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## **The Effect of Foreign Aid on Economic Growth in Ghana**

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### **Abstract**

This paper uses time series data from 1972 to 2012 on Ghana to test the hypothesis that foreign aid can promote growth in developing countries. The ARDL approach to cointegration (bounds test) was employed to examine both the long run and short run relationships between aid and economic growth. The results of the bounds test showed that there is cointegration between foreign aid and economic growth in Ghana. This was further confirmed by the error correction term which was very significant and correctly signed. The error correction term showed that the speed of convergence to long run equilibrium is moderate. From the results, labour, capital and government expenditure have positive impact on economic growth in Ghana in both the long run and the short run whereas foreign aid and interest payment on external debt have negative impact on growth. In order to derive a positive benefit of foreign aid, we recommend the provision of economic aid which is geared towards capital formation and skills development of labour through education and training rather than political aid since the results show that capital and labour have positive impact on economic growth. We also recommend the provision of more grants and less loans as aid to Ghana because interest payment on external debt has been found in the study to have negative effect on economic growth because most foreign aid are not invested in projects with direct future cash flows.

**Keywords:** Cointegration, Economic Growth, Foreign Aid, Ghana

JEL Code: O47

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## **1 Introduction**

Official development assistance (ODA), usually referred to as foreign aid, entails resource transfers from development partners in the form of grants and loans to developing countries (WDI, 2015). The primary objective of much of the aid inflows to developing countries such as Ghana is the promotion of economic development and welfare, usually measured by its impact on economic growth and poverty reduction. Aryeetey and Tarp (2000) have argued that the sustained economic growth of the 1980s in Ghana came about as a result of the expansion of capital application, largely as a consequence of increased aid inflows, which was similar to the expansion that occurred in the 1960s financed largely through accumulated reserves from the 1950s. In the late 1990s, the pursuit of democratic governance also endeared Ghana to the aid community. In the late 1980s and early 1990s, Ghana benefited from a significant amount of aid inflows largely as a consequence of the pursuance of reforms and structural adjustments during the Economic Recovery Program (ERP) of 1983 and the Structural Adjustment Program (SAP) of 1986. Between 1985 and 1996, total aid flows to Ghana increased threefold from US\$150.7 million to US\$450.8 million in 1995 (Boakye, 2008).

Traditionally, both multilateral and bilateral agencies have supported Ghana's development efforts through aid pledges. Pledges and disbursements were volatile throughout the 1990s. Disbursements as percentage of total pledges ranged between 29% and 81% and averaged about 64% during the decade of 1989/1999. The high variations in aid commitments and disbursement makes dependence on development aid more and more precarious for a developing country like Ghana. The impact of the inconsistencies in aid inflows usually result in high domestic borrowing, balance of payment deficits and declines in foreign reserves. Despite the significant aid inflows into Ghana under the Economic Recovery Program of 1983 and, throughout the early 1990s, a string of budget deficits, rising debt and high debt service burden, rapid growth in the money supply, high and volatile inflation, unstable exchange rate, unfavorable terms of trade and the high variations in aid commitments and disbursements all combined to plunge the country into serious economic crisis by the end of the 1990's (Tsikata, 1999). By its own historical standards, the economy regained some growth impetus beginning in 2001. This was largely on account of relief of the external debt burden through the HIPC initiative, improved export earnings, a focused attention on growth and poverty alleviation, a noticeably improved fiscal and monetary management, and the availability of development assistance (CEPA, 2005). In 2009, Ghana again resorted to an IMF bailout to address its economic woes after the huge debt relief granted by its development partners between 2002 and 2008 under the HIPC initiative

