from the mid 1980s through to the early 1990s was not just aimed at economic restructuring but also promoting FDI inflows. This study tries to quantify the relationship between FDI and growth and examines whether FDI is important for growth in the ten Sub-Saharan African countries considered here.

8. Methodology

8.1 The co-integration approach

Econometric literature proposes different methodological alternatives to empirically analyse the long-run relationships and dynamic interactions between two or more time-series variables. The most widely used methods include the two-step procedure of (Engle & Granger 1987) and the full information maximum likelihood-based approach due to (Johansen 1988) and (Johansen & Juselius 1990). All these methods require that the variables under investigation are integrated of order one. This inevitably involves a step of stationarity pre-testing, thus introducing a certain degree of uncertainty into the analysis. In addition, these tests suffer from low power and do not have good small sample properties (Cheung & Lai 1993) and (Harris 1995). Due to these problems, this study makes use of a newly developed approach to cointegration that has become popular in recent years.

The bounds testing approach to cointegration was originally introduced by (Pesaran & Shin 1999) and further extended by Pesaran et al. (2001). The bounds testing approach to cointegration has at least two major advantages over the (Johansen & Juselius 1990) approach used by a wide range of studies (Masih &Masih2000) and (Narayan & Peng, 2007). The first advantage is that it is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. The second advantage is that it has superior statistical properties in small samples. The bounds test is relatively more efficient in small sample data sizes as is the case in most empirical studies on African countries. Estimates derived from Johansen-Juselius method of cointegration are not robust when subjected to small sample sizes such as that in the present study.

To search for possible long run relationships amongst the variables, namely gross domestic product per capita (GDPC) and the ratio of foreign direct investment to GDP, we employ the bounds testing approach to cointegration suggested by Pesaran et al. (2001).

In estimating the model, the dependent and independent variables are separately subjected to normality, ARCH, stability and stationary tests using histogram, white heteroskedasticity test, Ramsey reset and unit root tests since the appriori assumptions for the regression model require that the variables normal, heteroscedasticity, in functional form and stationary and that errors have a zero mean and unequal variance. The unit root test is evaluated using the Augmented Dickey-Fuller (ADF) test which can be determined as:

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \gamma \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \quad (1)$$

Where α represents the drift, t represents deterministic trend and m is a lag length large enough to ensure that ε_t is a white noise process. If the variables are stationary and integrated of order one I(2), we test for the possibility of a co-integrating relationship using (Eagle & Granger 1987) two stage Var Auto-

Regression (VAR). The study employs the Vector Auto-Regression (VAR) because it is an appropriate estimation technique that captures the relationship among the inflows variables.

The specification is expressed as function:

NGDP= f (GFDI, SAFDI and Others)

The proposed long-run equation in this study is specified below

$$NGDP_t = \alpha_0 + \alpha_1 GFDI + \alpha_2 SAFDI_t + \alpha_3 Others_t + \varepsilon_t \quad (2)$$

Hence VAR model used in this study is specified as:

$$\Delta NGDP_t = \beta_1 + \beta_2 \sum_{i=1}^{n} \Delta GFDI_{t-i} + \beta_3 \sum_{i=1}^{n} \Delta SAFDI_{t-i} + \beta_2 \sum_{i=1}^{n} \Delta Others_{t-i} + \delta_1 VAR(-2) + \varepsilon_t \quad (3)$$

where NGDP is Nigerian Gross Domestic Product, FDI is Foreign Direct Investment inflow from Ghana, Liberia and Others and $VAR(-2)$ is VAR term and U_t is Error term.

The short run effects are captured through the individual coefficients of the differenced terms. That is β_i captures the impact while the coefficient of the VAR variable contains information about whether the past values of variables affect the current values of the variables under study. The size and statistical significance of the coefficient of the residual correction term measures the tendency of each variable to return to the equilibrium. A significant coefficient implies that past equilibrium errors play a role in determining the current outcomes ∂_1 captures the long-run impact. The OLS result in table1 showed the independent variables have positive relationship with Nigeria economic growth.

9. Conclusion

This study has contributed to the cointegrating and causal relationship between foreign direct investment and economic growth in the case of three Sub-Saharan African countries. To this end, we use two recent econometric procedures which are the Pesaran et al. (2001) approach to cointegration and the procedure for non-causality test popularized by Toda & Yamamoto (1995). We build vector Auto-regression models and compute bounds F-statistics to test for the absence of a long-run relationship between foreign direct investment and growth. We also construct vector autoregressive models and compute modified Wald statistics to test for the non-causality between FDI and economic growth. Granger test revealed that NGDP causes SAFDI and both SAFDI and GFDI granger cause which implies that there is long run relationship between FDI from South Africa and Ghana to the economic growth in Nigeria.

