External Debt and Economic Growth in Ghana: A Co-integration and a Vector Error Correction Analysis

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ABSTRACT

This paper employed a co-integration analysis and an error correction methodology to examine the impact of external debt on economic growth in Ghana using annual time series from 1970-2017. Estimates show that our normalized long-run co-integrating growth equation coefficients do not differ from our short-run vector error correction coefficients for our variables of interest. Findings are that external debt inflows stimulate growth in Ghana both in the long-run and short-run. Secondly, our study also confirmed the crowding out effect, debt overhang effect and the non-linear effect of external debt on economic growth in Ghana.

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From the perspective of policy, we advocate for a judicious allocation of the debt resources such that the cost of servicing the debt will not skew resources away from investment which in a medium to long-term will be inimical to growth.

Keywords: External debt, Economic growth, Economic Development, Johansen Co-integration, Time series Models, Ghana

JEL Classification: F34, F43 , F63, C01, C32, N17.

1. INTRODUCTION

Ghana[3] and many other developing countries face a dire savings and investment gap which to a larger extent has constrained the speed of economic growth and sustainable development. In view of this, sourcing for external funding to supplement domestic revenue has become necessary. However, the accumulation of such foreign loans with it repayment terms has put developing countries including Ghana into a bad fiscal position. Ghana has always being a recipient of development assistance (grants and loans) on average US$ 300million between 1960 and 2003(Ministry of Finance and Economic Planning, 2009). Studies on the economic prospects of external debt in the developing world have diverse findings. Notable among studies that explains the positive effect of external debt on economic include:(Elbadawi, Benno, & Njuguna, 1996; Schclarek, 2004; Siddique, Selvanathan, & Saroja, 2015; Diego, Jonhannes, & Marcelo, 2009; Rolf, 2005).On the other-hand(Todaro & Smith, 2009;Fosu, 1996; Cunningham, 1993;Chowdhury, 2001; Iyoha, 1999) found a negative effect of external debt on economic growth. (Eaton, 1993) argued that external debt complements domestic savings and investment, hence it enhances growth.There is evidence to the effect that Ghana's debt stock also saw an appreciable increase after the implementation of the SAP[4] and ERP[5](World Bank, 2010).According to (World Bank, 2004), Ghana's debt was cancelled under the HIPC[6] initiative in July 2005 by G8[7] countries. However, the debt stock of the

[3]Ghana is a country located along the Gulf of Guinea and the Atlantic ocean in the sub-region of West Africa
[4]Structural Adjustment Programme
[5]Economic Recovery Programme
[6]Highly Indebted Poor Countries
[7]Group of eight highly industrialized nations who hold annual meetings to fosters consensus on global issues. These countries are: France, Germany, Italy, United Kingdom, Japan, United States, Canada and Russia

country still saw an appreciable increase with estimates from (International Debt Statistics, 2019) indicating that the debt stock from 2009 ,2010 ,2011, 2012, 2013, 2014, 2015, 2016 and 2017 in current US dollar prices has been US$7,385.0million , US$9,110.1million,US$11,220.5million,US$12,833.2million,US$16,637.9million,US$18,369.5million, US$20,633.3million, US$21,371.5 million and US$22,022.4 million respectively.

We contribute to the literature by estimating the impact of external debt on the economic prospects of Ghana using a Johansen co-integration analysis and an error correction methodology on annual data from 1970-2017. Our study follows (Frimpong & Oteng-Abayie, 2006) who used annual data from 1970-1999 to estimate external debt and economic growth nexus in a co-integration and an Error Correction Model. Their findings indicate that apart from external debt positively impacting GDP growth, debt overhang and crowding out effect were also confirmed in their study. Our study differs from (Frimpong & Oteng-Abayie, 2006) in the following ways: firstly, we used current datasets from 1970-2017 giving us large enough observation to capture the dynamics of our target variables. Secondly, apart from testing for debt overhang and crowding out effect ,we also estimated for the non-linearity between external debt and economic growth. Our findings to a larger extent corroborates the literature.