A significant number of empirical studies on the aid-economic growth nexus such as Roodman (2004), Dalgaard et al. (2004) and Berthelmy (2006) have sought to find out whether aid inflows in developing countries achieve the core objective of promoting economic development and welfare of the people in these countries. However, results obtained from these studies differ significantly (Moreira, 2005). Studies at the micro-level, mainly using cost-benefit analyses, report that foreign aid is growth-enhancing. In contrast, the results presented in studies at the macro-level, using cross-country regressions are generally ambiguous. This contradiction in the aid-economic growth relationship has been termed by Mosley (1986) as the "micro-macro paradox". The contradiction in the aid-growth relationship has been attributed to several factors

including poor data quality, econometric technique, model specification and more importantly relatively short data periods which adversely affects the reliability of the results (Boakye, 2008). To this end, the present study uses a relatively long data period spanning 40years (1972-2012) obtained from the WDI database and the Aggregate Production Function (APF) as the underlying model to estimate the aid-growth relationship in Ghana to provide fresh evidence on the aid-growth debate.

## **2 Literature Review**

The Harrod-Domar model, asserts that output is a function of investment rate and the productivity of investment. In an open economy like Ghana, investment is financed by savings which comprises of domestic and foreign savings. Foreign aid inflows therefore complement domestic savings to increase investment which increase steady state capital and promote economic growth (Easterly, 2003; p.31). Chenery and Strout (1966) developed the 'two gap model to explain the aid-growth nexus. The first gap which they termed 'the savings gap' is the difference between the amount of investment required to achieve a predetermined rate of growth and the available domestic savings. The second gap is the trade gap (foreign exchange gap). This gap comes about when there is a distance between import requirements for a given level of production and foreign exchange inflows. In this model, the occurrence of savings gap or trade gap in a developing country leads to a shortfall in productive investment needed to achieve a given level of output and thus foreign aid would be required to fill that gap. The 'two gap model' therefore supports the idea of investment-limited growth based on the Harrod- Domar model which assumes a specific amount of investment to increase growth.

The 'three gap model' identifies the fiscal gap in addition to the the saving- investment gap, and the trade gap. The fiscal gap is defined as the difference between government revenues and budgeted expenditures. In this model, the existence of a fiscal gap limits government efforts to stimulate private investment as a result of debt service and excessive domestic borrowing which crowds out private sector investment. In Ghana where the public debt to GDP ratio is over 70% (Bank of Ghana, 2016), the narrowing of the fiscal gap may result from foreign inflows in the form of budget support. In contrast, if a greater percentage of foreign aid is in the form of loans and not grants, it may have adverse effects for domestic savings, foreign exchange and fiscal gaps in the long-run and for the macroeconomic performance in general. Thus high debt service payments create excessive pressure on foreign currency and government revenue in general. Peter Hjertholm asserts that "... a loan aid inflow may fill the trade gap today, but necessitates a faster rate of export growth in the future for the country to become independent of foreign inflows' (cited in Kabete, 2008; p.21). More so, high debt service payments have adverse implications on the import capacity of the government and leads to declining government investment, especially in the areas of infrastructure, education and health facilities. Limited public investments in infrastructure and social services reduce the capacity of the economy to produce and thereby lowers economic growth in the long run.

Empirical studies on aid-growth relationship has not been able to provide conclusive results. Whiles some studies reported a positive significant effect, others reported no significant effect, and a few others reported adverse significant effect of foreign aid on economic growth in developing countries. Employing data on a sample of 34 Less Developed Countries (LDCs) for

the period 1955/1965, Papanek (1973) obtained a significantly positive effect of aid on growth. Stoneman (1975) and Gupta (1975) found similar result for a wider data and sample of LDCs. Hadjimichael et al. (1995) found the positive aid-growth nexus to be conditioned upon the estimation technique employed. Lloyd et al. (2001) found aid to impact on long term private consumption but its marginal impact was not as much as that on exports. Dalgaard, Hansen, and Tarp (2004) have shown that aid advances improve steady state productivity in the receiving country via increased capital stock per head. Roodman (2004) also finds the determinants of aid-growth nexus to include governance, domestic policies, historical circumstances and external condition tied to the transfer. An interesting third generation study is that of Burnside and Dollar (2000) who find the effectiveness of aid flows in strengthening economic growth in the developing countries to be conditioned on the conduciveness of the policy environment. The significance of the policy environment in enhancing a positive aid-growth connection is validated by Collier and Dollar (2002) by employing a different data set and model specification. Collier and Hoeffler (2004) also empirically confirmed the effectiveness of aid in a good policy environment.