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Empirical Analysis Result

Appendix

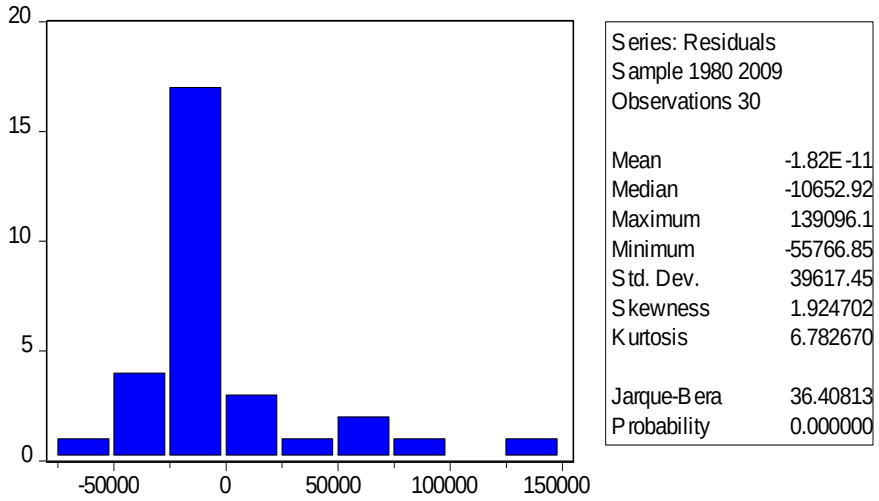
Dependent Variable: NGDP
Method: Least Squares
Table 1
Sample(adjusted): 1980 2009
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SAFDI	37.32926	15.45081	2.416007	0.0230
GFDI	27.79444	12.89845	2.154867	0.0406
OTHERS	38.95335	40.22011	0.968504	0.3417
C	-11009.12	11588.40	-0.950012	0.3509

R-squared	0.848101	Mean dependent var	87062.37
Adjusted R-squared	0.830574	S.D. dependent var	101650.4
S.E. of regression	41840.69	Akaike info criterion	24.24469
Sum squared resid	4.55E+10	Schwarz criterion	24.43152
Log likelihood	-359.6704	F-statistic	48.38884
Durbin-Watson stat	0.961045	Prob(F-statistic)	0.000000

Source: E-Views version 3.1

Table2 Diagnostic Test



Source: E-Views version 3.1

Table3 Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.783712	Probability	0.017845
Obs*R-squared	8.550633	Probability	0.013908

Source: E-Views version 3.1

Table 4 White Heteroskedasticity Test:

F-statistic	1.480964	Probability	0.228631
Obs*R-squared	8.360262	Probability	0.212880

Source: E-Views version 3.1

Table5 Ramsey RESET Test:

F-statistic	5.813862	Probability	0.002384
Log likelihood ratio	21.63842	Probability	0.000237

Source: E-Views version 3.1

Table6

Unit Root at 2 NGDP

ADF Test Statistic	-5.911813	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: E-Views version 3.1

Unit Root 2 DFF GFDI

ADF Test Statistic	-5.620173	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: E-Views version 3.1

Unit Root at 2 DFF

ADF Test Statistic	-9.323026	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: E-Views version 3.1

Unit Root at 2 DFF

ADF Test Statistic	-0.128973	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: E-Views version 3.1

Table 7 Johnsen Co-integration test
Sample: 1979 2009
Included observations: 28
Test assumption: Linear deterministic trend in the data
Series: DNGDP DGFDI DLFDI
Lags interval: No lags

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.637847	65.25730	29.68	35.65	None **
0.613204	36.81804	15.41	20.04	At most 1 **
0.305853	10.22199	3.76	6.65	At most 2 **

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 3 cointegrating equation(s) at 5% significance level
Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

DNGDP	DGFDI	DLFDI	C
1.000000	0.000000	-39.94833	-106.9733
		(18.4275)	
0.000000	1.000000	-0.066066	9.382873
		(0.25829)	
Log likelihood	-752.1599		

Source: E-Views version 3.1

Table 8
Sample(adjusted): 1983 2009

Included observations: 27 after adjusting endpoints
Standard errors & t-statistics in parentheses

	DNGDP
DNGDP(-1)	-0.033437
	(0.22998)
	(-0.14539)
DNGDP(-2)	-0.144454
	(0.21316)
	(-0.67766)
C	13462.02
	(8386.27)
	(1.60525)
DGFDI	-8.467041
	(15.4113)
	(-0.54941)
DSAFDI	-9.591634
	(20.3233)
	(-0.47195)
R-squared	0.043083
Adj. R-squared	-0.130901
Sum sq. resids	2.86E+10
S.E. equation	36064.12
F-statistic	0.247627
Log likelihood	-318.8591
Akaike AIC	23.98956
Schwarz SC	24.22953
Mean dependent	9719.389
S.D. dependent	33912.74

Source: E-Views version 3.1

Table 9 Estimation Proc:

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LS 1 2 DNGDP @ C DGFDI DSAFDI

VAR Model:

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DNGDP = C(1,1)*DNGDP(-1) + C(1,2)*DNGDP(-2) + C(1,3) + C(1,4)*DGFDI + C(1,5)*DSAFDI

VAR Model - Substituted Coefficients:

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DNGDP = - 0.03343657098*DNGDP(-1) - 0.144454019*DNGDP(-2) + 13462.01598 - 8.467040848*DGFDI - 9.59163364*DSAFDI

Table 10 Pairwise Granger Causality Tests

Sample: 1979 2009
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
DGFDI does not Granger Cause DNGDP	27	0.30725	0.73857
DNGDP does not Granger Cause DGFDI		0.31069	0.73611
DSAFDI does not Granger Cause DNGDP	27	0.45098	0.64276
DNGDP does not Granger Cause DSAFDI		0.94809	0.40275
DSAFDI does not Granger Cause DGFDI	27	1.86962	0.17787
DGFDI does not Granger Cause DSAFDI		1.56559	0.23137

Source: E-Views version 3.1