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Macroeconomic Effect of Foreign Aid

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Abstract

The study examines the linear and non-linear macroeconomic effect of foreign aid in Nigeria between 1970 and 2017. The macroeconomic variables considered include real GDP per capital growth, investment, real interest rate and consumer price index. It adopts the Linear and Non-Linear ARDL estimation techniques. The linear regression results show foreign aid to have no significant effect on welfare, measured by RGDPPC in the short-run and long-run. On investment however, foreign aid exerts significant positive influence both in the short-run and long-run and the impact of foreign aid on real interest rate and consumer price index is felt more in the long-run, than in the short-run. Looking into the asymmetry relationship, it was found that increase in aid significantly reduces welfare in Nigeria and decrease in aid significantly increases welfare and both positive and negative changes in aid have no significant effect on investment. Real interest rate is unaffected by increase in aid, but significantly affected by decrease in aid. Consumer price index is significantly affected by both positive and negative change in aid in short run and long run.

Keywords: Foreign aids, Macroeconomics, Long-run, Short-run ARDL, NARDL.
JEL Classification: C13, F35, F41, O11.

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Contents

Contribution of this paper to the literature
The study contributes to the existing literature by examining the linear and non-linear macroeconomic effect of foreign aid in Nigeria between 1970 and 2017.

1. Introduction

Foreign aid and intervention is becoming more popular than ever in the wake of the sustainable development goals (SDGs) targeted at 2030, especially to developing countries. Some arguments have been made for foreign aid as indispensable for developing countries, particularly at the early stage of development. Rostow, in his five stages of development theory argues implicitly that poor countries cannot take-off to development without help from advanced countries in the form of aid and assistance. Burnside and Dollar (2000) corroborate this that financial constraint in developing countries may hamper their potential capacity for desired growth, thus, foreign aid and assistance may be away out of the fiscal impasse.

However, in the case of Nigeria, available statistics does not support this claim. Nigeria within 1970 and 1990 had enjoyed official development assistance (ODA) in the range of $10.62 million and $118.88 million. By 2010, Nigeria received a sum in total of $846.04 million, and $1, 742.68 million in 2017 (Organization for Economic Corporation and Development (OECD), 2019). Despite these large sums received in the form of aids and assistance from advanced countries, Nigeria still wallows in poverty and perpetually experiences economic downturn. In 2018, Nigeria records the highest number (about 91.8 million) of extremely poor people in the world, it records negative growth of real GDP per capital for 2015, 2016 and 2017 (WDI, 2018) and unemployment rate stood at 21.3% (NBS, 2018). In a bid to ameliorate the demeaning economic situation, the government of Nigeria has embarked on various journeys to advance countries seeking one form of aid or the other. Report has it that the president of Nigeria, since 2015 has spent 404 days in 33 different countries, across four continents (Punch Newspaper, 2019).

Other than the available statistics indicting foreign aids against development in Nigeria, empirical investigations into this issue have produced a mixed result. While findings from the works of Burnside and Dollar (2000); Chauvet and Ehrhart (2018); Harb and Hall (2018) present that foreign aid positively motivate growth and development, evidences from works of Djankov *et al.* (2008) claim that foreign aid has a negative effect on institution and development in general. In fact, they assert that foreign aid is a bigger curse than oil in developing countries. Sachs and Warner (2001) link foreign aid with natural resources, claiming that they share common characteristics; they can both be appropriated by corrupt politicians without having to resort to less profitable measure like taxation. Feeny and De Silva (2012) explained that macroeconomic impact of official development assistance depends on how these are channeled to the development activities. they pointed out factors like good governance, socio-political condition of the country as germane to the effectiveness of foreign aid on macroeconomic variables.

But beyond these empirical results is an underlying conspiracy theory that aids from advance countries come with ulterior motives. That in most cases, these aids and assistance comes with political conditionality which allows the donor country to profit from their donations to the developing countries. In fact, Perkins (2004) in his confession of an economic hit-man claimed that, those aids are meant to subject the developing countries to the bidding of the donor countries. After all, *he who plays the piper dictates the tune.*

Empirically understanding the macroeconomic impact of foreign aid in Nigeria is very important because this will help the government evaluate their stance on foreign aid. If it is found to have positive impact on macroeconomic variables, the government would encourage foreign aid and seek a better use to it, but if is found deleterious, the government should discourage it no matter how tempting, and look for better ways of achieving macroeconomic objectives. Therefore, this paper seeks to empirically investigate the macroeconomic impact of foreign aid in Nigeria between 1970 and 2017.

