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Macroeconomic Fundamentals of Foreign Investment and Economic Growth in Sub-Saharan Africa: the Nigeria Case

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Abstract
A series of recent studies have pointed to the significance of microeconomic fundamentals in explaining long-run of relationship between foreign investment and economic growth in sub-Saharan Africa. This paper critically looked at the macroeconomic fundamentals of foreign investment determinant and its impact on economic growth in Nigeria. Data for the study were collected from the CBN statistical bulletin 2011 over period of 32 years within the space of 1980-2010. Econometrics techniques such as unit root test, co integration and ARDL were adopted to estimate models and investigate stationarity and long run relationship. The trace statistic and likelihood function values are greater than critical value at 5%. This reveals that there is co integration at most 1 with an implication of at least 2 co integrating equations. ADF test statistic indicated stationary at 5% level. The result showed that DLNEXR, DLNINTR, DLNINF and DLNMSP growth rates are statistically significant to the foreign investments (DLNFI) in the previous and current year. Long run relationship existed among exchange, interest growth rates and foreign investment growth rate in Nigeria. It was found that the most macroeconomic fundamentals are exchange rate, interest rate and money supply. Therefore, the empirical study further recommended that it is important for appropriate policy formulation and implementation to encourage and boost these variables for effective management of macroeconomic fundamentals that brings about foreign investment in Nigeria and its contribution to economic growth.
Keywords: Fundamentals, ARDLs, Unit roots, foreign investments, Long run relationship.

1. Introduction

The generally disappointing growth is sub-Saharan Africa over the last 20 years reflects the difficulties posed by institutional and economic factors, including the lack of resource endowments, the low level of human capital, the administrative, legal and institutional framework, the stance of financial policies, and structural policies that have often been distortionary. These factors, coupled with adverse external environment – with significant declines in terms of trade have all contributed to hinder sustained economic growth in the region. A series of recent studies have pointed to the significance of these factors in explaining long-run output growth in sub-saharan Africa, see among others Chour and Hadjimichael (2006), and World Bank (2004). Less attention, however, has been paid to the sources of macroeconomic fluctuations in the region.

During the last decade several developing countries adopted a set of open economy macroeconomic policies which – though sharing some demands with the liberal approach (e.g a focus on low budget deficit and inflation) differ substantially from it in other areas. In some of them, such new approach appears to have improved growth and financial stability while helping to preserve reasonable macro stability in the face of severe external shocks like those of 2009 and 2011. This paper aims at distilling the common elements in this approach which we name for convenience “the macroeconomic fundamentals” and at analyzing their impact on investment is sub-saharan Africa.

The region which most systematically adopted in recent times this open economy macroeconomic fundamentals is Latin America, is particular South America. A part of sub-saharan Africa seems also to have introduced policy changes in some areas of macroeconomics and to have improved investment. This may be due, however, to its lower international economic integration, the importance of a subsistence economy insulated from the global markets, and

in some sub-regions by an increase in food production. In other countries such as china and Vietnam, macroeconomic policy continued to differ as in prior decades, from the orthodox approach. In these state controlled selectively – open economies, trade integration progressed fast but controls on some imports, capital movements and the financial sector remained in place (Ciovanni and Cornia, 2012). In contrast, several economies of Easten Europe and the former Soviet Union adopted during the 2000s a standard liberal approach emphasizing fixed exchange rates, large balance of payment deficits and heavy reliance on external indebtedness which exacerbated the 2009 crisis. As noted, the new one is not a radically new model but important differences exist in relation to the theoretical Washington consensus approach summarized in the early 1990s by John Williamson. These differences are, however, much greater when considering the real life Washington consensus which dominated policy making in the 1980s and 1990s. Three key changes stand out since the early 2000's in the policies of several developing economies including Nigeria. They concern: the domestic macro policy regimes, the regulation of national financial systems and changes in the modalities of integration into the international financial system.