However, some scholars and researchers have criticized the importance of foreign aid in development by using variety of political, economic and strategic rationales in making their case. Boone (1996) referred to aid and its importance to development as 'down the rat hole'. Aid becomes waste when given to countries that do not have the requisite or appropriate technical or administrative ability to absorb and use it appropriately. Aid to most developing countries are usually not used for the intended purposes for which it was advanced. Aid has been argued in several literatures not to contribute to economic progress in developing countries. According to Bauer (1991), aid tend to increase the government's political power, resources, and patronage relative to the deprived society as they are generally transferred to governments of those countries. This consequently results in political unrest as much more energy, attention, and resources are drawn into unproductive and non-economic activities. This claim is confirmed by the studies by Dollar and Easterly (1999) who found aid to be ineffective in increasing investments in Africa. Other studies like Burnside and Dollar (1997, 2000); Alesina and Dollar (2000) found aid to be ineffective in promoting growth in the receiving countries, especially in Africa. Similar study by Griffin and Enos (1970) for a sample of 32 Latin American Countries spanning the periods 1957-64 report a growth reducing effect of aid. Using data on 22 LDCs covering the periods 1956 to 1968, Voivodas (1973) also found that aid has a negative impact on growth, albeit insignificant.

Growth and poverty reduction have not always been the main motives for providing aid. Berthélemy (2006) shows that strategic motives and self-interest of donors to a large extent explain aid allocation. Clemens, Radelet and Bhavnani (2004) divide aid into three categories to discover that the effects on growth differ considerably. Emergency and humanitarian aid has no effect on growth. The same is true for aid aiming at a long term growth effect, such as aid in support of democracy, the environment, education and health. Aid with possible short term growth effects, such as budget support aid and support to productive sectors, are found to have a strong effect on growth. Rajan and Subramanian (2005) argue that aid flows reduce partner country competitiveness through exchange rate appreciations.

### 3 Methodology

#### A. Aid-growth equation specification

Following the works of Feder (1983) and Fosu (1990), we use the Aggregate Production Function (APF) as the underlying model to estimate the Aid-Growth relationship in Ghana. According to the neoclassical growth model, labour and capital inputs are able to explain to a large extent economic growth patterns in a given country. This notwithstanding, other explanatory variables are significant in deriving output changes; such variables have been considered on the basis of theoretical foundations as well as country-specific characteristics (Boakye, 2012).

One important assumption underpinning the APF is that, along with “conventional inputs” of labour and capital used in the neoclassical production function, “non-traditional inputs” like foreign aid and government expenditure among others may be included in the model to capture their contribution to economic growth.

The APF stipulates that the factors of production and the production technology determine the level of output in an economy which can be summarized as:

$$Y_t = A_t LB_t^{\beta_1} CAP_t^{\beta_2} e^{\varepsilon_t} \dots\dots\dots(1)$$

$Y$  represents the aggregate output of the economy (real  $GDP$  per capita) at time  $t$  whiles  $CAP$ ,  $LB$ , and  $A$  denote the amount of gross fixed capital formation, labour stock and total factor productivity ( $TFP$ ) respectively. Assuming constant technology, an increase in the amount of inputs in the model will increase the level of output in the economy. ‘ $A$ ’ denotes total factor productivity ( $TFP$ ). Thus,  $A$  accounts for increases in output not brought about by an increase in inputs. Because this study seeks to establish the impact of aid inflows on economic growth via changes in  $TFP$ , we assume therefore that  $TFP$  is a function of foreign aid inflows and other factors. Thus, it is assumed that;

$$A = f(AID, GXP, INP, D) = AID^{\beta_3} GXP^{\beta_4} INP^{\beta_5} DUM_t^\gamma \dots\dots\dots(2)$$

Where;  $AID$  is Official development assistance as a ratio of gross domestic product ( $GDP$ ) at constant prices;  $GXP$  is general government final consumption expenditure as a ratio of  $GDP$ ;  $INP$  is the ratio of interest payments on external debt to Gross National Income and  $DUM$ : Dummy (proxy for constitutional regime).