This paper is unique because, to the best of knowledge, it is the first paper to looks at the short-run and long-run symmetric and asymmetric impact of foreign aid on macroeconomic variables like real GDP per capita growth, Investment, inflation and interest rate at disaggregate level. Although, scholars like Djankov *et al.* (2008) (on 108 countries) and Harb and Hall (2018) (0n 25 developing countries) examined the asymmetry effect of aids, their studies focus on aids at panel level, making it difficult to assess the individual effect of aid on the countries assessed.

2. Literature Review

Theoretical trajectories have tried to explain the linkage between foreign aid and macroeconomic performance, but this study focuses on the dual-gap theory. Though the gap theory is old and unpopular in academic literature, it is still relevant and widely used by policymakers today (Elphas, 2009; Philip, 2012). The dual-gap model was developed by Chenery and Strout (1966) based on the Harrod–Domar growth model. The model identified two gaps that are peculiar to developing countries which support official development assistance (ODA) as the necessary option. Poor countries are always faced with low savings and foreign exchange constraints which create a gap that is filled with foreign aid (Philip, 2012). A savings gap arises when the domestic savings is less than what is required for investment to achieve the targeted growth rate. Similarly, a foreign exchange gap occurs when the net receipts of exports of a country falls short of the foreign exchange requirements (Jhingan, 2004). The model assumed that growth was constrained by the insufficiency of capital despite the excess labor supply. Capital availability depends on the level of savings which could be supplemented through foreign aid, thus increasing investment and leading to growth. Also, growth is constrained by the shortfall of capital goods for investment in developing countries. Insufficient export earnings necessary for the importation of capital goods create a foreign exchange gap which can be filled with foreign aid[1]. The empirical findings on this issue show that the macroeconomic effective of foreign aid remains a controversial issue in macroeconomics debate.

Studies by Hansen and Tarp (2000); Hermes and Lensink (2001); Morrissey (2001); McGillivray (2003) and McGillivray *et al.* (2005) have tried to investigate the progress made in the literature on the macroeconomic effect

[1] See Chenery and Strout (1966); McKinnon (1964) and Chenery and Bruno (1962) for the full structure of the model.

of foreign aid over time. McGillivray *et al.* (2005) examined the foreign aid-growth controversy for the past 50 years. Guillaumont and Wagner (2014) and Quibria (2014) had more comprehensive recent reviews on the macroeconomic effectiveness of foreign aid on poor countries with high recipient of foreign aid.

Two opposing groups have emerged in the debate concerning the effectiveness of foreign aid on macroeconomic variables. On the one hand, some scholars have argued that foreign aid has no positive macroeconomic effect on the economy; hence has caused more harm to poor countries over time (Burnside and Dollar, 2000; Moyo, 2010; Easterly, 2014). According to this view, official aid promotes dependency, creates room for corruption, and encourages currency overvaluation, among recipient countries (Sebastian, 2014). On the other hand, scholars like Sachs (2005;2009) and Stiglitz (2002); Doucouliagos and Paldam (2008) argued that foreign aid can help boost macroeconomic performance of poor countries. According to these scholars, increase in foreign aid, especially special interventions, could be effective in reducing poverty and improving living standard.

Albiman (2016) investigated the impact of foreign aid on economic growth in Tanzania, using Dynamic Ordinary Least Square (DOLS) with data from 1976 to 2014. He found that foreign aid has negative impact on economic growth. Also, the further revealed that there is no causal relationship between foreign aid and economic growth in short run. Similar study was conducted by Philip (2012) in Sierra Leone, adopting ARDL model and Johansen maximum likelihood. The study revealed that foreign aid has a significant impact on economic growth in the country. The study further showed that aid is more effective during the post-war period than the pre-war period. Hence, the impact of aid on the economy may change with time. Another study by Girijasankar (2008) examined the effectiveness of foreign aid on macroeconomic performance in the six poorest and highly aid dependent African countries (Central African Republic, Malawi, Mali, Niger, Sierra Leone and Togo). The study used cointegration analysis and the found that a long run relationship exists between per-capita real GDP, aid as a percentage of GDP, investment as a percentage of GDP and openness. However, the long run effect of foreign aid on growth was found to be negative for most of these countries (Girijasankar, 2008).