Our normalized long-run coefficients on GDP confirms that at 5% significance level ,external debt has a positive impact on GDP growth in Ghana. The coefficient of (-28.18) meant that external debt inflows stimulates growth of GDP. Additionally, total debt servicing negatively affects GDP growth which is explained by the parameter value of (0.136). This implies that the general benefit of borrowing is being offset by the astronomical cost of servicing the debt, hence a confirmation of the crowding out effect of external debt. Futhermore, investment positively impacts GDP growth which is explained by the coefficient value of (-1.195). This meant that domestic capital formation has the tendency to increase investment spending which will stimuate growth in the long-run. However, this finding differs from (Frimpong & Oteng-Abayie, 2006) who found a negative impact between the investment variable and GDP growth. Lastly, our study confirmed that at 5% level of signifcance, the square of external debt and GDP growth shows a negative and statiscally significant relationship. The coefficient of (4.268) implies that external debt enhances growth, beyond a certain limit; additional debt accumulation is deleterious to GDP growth.This finding actually was confirmed in (Fosu, 1996) for Sub- Saharan Africa.

Our short-run error correction model estimates do not differ so much from our long-run nomalization growth coefficients. There is evidence that in the short run, external debt inflows stimulates growth with a cofficient of (42.12). The size of the effect indicates that growth is sensitive to external debt. Total debt servicing negatively impacts growth by a magnitude of (-2.35). This meant that government receipts and additonal borrowing which otherwise should have been used for growth enhancing investment ends up in servicing debt.This confirms the crowding out effect of external debt in the shortrun. Debt overhang is confirmed via the negative sign of (-0.917) between the investment variable and GDP growth. According to (Krugman, 1988); (Sachs, 1989),(Anyanwu, 1994) the negative sign on investment explains the deleterious effect of external debt on GDP by decreasing capital formation and encourage capital flight due to future tax increase expectations.Lastly, we also confirm a non-linear relationship between square of external debt and GDP growth giving credence to the Debt Laffer Curve theory.The coefficient of (-5.263) meant that further debt accumulation beyond a certain limit, will cause GDP growth to decline. In addition, our error correction term is negative and statistically significant implying that GDP growth adjusts from short-run disequilibrium to long-run equilibrium at a speed of 0.57 percentage points.

The remainder of our paper follows as: Section 2 gives an empirical account or recent literature , Section 3 talks about the methodology, data and estimated results, Section 4 gives the concluding remarks.

2. Recent Empirical Review

This chapter tries to give an account of the most recent empirical papers that explains external debt and growth nexus. A chunk of the literature on the external debt and economic growth has mainly tried to empirically establish debt overhang or the crowding effect of external debt on economic growth**.** (Abdullahi Hassan et al, 2016) employed an autoregressive regressive distributed lag(ARDL) approach on annual data from 1970-2014 to estimate the debt-GDP nexus in Ghana. The study revealed significant positive impact of external debt on the economic growth in Ghana while total debt service has significant negative impact. The study further revealed the existence of debt overhang and crowding-out effects due to increasing external debt accumulation and its cost of service.(Senadza, Fiagbe, & Quartey, 2017) used system Generalized Methods of Moment technique on annual data from 1990 to 2013 for 39 sub-Saharan African countries to check for the relationship between external debt and economic growth. The paper finds a negative impact between debt and growth. In addition, the categorization of the countries to check if the income per capita affects the debt-growth relationship is not statistically significant. Results also revealed that there is no non-linear relationship between external debt and economic growth.(Siddique, Selvanathan, & Saroja, 2015) using panel data revealed that there exists short and long-run causality running from external debt service to GDP for the period of 1970-2007 for the heavily indebted poor (HIPC) countries. (Sulaiman & Azeez, 2012) evaluated the influence of external debt on economic growth in Nigeria from 1970 to 2010 using Vector Error Correction Approach. They found that external debt have a positive effect on economic growth of Nigeria. (Kasidi & Said, 2013) employed co-integration and vector error correction to examine the external debt-growth nexus in Tanzania from 1990 to 2010. Their findings are that external debt affects growth positively whereas debt service payment influences growth negatively.(Frimpong & Oteng-Abayie, 2006) used a co-integration and an error correction on annual data from 1970-1999 to estimate the effect of external debt on economic growth in Ghana. They found that total debt servicing has a negative impact on growth whereas external debt has a positive impact. In addition, their paper highlights debt overhang effect and crowding out effect explained by debt accumulation and debt servicing respectively. (Elbadawi, Benno, & Njuguna, 1996) adopted a non-linear fixed effect panel model of 99 countries including SSA[8] to estimate the relationship between external debt, investment and economic growth. They found that current debt stimulates growth whilst the lagged debt variable is deleterious to growth. Their study corroborates the literature that excessive debt hampers investment and growth in developing countries thus, a confirmation of debt overhang and crowding out effect of external debt. (Mwaba, 2001) used ordinary least squares regression to estimate a basic growth equation on the negative impact that accumulated external debt has on economic growth in Uganda. The estimated results confirmed that accumulated debt has a negative and statistically significant deleterious impact on growth whilst current debt inflows has a positive impact on growth. (Were, 2001) estimated the impact of external debt on economic growth and private investment in Kenya using time series data from 1970-1995. The findings from this study confirms debt overhang in Kenya since accumulated debt negatively impacts growth in Kenya.(Iyoha, 1999)using a simulation approach to investigate the impact of external debt on economic growth in Sub-