By putting (2) into (1), we arrive at (3) specified below

$$Y = LB_t^{\beta_1} CAP_t^{\beta_2} AID_t^{\beta_3} GXP_t^{\beta_4} INP_t^{\beta_5} DUM_t^\gamma e^{\varepsilon_t} \dots\dots\dots(3)$$

From 3.3, we take natural logs of both sides of the equation to obtain the operational model for real  $GDP$  per capita for Ghana in an econometric form as:

$$\ln Y_t = \beta_0 + \beta_1 \ln LB_t + \beta_2 \ln CAP_t + \beta_3 \ln AID_t + \beta_4 \ln GXP_t + \beta_5 \ln INP_t + \gamma DUM_t + \varepsilon_t \dots(4)$$

All variables in the model with the exception of  $\varepsilon_t$  (white noise error term) are as previously defined.  $t$ , is time and  $\ln$  denotes natural logarithm. Equation 4 shows the long-run equilibrium (cointegration) relationship between growth in real GDP per capita and foreign aid.

Labour input ( $LB$ ), measured in this model as the labour force participation rate is expected to lead to an increase in real GDP per capita. Thus, holding all other factors constant, an increase in the labour force participation rate is expected to lead to increase in real GDP per capita. Hence, the coefficient of labour is expected to be positive ( $\beta_1 > 0$ )

Capital input ( $CAP$ ) measured as gross fixed capital formation is theoretically expected to have a positive impact on real GDP per capita. Thus, an increase in capital formation results in growth of real GDP per capita, holding all other factors constant. As a result, the coefficient of capital is expected to be positive ( $\beta_2 > 0$ )

The main variable of interest in the study ( $AID$ ), herein considered as official development assistance as a ratio of real GDP is theoretically expected to augment domestic capital formation and hence enhance economic growth. An increase in the inflow of  $AID$  is expected to lead to an increase in the rate of growth. Thus, coefficient of  $AID$  is expected to be positive ( $\beta_3 > 0$ ). The focus of the present study is to test the statistical significance of  $AID$  on economic growth.

Government expenditure ( $GXP$ ) is expected to stimulate economic growth by increasing aggregate demand particularly in periods of recession or in a case of high unemployment like the situation in Ghana. Increase in government expenditure is therefore growth enhancing ( $\beta_4 > 0$ )

Interest payment on external debt is expected to have adverse effect on economic growth. It can increase the budget deficit of a country and also reduce public savings especially when the amount is huge. It can also result in currency depreciation. It is therefore expected that interest payments on external debt will be negatively related to economic growth ( $\beta_5 < 0$ ).

In theory, it is asserted that a regime of constitutional rule ensures well-functioning democratic institutions and promotes checks and balances, which is a necessary condition for a favourable investment climate and hence economic growth. According to Stasavage (2002) military interventions (coup d'états) are likely to lead to political instability and economic mismanagement. Thus, a constitutional regime in which property rights and contracts are enforced through a properly functioning judicial system will have a positive impact on economic growth (Boakye, 2012). Thus, the dummy variable in the model ( $DUM$ ) is expected to positively influence growth ( $\gamma > 0$ ).

$\beta_0$  is the intercept of the regression equation.

In order to empirically examine the relationship between aid and economic growth, the bound testing cointegration approach developed by Pesaran and Pesaran (1997) is employed. This approach is chosen for two main reasons. First, with infinite sample data as is the case in this study, this technique produces relatively more efficient results. Moreover, endogeneity problem is fixed in this technique provided an appropriate lag length is used (Pesaran & Shin, 1999).