Elphas (2009) examined the effects of foreign aid on investment, macroeconomic policy environment and economic growth in Kenya from 1966 to 2010. It employed the ARDL estimation technique and found that foreign aid had a positive effect on public investment and economic growth. In addition, the lagged effects of foreign aid are positively related with public investment and economic growth after one year and negatively thereafter (Elphas, 2009). Herzer and Morrissey (2011) investigated the long-run aid effectiveness on macroeconomic variables using data from 59 developing countries over the period 1971 to 2003. Their study argued that the effect of aid on economic growth depends on the trade-off a country chooses to make. Furthermore, they found that aid has a direct positive effect on the economy through financing investment, but could have an indirect negative effect on aggregate productivity (Herzer and Morrissey, 2011). A panel study on 20 Sub-Saharan African countries by Salisu and Ogwumike (2010) using OLS and TSLS, concluded that foreign aid is effective in countries with sound macroeconomic policy environment. However, Quibria (2014) and Rajan and Subramanian (2011) argued contrarily that there is no clear relation between more aid and faster growth, irrespective of better macroeconomic policy environment and stronger institutions.

3. Methodology

The study adopts the Auto-regressive Distributive lag (ARDL) model and the Non-Linear Auto-regressive Distributive lag (NARDL) to investigate the linear and non-linear relationship between the various series of interest. The ARDL method was developed by Pesaran *et al.* (2001) and suggests it can estimate both short run and long run relationships among the series in a model in one step simultaneously. It is adjudged efficient in establishing linear relationships between variables of mixed order of stationarity, usually, I(0) and I(1) series, but cannot accommodate I(2) variables. In other to confirm the existence of a long run relationship, Pesaran *et al.* (2001) presented a bound test approach to testing for cointegration in the model. The model is said to be cointegrated when the F-statistics from the bound test exceeds the upper bound limit of the test. Also, the error correction mechanism component of the model which shows the speed of adjustment of any disequilibrium in the model is expected to be negative, less than one and statistically significant. The linear ARDL model, given variable X and Y is given bellow:

$$y_t = \sum_{k=1}^{p} \propto_k y_{t-1} + \sum_{j=0}^{q} \beta_j x_{t-j} + \mathcal{E}_t \quad (1)$$

Re-specifying the model, we have:

$$\Delta y_t = \propto_1 y_{t-1} + \propto_2 x_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta y_{t-k} + \sum_{j=0}^{q-1} \varphi_j \Delta x_{t-j} + \varepsilon_t \quad (2)$$

$$\Delta y_t = \propto_1 v_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta y_{t-k} + \sum_{j=0}^{q-1} \varphi_j \Delta x_{t-j} + \varepsilon_t \quad (3)$$

Equation 1 expresses the relationship between X and Y in ARDL form. ARDL expresses dependent variable (Y) as a function of its lag and lags of other independent variables (X). Equation 2 extends Equation 1 to capture the short-run and long-run relationships between the variables. $\propto_1$ *and* $\propto_2$ represent the long-run parameters, while γ_k, φ_j measure the short run relationship in the model. Equation 3 simplifies Equation 2 such that $v_{t-1} = y_{t-1} + \left(\frac{\propto_2}{\propto_1}\right) x_{t-1}$, based on the assumption that in the long-run, $y_t = y_{t-1}$ and $x_t = x_{t-1}$. $\varepsilon_t$captures the error term in the model.