[8] Sub-Saharan Africaa

Saharan Africa countries for the period 1970 to 1994. His finding reveals that mounting external debt depresses investment through both a “disincentive effect” and a “crowding-out effect”. He again reveals that external debt stock reduction would have significant positive impact on investment and economic growth. (Fosu, 1996) used an augmented aggregate production function to establish a non-linear relationship between debt and growth in SSA, thus confirming the Debt Laffer Curve hypothesis.

3. METHODOLOGY, DATA AND ESTIMATION

Estimation of empirical results is carried out using annual time series data for the period 1970 to 2017. Datasets were taken from World Development Indicators (WDI) in 2018. Time series variables used in this study are annual growth rate of GDP; log of external to GDP; log total debt service to export ratio (capture crowding effect of external debt); log of gross capital formation to GDP (proxy for investment); foreign direct investment to GDP; log of growth rate of export capacity to import; oil rents to GDP and log of square of external debt to GDP *(capture non-linear effect of external debt).*

The paper starts with a specification of the growth equation in a semi-log long-run form following (Frimpong & Oteng-Abayie, 2006). The subsequent model estimation is further carried out using a unit root test, Johansen co-integration test and finally a Vector Error Correction Model(VECM). The semi-log long-run form of the growth equation is shown in equation 1 below:

$$\mathbf{GDP_t = \psi_0 + \psi_1 LnDEBT_t + \psi_2 LnTDS_t + \psi_3 LnINV_t + \psi_4 FDI_t} \quad \textbf{(1)}$$

$$\mathbf{+ \psi_5 LnEXPORTS_t + \psi_6 OILRENTS_t + \psi_7 Square\_LnDEBT_t + \varepsilon_t}$$

Where GDP_t*= Annual growth of output;* $LnDEBT_t$ *= Log of external debt to GDP;* $LnTDS_t$*=Log of total debt service to export ratio;* $LnINV_t$ *= Log of gross capital formation to GDP;* FDI_t *= Foreign direct investment to GDP;* $LnEXPORTS_t$*= log of growth rate of export capacity to import;* $OILRENTS_t$ *= oil rent to GDP;* $Square\_LnDEBT_t$ *= Square of log of external debt;* $\varepsilon = N \sim (0, \sigma^2)$ *and t =time.*

3.1 Testing for Stationarity

In view of the fact that macroeconomic time series exhibit non-stationary tendencies, it is quite known in the literature that spurious correlations may emerge among variables which are non-stationary over time see (Granger C & Newfold, 1974),(Phillips P, 1986). To this end we perform standard unit root test following (Dickey & Fuller, 1979), (Dickey & Fuller, 1981)and (Phillips P & Perron, 1988)to check for unit root in our time series. (Perron, 1989) argues that in the presence of a structural break, the ADF[9] tests are biased towards the non-rejection of the null hypothesis hence the PP[10] test will be used as robustness check for the ADF results. The ADF model can be tested by the estimation of α_2 from the equation 2 below:

$$\Delta Y_t = \alpha_0 + \alpha_{1t} + \alpha_{2t} y_{t-1} + \sum_{i=1}^{k} \theta_i \, \Delta y_{t-1} + \varepsilon_t \quad (2)$$

Where Δ = first difference operator ; y = time series variable under test, t= time; k= appropriate lags selected using the AIC ; θ = coefficients , ε = residuals. If we reject the null hypothesis that *the series has unit root* then our series is stationary over time. To the contrary, if we *fail to reject the null hypothesis that the series has unit root*, then our series is non-stationary.Table 1: Unit Root Test Results shows the results of the unit root test for the ADF test and PP tests. Findings are that GDP and oil rents were all stationary at levels in both the ADF test and the PP test. However, our main aim is to conduct a Johansen co-integration test to ascertain the long-run properties in our variables, hence we take the first difference of all variables. In both the ADF test and PP test, all our variables are stationary in their first differences confirming their order being integrated of order 1. This meant that the prerequisite for the Johansen co-integration test is satisfied.