However, one weakness of this technique is that the procedure crashes in the presence of I(2) series.

The ARDL model is written as

$$\begin{aligned} \Delta \ln Y_t = & b_0 + \delta \ln Y_{t-1} + \beta_1 \ln LB_{t-1} + \beta_2 \ln CAP_{t-1} + \beta_3 \ln AID_{t-1} + \beta_4 \ln GXP_{t-1} + \beta_5 \ln INP_{t-1} + \\ & \sum_{i=1}^q \phi_1 \Delta \ln Y_{t-i} + \sum_{i=0}^q \phi_2 \Delta \ln LB_{t-i} + \sum_{i=0}^q \phi_3 \Delta \ln CAP_{t-i} + \sum_{i=0}^q \phi_4 \Delta \ln AID_{t-i} + \sum_{i=0}^q \phi_5 \Delta \ln GXP_{t-i} + \\ & \sum_{i=0}^q \phi_6 \Delta \ln INP_{t-i} + \gamma DUM_t + \varepsilon_t \dots \dots \dots (5) \end{aligned}$$

Where  $b_0$  is the constant,  $\delta$  and  $\beta_i$  are the long run elasticities,  $\phi_i$  are the short run elasticities and the white noise errors are  $\varepsilon_t$  in the ARDL model above.

To conduct the bound test, the first step is to estimate equation (5) using the OLS and then conduct the F-test to check for long run relationship among the variables. The null hypothesis of the F-test of no joint significance of the coefficients of the lagged variables:  $\delta = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$  is tested against the alternative hypothesis of joint significance  $\delta \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$ . The magnitude of the F-statistic will determine whether there exist cointegration among the variables or not. In conducting the bounds test, if the independent variables are I(d) (where  $0 \leq d \leq 1$ ), then the two critical value bounds provided by Pesaran and Pesaran (1997) provide a test for cointegration. Here, if the F-statistic falls within the critical bounds, the test is inconclusive. If the F-statistic is higher than the upper bound the null hypothesis of no cointegration is rejected. However, if the F-statistic is below the lower bound we fail to reject the null hypothesis.

After cointegration is found to exist among the variables, the next step is to estimate the long run coefficients of the ARDL(q,r,s,t,u,v). The specification for the long run is as follows.

$$\begin{aligned} \ln Y = & b_c + \sum_{i=1}^q \delta_1 \ln Y_{t-i} + \sum_{i=0}^r \beta_6 \ln LB_{t-i} + \sum_{i=0}^s \beta_7 \ln CAP_{t-i} + \sum_{i=0}^t \beta_8 \ln AID_{t-i} + \sum_{i=0}^u \beta_9 \ln GXP_{t-i} + \\ & \sum_{i=0}^v \beta_{10} \ln INP_{t-i} + \gamma_1 DUM_t + u_t \dots \dots \dots (6) \end{aligned}$$

Where  $b_c$  is the constant,  $\delta_1$  and  $\beta_i$  are the long run elasticities, and the white noise errors are  $u_t$  in equation (6).

Finally, an error correction model as shown in equation (7) is estimated to obtain the short run parameters.

$$\begin{aligned} \Delta \ln Y_t = & \alpha + \sum_{i=1}^q \phi_7 \Delta \ln Y_{t-i} + \sum_{i=0}^r \phi_8 \Delta \ln LB_{t-i} + \sum_{i=0}^s \phi_9 \Delta \ln CAP_{t-i} + \sum_{i=0}^t \phi_{10} \Delta \ln AID_{t-i} + \sum_{i=0}^u \phi_{11} \Delta \ln GXP_{t-i} + \\ & \sum_{i=0}^v \phi_{12} \Delta \ln INP_{t-i} + \gamma_2 DUM_t + \varpi ECT_{t-1} + v_t \dots \dots \dots (7) \end{aligned}$$



Where  $\alpha$  is the constant and  $\phi_i$  are the short run elasticities,  $\varpi$  is the coefficient of the error correction term and the white noise errors are  $v_t$  in equation (7).