In parallel to the introduction of changes in macroeconomic policies, the last decade has witnessed a decline in investment is the vast majority of the Latin American countries (Crnia 2010), as well as in 15 – 20 sub-saharan African countries and some Asian economics. The question therefore spontaneously arises about the relation between the macroeconomic policies and the recent trend in investment is selected regions. Despite the persistence of this deadlock, the early 2000s element of a new approach to macro management seems to have spontaneously emerged in a number of developing countries. .the IMF itself – for long the enforcer of orthodox macroeconomics in developing countries has gone through some re-thinking (Blancherd et al 2010) and has been playing since 2009 a more positive role in the management of the recent crises than in the past.

2.0 Review of Related Literature

2.1.1 Theories of Investment of the Firm

In neo-classical theory, the firm operates in competitive markets, producing one or more outputs with the aid of two or more input, generally classified as labour, services and capital. Concomitantly with the flow decision problem of output supply and input demand over time, the firm faces on the investment problem of optimally adding to or subtracting from its stock of machine from which capital services are obtained. As is well-known, the macroeconomic terms, investment = savings = income – consumption. The problem of capital accumulation therefore emerges as a part of the problem of output, consumption, savings and investment over time. This raises many interesting questions:

- What relationship(s) exist between interest rates and investment
- How much of aggregate output or real GDP should an economy optimally save and hence invest to accumulate capital?
- At what rate should the society substitute consumption for savings/investment over time?
- As the economy grows as a result of investment, what would happen to the distribution of income between owners of capital and owners of labour?
- How much should an economy invest in resource and development to speed up technological progress?

2.1.2 The Harrod-Domer Model

The model that captures the main objective of this study is Harrod Domer model Harrod-Domer model describes the economic mechanism by which more investment leads to more growth. For a country to develop and grow, it must divert part of its resources from current consumption needs and invest them in capital formation. Diversion of resources from current consumption is called saving. While saving is not the only determinant of growth, the Harrod – Domer model suggests that it is an important ingredient for growth. Its argument is that every economy must serve a certain proportion of its national income if only to replace worn-out of capital goods. The model shows mathematically that growth is directly related to saving and indirectly related to capital output ratio. Suppose we define national income as Y, growth as G, capital output ratio as K, saving as S, and investment as I and average saving ratio as S and incremental capital output ratio as K, then we can construct the following simple model of economic growth.

$S = SY$ 1

i.e saving (s) is some proportion of (s) of national income (y) $I = DK$ 2

i.e investment (1) is defined as the change in capital stock (k) $G = \frac{\Delta Y}{Y}$ 3

i.e growth is defined as change in National income ΔY divided by the value of the National income.
But since the total stock, K bears a direct relationship to total national income or output Y, as expressed by the capital/output ratio K, then it follows that

$\frac{K}{Y} = k$ 4

OR

$\frac{\Delta K}{\Delta y} = k$ 5

Finally, since total national saving s, must equal total investment, 1 we can write this equality as S = I 5a.
But from Equation (1) above we know that S = S y and from Equation (2). And (3) we know that 1 Δk = kΔy
It therefore follows that we can write the, identity, of saving equaling investment shows by Equation (6) as
S = s
Y = kΔy = Δk = 1 6
The economy logic of this model is very simple. In other to grow, an economy must save and therefore, invest a certain proportion of their GNP. The more an economy can save, the more it can grow, for any level to the rate of growth depends on how productive the investment is?