While Pesaran *et al.* (2001) developed ARDL to capture short-run and long-run linear relationships among series, Shin *et al.* (2014) modified the model to reflect non-linearity in relationship among variables, siting that, often time, relationship among variables are not linear. Thus, Non-linear ARDL was introduced to capture both short run and long run asymmetries, without compromising the merit of standard ARDL model. The model measures both the positive and negative relationship in a model, by identifying the positive and negative effect. Given variable x, it can be decomposed into positive and negative as follow:

$$positive\ X_t = \sum_{j=1}^{t} \Delta X_j^{+} = \sum_{j=1}^{t} max(\Delta X_j, 0) \quad (4)$$

$$Negative\ X_t = \sum_{j=1}^{t} \Delta X_j^{-} = \sum_{j=1}^{t} max(\Delta X_j, 0) \quad (5)$$

Equation 4 and 5 shows the decomposition of variable X into negative changes and positive changes. $\Delta X_j{}^+$ represents positive changes in X and $\Delta X_j{}^-$ denotes negative changes in X. From Equation 4 the maximum value between $\Delta X_j \; and \; 0$ is considered as positive changes in X and in Equation 5, the minimum value between $\Delta X_j \; and \; 0$ is taken to be negative changes in X. $Positive\; X_t$ is the partial sum of positive changes in X and $Negative\; X_t$ is the partial sum of negative changes in X. Hence, a Non – linear ARDL model is specified as follow, given variable X and Y:

$$\Delta Y_t = \propto_0 + \sum_{i=1}^{n} \propto_{1i} \Delta Y_{t-1} + \sum_{i=0}^{m} \propto_{2i} \Delta X^-{}_{t-1} + \sum_{i=0}^{p} \propto_{3i} \Delta X^+{}_{t-1} + \propto_{4i} X_{t-1}{}^- + \propto_{5i} X^+{}_{t-1} + \mu_t \quad (6)$$

Equation 6 shows the specification of the ARDL model in non-linear form to accommodate the effect positive and negative changes of X on Y. $\Delta X_j{}^+$ and $\Delta X_j{}^-$ symbolize the positive and negative changes of X in the model.

3.1. Model Specification

In other to achieve the objectives of this paper, we specify four models to capture the asymmetry and non-asymmetry effect of foreign aid on selected macroeconomic variables. The models are specified as follow:

Rgdp = f (foreign aid, external debt, real interest rate, exchange rate) (7)

Investment = f (foreign aid, real interest rate, exchange rate) (8)

Real interest rate = f(foreign aid, money supply, exchange rate) (9)

Consumer Price Index = f(foreign aid, external debt, RGDP per capital, Money Supply) (10)

Equation 7, 8, 9 and 10 is specified to capture the effect of foreign aid on selected macroeconomic variables. Equation 7 expresses national output (Rgdp) as a function of external debt, real interest rate and exchange rate, Equation 8 functioned Investment as a function of foreign aid, real interest rate and exchange rate, 9 specifies Real interest rate as a function of foreign aid, money supply and exchange rate, while 10 shows consumer price index to be a function of foreign aid, external debt, RGDP per capita and money supply.

Re-paramatizing the model for linear ARDL;

$$\Delta RGDPPC_t = \propto_1 RGDPPC_{t-1} + \propto_2 foreignaid_{t-1} + \propto_3 extd_{t-1} + \propto_4 realint_{t-1} + \propto_5 exchr_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta rgdppc_{t-k} + \sum_{j=0}^{q-1} \lambda_j \Delta foreignaid_{t-j} + \sum_{j=0}^{r-1} \delta_j \Delta extd_{t-j} + \sum_{j=0}^{s-1} \sigma_j \Delta realint_{t-j} + \sum_{j=0}^{t-1} \varphi_j \Delta exchr_{t-j} \; \varepsilon_t \quad (11)$$

$$\Delta inv_t = \propto_1 inv_{t-1} + \propto_2 foreignaid_{t-1} + \propto_3 realint_{t-1} + \propto_4 exchr_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta inv_{t-k} + \sum_{j=0}^{q-1} \lambda_j \Delta foreignaid_{t-j} + \sum_{j=0}^{s-1} \sigma_j \Delta realint_{t-j} + \sum_{j=0}^{t-1} \varphi_j \Delta exchr_{t-j} \; \varepsilon_t \quad (12)$$