#### 4. Results and Discussion

##### A. Unit Root Tests

The ARDL approach to cointegration does not require pre-testing of the variables for unit root. However, according to Ahmed, Muzib and Roy (2013) the bound test will make no sense if some of the variables are integrated of order 2 since the computed F-statistics provided by Pesaran and Pesaran (2001) will no longer hold in the presence of I(2) variables. The study therefore conducted unit root test using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests to ensure that none of the variables are I(2). Table 1 displays the result of the unit root test. From Table 1 it can be seen that all the variables are I(1).

**Table 1: Unit Root Test**

VARIABLE	ADF test			PP test		
	LEVELS	(with intercept) 1 <sup>st</sup> DIFFERENCE	I(d)	LEVELS	(with intercept) 1 <sup>st</sup> DIFFERENCE	I(d)
<i>LY</i>	0.4794	-3.8792***	I(1)	0.9458	-3.8232***	I(1)
<i>LLB</i>	-2.2032	-4.4989***	I(1)	2.2446	-4.1291***	I(1)
<i>LCAP</i>	-0.7668	-7.3099***	I(1)	-0.8423	-7.3099***	I(1)
<i>LAID</i>	-2.2351	-10.872***	I(1)	-2.0345	-12.292***	I(1)
<i>LGXP</i>	-2.1344	-5.0920***	I(1)	-1.8011	-4.9699***	I(1)
<i>LINP</i>	-2.0111	-6.9411***	I(1)	-1.9860	-6.9411***	I(1)

Note: D denotes first difference, \*\*\* represents significance at 1% level and L represents log  
Source: computed from WDI (2015).

##### B. Bounds Test for Cointegration

The study estimated equation (5) to test for cointegration among the variables. A maximum lag order of 2 was chosen due to the use of annual frequency over a short time span. A general-to-specific modelling approach was employed. Table 2 reports the result of the bounds test with real GDP per capita as the dependent variable. The F-statistic from Table 2 of  $F_Y(Y|AID,CAP, LB, GXP, INP) = 13.3442$  is greater than the upper bound at 1 percent significance level. This implies that the null hypothesis of no cointegration is rejected, and thus suggesting the existence of long run relationship among the variables.

**Table 2: Bound Testing**

Dependent Variable	F-statistic	
$F_Y(Y LB,CAP,AID,GXP,INP)$	13.3442	
<b>Pesaran and Pesaran (1997)</b>	(Intercept with no trend)	K= 6
<b>Critical Value</b>	<b>Lower Bound</b>	<b>Upper Bound</b>
1%	3.627	4.540
5%	2.476	3.646
10%	2.141	3.250

After finding cointegration among the variables, the next step was to estimate the long run coefficients from equation (6). Table 3 reports the results of the long run parameters.

### C. Long run Coefficients

**Table 3: Estimated Long Run Coefficients using the ARDL Approach**

ARDL(2,0,0,0,0) selected based on Schwarz Bayesian Criterion

Dependent Variable is *LY*

Regressor	Coefficient	Standard Error	T-Ratio	Probability
<i>LLB</i>	4.0161	0.6753	5.9473	0.0000
<i>LCAP</i>	0.0047	0.0024	1.9332	0.0630
<i>LAID</i>	-0.0742	0.0350	-2.1202	0.0420
<i>LGXP</i>	0.1526	0.0650	2.3478	0.0260
<i>LINP</i>	-0.1566	0.0302	-5.1836	0.0000
<i>DUM</i>	0.0255	0.0295	0.8620	0.3960
<i>C</i>	8.3651	0.4825	17.3376	0.0000