2.20 **Empirical Studies**
Investment is a key to economic growth, Recent empirical studies (Hernandez- cata 2000), Ben – David (2008), Collier and Gunning (2009), Ghura and Hadjimicheal (2006), Khan and Reinhent (2000), conducted in Africa, Asia and Latin America have established beyond a doubt, the critical linkage between investment as the rate of growth. Throughout the 1990s, the ratio of total gross domestic product (GDP) in Asia, which experienced a high average rate of growth compared with the rest of the world,was about 27 %, while latin America and Sub sahara Africa, the corresponding ratios were 20% and 17% respectively. Econometric evidence (Beddees 2009, Ghura and Hadjimicheal 2006, Ghura 2007) indicates that private investment has a stronger, more favourable effect on growth rather than government investment probably because private investment is more efficient and less closely associated with corruption.
This analogy has been supported by a number of studies on the Kenyan growth process (Caplin and Leahy 2008), Glenday and Ryan (2002), concluded that private investment has been the strongest and the most significant contributor to growth in Kenya. Azam and Daubree (2007) highlighted the predominant role of insufficient private investment and its failure to match the progress of human capital accumulation as an important factor slowing growth is Kenya during this period. Private investment logged behind competition from investment in a context of financial repression. There are some evidence that the efficiency of capital use worsened over time, especially in the public sector activities, thereby reducing the growth effects of investment (Gabriele etal, 2000, Gelbard 2009, Giovonni 2012). In some developing countries, there is massive under-utilization and unemployment of educated labour (osei etal 2002, Bhinda etal 2009, Leape 2009), so that its social productivity may be minimal at the margin. The findings could also be attributed to measurement errors and possible non-linearities in the data, especially when micro evidence suggests high returns on investment.

3. Methodology
The study shall employ macroeconomic time series variables over a period of 32 years within the space of 1980-2010. The data are collected from the CBN statistical bulletin 2011. Econometrics techniques are adopted to estimate models. Analysis is conducted electronically with the use of econometrics software **Microfits 4.1**.

3.1 Model Specification

The study adopted the econometric model in evaluating the role of macroeconomic variables on the foreign investments in Nigeria. The econometric model used was to determine the relationship between foreign investments and selected macroeconomic variables (gross domestic product, exchange rate, interest rate, inflation rate and money supply)

In this empirical investigation of the role of macroeconomic variables on foreign investments we specify and adopted model in the form of:

$$FI = f(EXR, INTR, INF, MSP) \quad 7$$

Where; EXR - Exchange rate, GDP -Gross domestic product, $INTR$ -Interest rate, INF -Inflation rate, MSP - Money Supply.

For easy estimation, equation 7 is operationalized in the following growth rate equations as:

$$DLNFI_{t+1} = \alpha_0 + \alpha_1 DLNEXR_{t-1} + \alpha_2 DLNINTR_{t-1} + \alpha_3 DLNINF_{t-1} + \alpha_4 DLNMSP_{t-1} + Var(-1) + \varepsilon_t \quad 8$$

The D signifies the growth rate of the variables understudy; the functions are obtained as follows:

$$LNFI_i = \frac{1}{Log\ (FI_i)} \quad and \quad DLNFI_i = \frac{(LNFI_{i+1} - LNFI_i)}{LNFI_i} * 100 \quad 9$$

3.2 Empirical Approach

To estimate the model in equation 9, VAR and ARDL models for multivariate analysis of macroeconomic variables on foreign investments is adopted to determine the long run relationship and also to test the significance effect of macroeconomic instability on foreign investments between the years (1980-2010). To further investigate the effect of macroeconomic variables on foreign investment, co integration tests would be performed. Unit root test procedure was used to find out the order of time series variable stationarity to inform the correct estimation procedures. F-statistics and t-statistics are adopted to accept or reject the above hypotheses to be tested using the decision rule criteria of the probability associated with t-ratio and F-stat. If the t-value is greater than 2.0, we accept H1 that there is significant relationship but if the t-ratio value is less than the 2.0, it is not statistically significant.

3.3 Unit Root Test

The unit root test is evaluated using the Augmented Dickey-Fuller (ADF) test which can be determined as:

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \gamma \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad 10$$

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(1), we test for the possibility of a co-integrating relationship using restricted two stage Auto-Regression Distributed Lags (ARDLs).

3.3.4 ARDLs Model

The study employs the ARDLs because it is an appropriate model in the estimation technique that captures the error correction and determines the equilibrium changes in the endogenous and exogenous variables. The model is expressed as: FI= f (macroeconomic variables)

Hence ARDLs model used in this study is specified as:

$$\Delta LNFI_t = \beta_1 + \beta_2 \sum_{i=1}^{n} \Delta LNEXR_{t-i} + \beta_3 \sum_{i=1}^{n} \Delta LNINTR_{t-1} + \beta_4 \sum_{i=1}^{n} \Delta LNINF_{t-1} + \beta_5 \sum_{i=1}^{n} \Delta LNMSP_{t-1} + \delta_1 VAR(-1) + \varepsilon_t \quad 11$$

where EXTR is External Reserve, is macroeconomic instability and $VAR(-1)$ 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 ARDL 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.