$$\Delta cpi_t = \propto_1 cpi_{t-1} + \propto_2 foreignaid_{t-1} + \propto_3 ms_{t-1} + \propto_4 exchr_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta cpi_{t-k} + \sum_{j=0}^{q-1} \lambda_j \Delta foreignaid_{t-j} + \sum_{j=0}^{r-1} \delta_j \Delta ms_{t-j} + \sum_{j=0}^{s-1} \sigma_j \Delta exchr_{t-j} + \varepsilon_t \quad (13)$$

$$\Delta realint_t = \propto_1 realint_{t-1} + \propto_2 foreignaid_{t-1} + \propto_3 extd_{t-1} + \propto_4 ms_{t-1} + \propto_5 rgdppc_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta realint_{t-k} + \sum_{j=0}^{q-1} \lambda_j \Delta foreignaid_{t-j} + \sum_{j=0}^{r-1} \delta_j \Delta extd_{t-j} + \sum_{j=0}^{s-1} \sigma_j \Delta ms_{t-j} + \sum_{j=0}^{t-1} \varphi_j \Delta rgdppc_{t-j} \; \varepsilon_t \quad (14)$$

Equation 10 to 14 represent the re-parametized form of model 7 to 10 in linear ARDL form, expressing the dependent variables (Rgdp, Investment, Real interest rate and Consumer price index) as a function of their lag values (dependent variables) and the lag values of the independent variables. Parameters $\propto_1, \propto_2, \propto_3, \propto_4 \; and \; \propto_5$ capture the short-run linear relationships, while parameters γ_k, λ_j, δ_j, σ_j and φ_j are long-run linear parameters.

Re-paramatizing the model for Non-linear ARDL;

$$\Delta RGDP_t = \propto_1 RGDP_{t-1} + \propto_2 foreignaid^+{}_{t-1} + \propto_3 foreignaid^-{}_{t-1} + \propto_3 extd_{t-1} + \propto_4 realint_{t-1} + \propto_5 exchr_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta rgdp_{t-k} + \sum_{j=0}^{q-1} \varphi_j \Delta foreignaid^+{}_{t-j} + \sum_{j=0}^{q-1} \beta_j \Delta foreignaid^-{}_{t-j} + \sum_{j=0}^{r-1} \lambda_j \Delta extd_{t-j} + \sum_{j=0}^{s-1} \delta_j \Delta realint_{t-j} + \sum_{j=0}^{t-1} \sigma_j \Delta exchr_{t-j} \; \varepsilon_t \quad (15)$$

$$\Delta inv_t = \propto_1 inv_{t-1} + \propto_2 foreignaid^+{}_{t-1} + \propto_3 foreignaid^-{}_{t-1} + \propto_4 realint_{t-1} + \propto_5 exchr_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta inv_{t-k} + \sum_{j=0}^{q-1} \varphi_j \Delta foreignaid^+{}_{t-j} + \sum_{j=0}^{q-1} \beta_j \Delta foreignaid^-{}_{t-j} + \sum_{j=0}^{s-1} \delta_j \Delta realint_{t-j} + \sum_{j=0}^{t-1} \sigma_j \Delta exchr_{t-j} \; \varepsilon_t \quad (16)$$

$$\Delta realint_t = \propto_1 realint_{t-1} + \propto_2 foreignaid^+{}_{t-1} + \propto_3 foreignaid^-{}_{t-1} + \propto_4 extd_{t-1} + \propto_5 rgdppc_{t-1} + \propto_6 ms_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta realint_{t-k} + \sum_{j=0}^{q-1} \varphi_j \Delta foreignaid^+{}_{t-j} + \sum_{j=0}^{q-1} \beta_j \Delta foreignaid^-{}_{t-j} + \sum_{j=0}^{r-1} \lambda_j \Delta extd_{t-j} + \sum_{j=0}^{s-1} \delta_j \Delta rgdppc_{t-j} + \sum_{j=0}^{t-1} \sigma_j \Delta ms_{t-j} \; \varepsilon_t \quad (17)$$

$$\Delta cpi_t = \propto_1 cpi_{t-1} + \propto_2 foreignaid^+{}_{t-1} + \propto_3 foreignaid^-{}_{t-1} + \propto_4 ms_{t-1} + \propto_5 exchr_{t-1} + \sum_{k=1}^{p-1} \gamma_k \Delta cpi_{t-k} + \sum_{j=0}^{q-1} \varphi_j \Delta foreignaid^+{}_{t-j} + \sum_{j=0}^{q-1} \beta_j \Delta foreignaid^-{}_{t-j} + \sum_{j=0}^{s-1} \delta_j \Delta ms_{t-j} + \sum_{j=0}^{t-1} \sigma_j \Delta exchr_{t-j} \; \varepsilon_t \quad (18)$$