From Table 3, the following deductions can be made: The estimated coefficient of aid is -0.0742 and significant at 5 percent level. This implies that a 1 percent increase in foreign aid will cause real GDP per capita to decline by about 0.07 percent. The negative aid-growth relationship conflicts with the apriori sign of the study (which is positive) and the findings of some empirical studies that reported a positive aid-growth relationship (see Papanek, 1973; Aryeetey & Tarp, 2000; Dalgaard et al. 2004 and Karras, 2006). This finding is however consistent with Ekanayake et al. (2008) who reported that foreign aid has a negative effect on economic growth for low-middle income countries such as Ghana. Brautigam and Knack (2004) also find evidence for negative impact of foreign aid on economic growth in developing countries. Osew (2012) assert that the negative effect of aid on growth could be attributed to the following reasons: (1) The fact that foreign aid may not be used for the intended purpose and may give rise to engagement in corrupt activities such as using foreign aid to sponsor political campaigns leading to the perpetuation of bad governments. (2) The embezzlement or use of foreign aid (which come in the form of loans) to enrich some few political elites poses a great economic burden on receiving countries as repayment of principal and interests harm the growth of the economy. Foreign loans have accounted for over 70% of total foreign aid in Ghana in the last

two decades (CEPA, 2008). In 2014, debt servicing in Ghana accounted for 40% of total tax revenue and overshot capital expenditure. Total debt servicing in the 2015 budget amounted to GHc9.58billion (7.1% of estimated GDP for 2015) (Graphic Business, 2015). According to the three gap model discussed earlier, high cost of external debt servicing limits public investments in infrastructure and social services and thereby lowers economic growth in the long run. (3) Lack of integration of aid-supported programs into the national development framework. Labour force, government expenditure and capital have positive effects on GDP per capita as expected at 1 percent, 5 percent and 10 percent significance levels respectively. Interest payment on external debt also has the expected negative sign and very significant at 1 percent level while the dummy variable for democracy is not significant.

#### **D. Short run Relationship**

Once the long run coefficients were estimated, we proceeded to conduct the short run estimate. The results from Table 4 show that the error correction term (*ECT*) of -0.4460 is significant at 1 percent confirming the existence of cointegration among the variables. The absolute value of the *ECT* is less than 1 and also negative as expected. The value of the *ECT* implies that about 45 percent of the deviations from equilibrium caused by shocks in the previous year converges back to equilibrium in the current year. Thus, there exist a moderate speed of adjustment to equilibrium.

From Table 4 a negative relationship is also found between foreign aid and real per capita GDP at 5 percent significance level. Specifically, a 100 percent increase in foreign aid will lead to approximately 3 percent decline in per capita GDP in the short run. The signs of the rest of the short run coefficients are consistent with the long run coefficients and the significance levels are also maintained. The previous year's real per capita GDP is also found to have a positive impact on the current GDP per capita in the short run. The dummy variable is also not significant in the short run.

**Table 4: Error Correction Representation for the Selected ARDL Model**

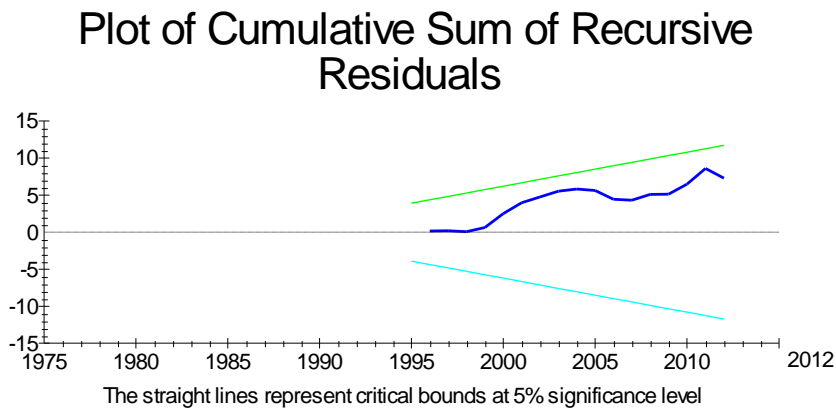
ARDL(2,0,0,0,0) selected based on Schwarz Bayesian Criterion				
Dependent variable is <i>DLY</i>				
Regressor	Coefficient	Standard Error	T-Ratio	Probability
<i>ECT(-1)</i>	-0.4460	0.07846	-5.6843	0.0000
<i>DLY(-1)</i>	0.2430	0.1402	1.7339	0.0930
<i>DLLB</i>	1.7912	0.3293	5.4390	0.0000
<i>DLCAP</i>	0.0021	0.0011	1.9509	0.0600
<i>DLAID</i>	-0.0331	0.0162	-2.0421	0.0500
<i>DLGXP</i>	0.0681	0.0290	2.3460	0.0260
<i>DLINP</i>	-0.0698	0.0179	-3.9033	0.0000
<i>DUM</i>	0.0114	0.0136	0.8366	0.4090
<i>C</i>	3.7308	0.6037	6.1801	0.0000
R-Squared 0.70509 R-Bar-Squared 0.62645 F-stat. F(8, 30) 8.9658[0.000]				
DW-statistic 2.2399				