4.0 Result of Empirical Analysis

Unit root test for residuals of the time series properties for detecting stationarity is summarized in the table below:

Table 1: Summary of Result of Augmented Dickey Fuller Test (ADF-Test)

Variables	ADF Test	Critical Value	Decision	Conclusion
DLNFI I(1)	-5.0741	-4.9327*	No Unit Root	It is Stationary
DLNEXR I(1)	-5.8242	-4.9327*	No Unit Root	It is Stationary
DLNINTR I(1)	-5.4389	-4.9327*	No Unit Root	It is Stationary
DLNINF I(1)	7.7184	-4.9327*	No Unit Root	It is Stationary
DLNMSP I(1)	-7.0416	-4.9327*	No Unit Root	It is Stationary
DLNMSP I(1)	-5.7661	-4.9327*	No Unit Root	It is Stationary

95% critical value for the Dickey-Fuller statistic = -4.9327

**significant at 5% level, ADF test > Critical value, then the variable is stationary*

Table 1 shows that there is no unit root among the time series when subjected to ADF-test at various level and order difference in the time series. Foreign Investments growth rates (DLNFI), Exchange growth rate (DLNEXR), interest growth rate (DLNINTR), inflation growth rate (DLNINF) and Money supply growth rates have no unit root at first difference I(1) as the calculated ADF test values are greater than the critical value at 5% irrespective of sign difference. This is evidence that all the time series variables are stationary which informs co integration and possible VAR or ARDLs model application for model estimation and relationship.

Table 2: Cointegration with restricted intercepts and no trends in the VAR

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

****

30 observations from 1981 to 2010. Order of VAR = 1.
List of variables included in the cointegrating vector:
DLNFI DLNEXR DLNINTR DLNINF DLNMSP
Intercept
List of eigenvalues in descending order:
.97957 .89889 .73337 .57934 .11114 0.00

****

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	116.7180	34.4000*	31.7300*
r<= 1	r = 2	68.7468	28.2700*	25.8000*
r<= 2	r = 3	39.6564	22.0400	19.8600
r<= 3	r = 4	25.9776	15.8700	13.8100
r<= 4	r = 5	3.5345	9.1600	7.5300

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

From Table 2 the trace statistic and likelihood function values are greater than critical value at 5%. This reveals that there is co integration at most 1 with an implication of at least 2 co integrating equations among the variables which were rejected in favour of the alternative hypotheses at 5 per cent critical level. This is because their values exceed the critical values at the 0.05 level.

The Johansen co integration shows that there is no presence of full rank given that subtraction of the number of co integrating equations and the variables under study do not equal to zero, therefore implying that the model is good and in functional form for prediction.

Table 3: Error Correction Representation for the Selected ARDL Model

ARDL(0,1,0,0,1) selected based on R-BAR Squared Criterion

****

Dependent variable is dDLNFI

29 observations used for estimation from 1982 to 2010
****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dDLNEXR	.33007	.048279	6.8368[.000]
dDLNINTR	.20217	.032788	6.1662[.000]
dDLNINF	.13156	.047871	2.7482[.011]
dDLNMSP	.17599	.051037	3.4484[.002]
ecm(-1)	-1.0000	0.00	*NONE*

****
List of additional temporary variables created:
dDLNFI = DLNFI-DLNFI(-1)
dDLNEXR = DLNEXR-DLNEXR(-1)
dDLNINTR = DLNINTR-DLNINTR(-1)
dDLNINF = DLNINF-DLNINF(-1)
dDLNMSP = DLNMSP-DLNMSP(-1)
ecm = DLNFI -.030668*DLNEXR -.20217*DLNINTR -.13156*DLNINF + .050431*DL
NMSP
****