Equation 15 to 18 represent the re-specification of model 7 to 10 in a non-linear ARDL form to capture the non-linear relationships in the model. The variable with $^+$ and $^-$ capture the effect of positive and negative changes in foreign aid on each of the dependent variable. Parameters $\propto_2 \; and \; \propto_3$, capture the short-run non-linear relationships, while parameters $\varphi_j \; and \; \beta_j$ are long-run non-linear parameters.

3.2. Data

The data for the study were sourced from OECD (2019) and WDI (2018). The variables include;

Foreign aid: this is measured by the sum of the Official Development Assistance (ODA) received in Nigeria. The ODA is the total aid flow that is accrued to a country in a given year. This data was sourced from the OECD (2019).

Investment: this is measured by Gross Fixed Capital Formation (GFCF). GFCF measures the net increase in tangible asset within a given period. The net increase in tangible asset interprets investment less disposal and does not include capital consumption or land purchased. The data was sourced from WDI (2018).

Real GDP: this is measured by the total value of all goods produced and services rendered at a constant price within Nigeria over a given period, usually a year. The data was sourced from WDI (2018).

Real interest rate: This measure the real cost of capital. It is the cost of borrowing after adjusting for inflationary effect. The data was sourced from WDI (2018).

Exchange rate: This measure the average rate at which naira exchanges for dollar in a year. The data was sourced from WDI (2018).

External debt: this measures the total borrowings of the government in dollars within a given period, usually a year. The data was sourced from WDI (2018).

Consumer Price Index (CPI): this measures the average changes overtime in consumer baskets of goods and services. The data was sourced from WDI (2018).

Money supply (MS): this measures the total volume of money in circulation in local currency. This is defined in terms of broad money. That is, local money in circulation plus demand deposit, savings and fixed deposit.

4. Empirical Findings

Table-1. Summary of unit root test result.

Augmented Dicky-Fuller (ADF)			Phillips-Perron (PP)		
Variables	**Level**	**First difference**	**Level**	**First difference**	**I(d)**
EXCHR	-0.2603	-4.3106***	0.1646	-4.3044***	I(1)
EXTDEBT	-1.998	-4.4840***	-1.7153	-4.3695***	I(1)
GDPG	-5.5724***	-	-5.5745***	-	I(0)
GRANT	-4.7357***	-	-3.9300**	-	I(0)
RGDPPC	-5.5676***	-	-5.5714***	-	I(0)
RINTR	-6.2604***	-	-6.2155***	-	I(0)
MS	-3.6804**	-	-2.0668	-3.5988**	I(0)/I(1)

Note: NB: ***, **, and *, represent significance levels at 1%, 5% and 10%, respectively.

Table 1, shows that the variables are stationary in mixed order of I(0) and I(1). This informs us of the nature and degree of predictability of the variables in the model. This informs the conduct of bound test as prescribed by Pesaran *et al.* (2001) to check for the existence of long run relationship between the variables. This is presented in Table 2.

Table-2. Bound test.

Bound test	Test statistic	Value	K
Model 1	F-Statistic	6.015389	4
Model 2	F-Statistic	11.08556	4
Model 3	F-Statistic	12.34779	4
Model 4	F-Statistic	32.47732	4
Critical value bounds			
Significance	**I0 bound**	**I1 bound**	
10%	2.45	3.52	
5%	2.86	4.01	
2.50%	3.25	4.49	
1%	3.74	5.06	

From Table 2, the bound test confirms the existence of long run relationship between in the models. I0 represent the lower bound and I1, the upper bound. As explained by Pesaran *et al.* (2001) long run relationships exist in a model if the F-statistic exceeds the upper bound of the bound test result. The models are bounded and exhibit long run relationships.