**E. Diagnostic Tests**

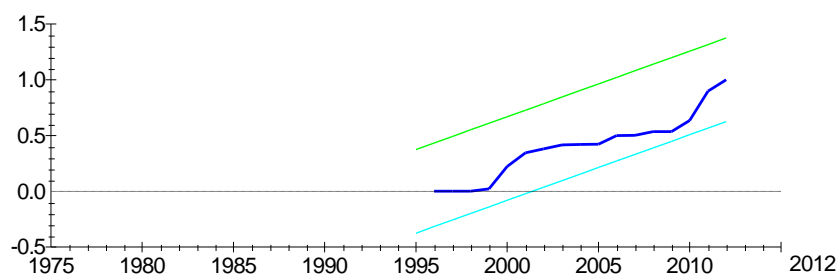
The R-Squared value of 92% and the R-Bar-Squared value of 84% of the ARDL model in equation (5) show a good fit model. The results from Table 5 show that the model passed all the post estimation tests conducted in the study. The model does not suffer from serial correlation, mis-specification, heteroscedasticity or non-normality of residuals. It also passed the CUSUM and CUSUMSQ of recursive residuals tests which imply the estimated coefficients are stable.

**Table 5: Diagnostic Tests**

Test Statistics	LM Version	F Version
Serial Correlation	$\chi^2(1) = 1.7115[0.191]$	F(1,17)= 0.80177[0.383]
Functional Form	$\chi^2(1) = 1.5122[0.219]$	F(1,17)= 0.70456[0.413]
Normality	$\chi^2(2) = 0.97513[0.614]$	Not applicable
Heteroscedasticity	$\chi^2(1) = 0.15484[0.694]$	F(1,36)= 0.14729[0.703]



### Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

## 5. Conclusion

In this study, the ARDL approach to cointegration (bounds testing) was employed to examine both the long run and short run relationships between aid and economic growth. The result of the bounds test showed the existence of a long run relationship between the variables. This was further confirmed by the error correction term which was very significant and correctly signed. The study found the speed of convergence to long run equilibrium to be moderate. The results also indicate that all the variables with the exception of the dummy variable were significant in explaining economic growth in both the long run and the short run in Ghana.

From the results, labour, capital and government expenditure have positive impact on economic growth in Ghana in both the long run and the short run whiles aid and interest payment on external debt have negative impact on growth. This implies that aid which is intended to promote economic development end up harming the economy of Ghana due to mainly corruption and high interest payments on aids that come in the form of loans. In order to derive the full benefit of foreign aid, the study recommends the provision of economic aid which is geared towards capital formation and skills development of labour through education and training rather than political aid since the results of the study show that capital and labour have positive impact on growth. The study also recommends the provision of more grants and less loans because interest payment on external debt has been found in the study to have negative effect on economic growth since most foreign aid are not profitably invested in Ghana.

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