R-Squared	.87608	R-Bar-Squared	.84914
S.E. of Regression	7.5231	F-stat. F(4, 24)	40.6508[.000]
Mean of Dependent Variable	-3.4883	S.D. of Dependent Variable	19.3690
Residual Sum of Squares	1301.7	Equation Log-likelihood	-96.3093
Akaike Info. Criterion	-102.3093	Schwarz Bayesian Criterion	-106.4112
DW-statistic	1.9308		

****
R-Squared and R-Bar-Squared measures refer to the dependent variable dDLNFI and in cases where the error correction model is highly restricted, these measures could become negative.

4.3.1 Discussion of ARDLs Result

Econometric result of the model adopted is presented in table 3. The Autoregressive Distributed Lags (ARDLS) model is statistically significant at the current year (-1) and previous year (-2) as the probability of the t-ratios (*none*) is less than the critical value of 5%. Estimate of exchange growth rate is 0.33007. This implies direct relationship between DLNEXR and DLNFI. A relative change in DLNEXR will result in about 33% increase in EXTR. The estimate of interest growth rate is 0.2022. This implies that there is direct relationship between the independent variable, (DLNINTR), and the dependent variable, foreign investments (DLNFI). This means that unit change in (DLNINTR) will bring about 20.2 percent increase in foreign investments (DLNFI).

The estimated value of inflation growth rate is 0.1325. This shows a direct relationship between inflation growth rate (DLNINF) and foreign investments (DLNFI). That is, a relative change in (DLNINF) results in about 13.3% increase in foreign investments (DLNFI). The estimate of money supply growth rate is 0.17599. This implies correspondent relationship between money supply growth rates (DLNMSP) and foreign investments (DLNFI). This further implies that a relative change in money supply growth rates (DLNMSP) will account for 17.6% increase in foreign investments (DLNFI).

Investigating the overall significance of the model, the value of F-statistics is 40.6508 and the probability associated with it is (0.000) which is less than 0.05 at 5% level of significance. This means that there exists statistical significance between foreign investments and Macroeconomic variables. R-square is 0.8761, implying that the coefficient of determination (R^2) is statistically significant at 87.6% which adjudge the model is accurate and highly fitted. The exogenous variables (DLNEXR, DLNINTR, DLNINF, DLNMSP) growth rates can explain variation in the endogenous variable (DLNFI) growth rates by 84.9% while about 25.1% un explained variation in foreign investment growth rate is accounted for by policy or other economic factors. Durbin Watson Statistic (1.93) is approximately 2.0 which imply that there is no presence of first order serial autocorrelation based on the rule of thumb of DW-Hat statistic decision criteria.

To test for the significance of the individual parameter, if the probability value of t-ratio for the coefficient of the regression coefficient is less than the 0.05, we accept H1 and conclude that they are statistically significant to the Endogenous variable (DLNFI) otherwise is not significant. Based on these arguments, DLNEXR, DLNINTR, DLNINF and DLNMSP growth rates are statistically significant to the foreign investments (DLNFI) in the previous and current year since the probability of their t-ratio are all zero and less than 0.05.

5.0 Conclusion

The empirical analysis shows a direct relationship between foreign investment growth rate and some explanatory variables. These variables are exchange, interest, inflation growth rates and money supply growth rate in Nigeria. Macroeconomic variables time series properties were observed to be stationary with the foreign investment. The ARDLs model estimate revealed that there is long run relationship among exchange growth rate, interest growth rate and foreign investment growth within the study period. It also observed that among the macroeconomic variable measure of foreign investment. Exchange rate, interest rate and money supply impacted significantly and have influential effect in determining performance of foreign investment in Nigeria. Empirical findings show that long run relationship between the some identified macroeconomic variable measures and performance of foreign investment as a result of convergence in co integration results. Boosting foreign investment in Nigeria and the current challenges facing the economy indicates that the investment level should be generated among Nigerians to create employment opportunities.

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