From the result obtained in Table 3, the effect of grant on RGDPPC is insignificant in both short run and long run. It shows an estimated negative coefficient of -0.0005 and -0.0007 in the short run and long run respectively, but these coefficients are insignificant. Real interest rate is shown to have significant positive impact on RGDPPC in the short and long run, while exchange rate has a significant negative effect on RGDPPC in the short run and no significant effect in the long run.

On investment, grant is shown to have a significant and positive impact in the short and long run. It shows that for every 1$ grant, it leads to approximately 0.0008 NGN and 0.0016 NGN increase in investment in Nigeria in the short run and long run respectively. Also, real interest rate exerts a positive and significant effect on investment in both short and long run. Exchange rate have only negative and significant effect in the long run, in the short run, the effect is insignificant.

On consumer price index, grant has no significant effect in the short run, but exerts a significant and positive effect in the long run. The result shows that a 1$ increase in grant leads to approximately 0.0088 NGN increase in consumer basket of commodity in the long run in Nigeria. Other significant variables influencing CPI in the model include money supply and exchange rate.

Table-3. Symmetry results.

Variables	Model 1 RGDPPC	Model 2 investment	Model 3 CPI	Model 4 RINTR
D(Foreign aid)	-0.0005	0.0008**	0.0002	0.0005
	(0.4033)	(0.013)	(0.5227)	(0.5529)
D(Extdebt)	0.0000	-	-	0.0000***
	(0.2253)			(0.0075)
D(Rintr)	0.1954***	0.1032*	-	-
	(0.0006)	(0.1084)		
D(Exchr)	-0.1341***	0.05093	0.0450	-
	(0.0066)	(0.1533)	(0.2019)	
D(Ms)	-	-	0.0000*	3.5045***
			(0.0921)	(0.0000)
D(Rgdppc)	-	-	-	0.428276
				(0.1442)
Foreign aid	-0.0007	0.0016**	0.0088**	0.0027**
	(0.4071)	(0.0219)	(0.0214)	(0.0306)
Extdebt	0.0000		-	0.0000
	(0.9143)			(0.0024)
Rintr	0.6223***	0.6132**	-	
	(0.0016)	(0.0314)		
Ms	-	-	0.0000***	1.2454***
			(0.0001)	(0.0007)
Rgdppc	-	-	-	0.133452
				(0.7520)
Exchr	-0.02143	-0.2491***	0.2531***	-
	(0.3918)	(0.0000)	(0.0000)	
C	3.9037	45.2202***	-0.2454	-30.1712***
	(0.1119)	(0.0000)	(0.7182)	(0.0000)
R-squared	0.65	0.97	0.99	0.86
Cointeq(-1)	-0.7667	-0.4911	-0.362	-1.0347
Normality test	(0.81)	(0.01)	(0.31)	(0.01)
Serial correlation test	(0.44)	(0.43)	(0.65)	0.06
Heteroscedasticity test	(0.34)	(0.58)	(0.65)	(0.84)
Ramsey test	0.19	0.49	0.49	(0.36)

Note: NB: ***, **, and *, represent significance levels at 1%, 5% and 10%, respectively. The figures in parenthesis are p-value.

Table-4. Asymmetry results.

Variables	RGDPPC model 5	Investment model 6	RINTR model 7	CPI model 8
D(Foreign Aid-positive)	-0.0028**	0.0009	0.0013	0.0016***
	(0.0229)	(0.6054)	(0.3721)	(0.0002)
D(Foreign Aid- negative)	-0.0269**	-0.0098	-0.0090**	-0.0126***
	(0.0325)	(0.3618)	(0.0163)	(0.0028)
D(Extdebt)	0.0000**	-	0.0000	-
	(0.0209)		(0.2684)	
D(Rintr)	0.2046***	0.1149	-	-
	(0.0015)	(0.7511)		
D(Exchr)	-0.1421**	0.0847	-	0.1585***
	(0.0186)	(0.1886)		(0.0024)
D(Ms)	-	0.2887	2.8845***	0.0000
		(0.8370)	(0.0000)	(0.3960)
D(Rgdppc)	-	-	0.4836*	-
			(0.077)	
Foreign Aid _POS	-0.0097	0.0019	-0.0076**	-0.0140***
	(0.5939)	(0.6212)	(0.0599)	(0.0001)
Foreign Aid _NEG	-0.0098	0.0025	-0.0095**	-0.0156***
	(0.6156)	(0.5698)	(0.0295)	(0.0001)
Extdebt	0.0000	-	0.0000	-
	(0.5817)		(0.2252)	
Rintr	0.5774**	0.2084**	-	-
	(0.0131)	(0.0478)		
Ms	-	0.7119	-0.0259	0.0000***
		(0.3690)	(0.9634)	(0.0000)
Rgdppc	-	-	0.3515	-
			(0.4437)	
Exchr	0.08348*	-0.0415	-	0.2155***
	(0.0627)	(0.1912)		(0.0000)
C	5.05315	-4.54594	-8.6560	-1.0744***
	(0.1173)	(0.5892)	(0.4283)	(0.0001)
R-Squared	0.81	0.99	0.97	0.99

Note: NB: ***, **, and *, represent significance levels at 1%, 5% and 10%, respectively. The figures in parenthesis are p-value.

Results grant has no significant effect on real interest rate in the short run, but in the long run, it has a significant positive impact on real interest rate. This might not be unconnected with the positive effect of grant on CPI. Increase in CPI increases inflation rate, and increase in inflation with a given nominal interest rate reduces

real interest rate. Other factors that significantly influence real interest rate in the model include external debt, exchange rate and money supply.

From Table 4, in the short-run, the non-linear model reveals a significant and indirect relationship between an increase in grant and RGDPPC in Nigeria. It shows that a $1 increase in grant reduces RGDPPC by 0.0028NGN. Conversely, a $1 decrease in grant increases significantly RGDPPC by 0.0269. The negative sign with the coefficient (i.e. -0.0229) indicates a negative relationship between a unit decrease in grant and RGDPPC. In the long-run however, both positive and negative changes in grant have no significant effect on RGDPPC.

On investment, for short-run, the result shows that both positive and negative changes in grant exert positive but insignificant effect on investment, however, the magnitude of the effect of negative change in grant (0.0098) exceeds that of positive change (0.0009). The long-run non-linear estimates provide similar result.

The real interest rate model shows in the short-run a positive change in grant has no significant effect on real interest rate; however, a negative change in grant significantly increases real interest rate by 0.009%. In the long run however, a positive change in grant significantly reduces real interest rate by 0.0076%, while a negative change in grant significantly increases real interest rate by 0.0095%.

Model 8 presents both positive and negative changes in grant significantly positively affect CPI in the short run. In the long run however, a positive change in grant significantly reduces CPI by 0.0140 units and a negative change in grant increases CPI by 0.0156 units.

5. Conclusion

The study examines short-run and long-run linear and non-linear effect of foreign aid on Gross Domestic Product per capita, investment, real interest rate and consumer price index. The linear regression results show foreign aid to have no significant effect on welfare, measured by RGDPPC in the short-run and long-run. On investment however, foreign aid exerts significant positive influence both in the short-run and long-run and the impact of foreign aid on real interest rate and consumer price index is felt more in the long-run, than in the short-run. The non-linear result on the other hand presents an interest result. Increase in aid significantly reduces welfare in Nigeria and decrease in aid significantly increases welfare and both positive and negative changes in aid have no significant effect on investment. Real interest rate is unaffected by increase in aid, but significantly affected by decrease in aid. Consumer price index is significantly affected by both positive and negative change in aid in short run and long run. From these findings, it is clear that foreign aids do more harm than good to Nigerian economy. These findings are in consonant with the findings of Sachs and Warner (2001) and Djankov *et al.* (2008). It is therefore recommended that instead in seeking for foreign assistance for growth, Nigerian government should look inward to raise revenue needed for developmental projects. The government could implement an effective and efficient tax system to raise more revenue, cut down unnecessary recurrent government expenditure by closing down redundant ministry and parastatals and privatizing inefficient government establishment and even pursue the economic diversification. If foreign aid is however inevitable, then such fund should be properly managed by establishing strong institutions to administer the aids and the conditions to such aids should be critically examined.

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