Table 1: Unit Root Test Results

Variables	**ADF statistic**		**PP Test Statistic**	
	Level	**Diff.**	**Level**	**Diff.**
GDP	-4.479***	-6.312***	-4.491***	20.550***
LnDebt	-1.710	-6.245***	-1.768	-6.246***
LnTDS	-1.379	-6.766***	-1.446	6.756***

[9]Augmented Dicker-Fuller Test for unit root
[10]Phillips Perron Test for Unit root

LnINV	-1.712	-7.509***	-1.6647.571***	
FDI	-0.951	6.341***	-1.014	6.667***
LnExports	-1.483	5.269***	-1.2445.241***	
Oil Rents	-2.791*	5.770***	-2.2495.770***	
Sqrt_LnDebt	-2.151	3.480**	-1.8025.991***	

Notes: ,**,*** refers to 10%, 5% and 1% levels of significance.*

3.1.1. Johansen Co-Integration Test.

The Johansen co-integration which was propounded by (Johansen, 1988) will be employed to test for the number of co-integrating vectors. This test takes its basics from the unrestricted VAR *(p)* as shown in the equation 3 below. We adopted the (Hendry & Krolzig, 2001) general to specific approach where we specify the order of lags of the unrestricted VAR *(p)*. The optimal lag length to explain the dynamics in our model was *p=2* as indicated by the AIC in Table 2: VAR Lag Order Selection Criteria.

$$\boldsymbol{y_t = u + \sum_{i=1}^{p} \beta_i \, y_{t-1} + \varepsilon_t} \qquad \textbf{(3)}$$

Where y_t= all endogenous variables in the model, p = lag order β_i = matrix of coefficients, ε_t= the disturbance term with N~(0, σ^2) . The VAR is reconstituted in equation 4 as follows:

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-333.2783	NA	0.003556	17.06392	17.40169	17.18604
1	-134.1829	308.5978*	4.41e-06*	10.30915	13.34913*	11.40831*
2	-62.69230	82.21422	4.52e-06	9.934615*	15.67680	12.01081

*Notes: * , **,*** 10%,5% and 1% level of significance*

$$Y_t = u + \beta_i Y_{t-1} + \sum_{i=1}^{p-1} \psi_i \Delta Y_{t-1} + \psi_f Y_{f-1} + \varepsilon_t \qquad (4)$$

Where ψ_i = -I+ β_1+…+ β_i (I is a unit matrix), y = endogenous variables , ε_t is an error term with zero mean and constant variance. In the instance where all variables in $y_t$are not co-integrated, then the rank of ψ_f (NxN matrix) can be equal to N. If the rank of ψ_f is equal to R but less than N, then R in the number of co-integrating vectors that exists which represent ψ_f such that -ψ_f = αβ', where α and β are NxR matrices. Johansen proposed Maximum Eigen-value test statistic and Trace test statistic are based on the number of significant eigenvalues of β. A test of zero restrictions on α is the test of weak exogeneity when the parameters of interest are long-run. (Engel, 1983) introduced weak exogeneity as a sufficient condition for valid inference on the coefficients of a conditional distribution in a framework of I(0) variables, still holds when variables are I(1) and there is co-integration. (Engel & Granger , 1987) posits that the simple way to check weak exogeneity for the parameters of interest is to estimate an error correction model and test the significance of the error correction term in the model. Table 3: Unrestricted Cointegration Rank Test (Trace)andTable 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue) shows results of the Trace test and the Maximum- Eigen value test. Starting with the null hypothesis of no co-integration among the variables, the Trace test and the Maximum Eigen-value test both reject the null hypothesis at 5% level of significance. The Trace test shows 4 co-integrating equations whilst the Maximum Eigen-value test shows 2 co-integrating equations. This meant that *GDP, LnDebt, LnTDS ,LnINV , FDI, LnExports , Oilrents , Sqrt_LnDebt* exhibits a common stochastic trend implying there exists a long run relationship between them.

The normalized co-integrating coefficients are presented in Table 5: NormalizedLong run Growth Equation for Cointegration Test which shows a long-run relationship between GDP growth and the other variables. The model shows that our variables of interest (*External debt , Total debt servicing, investment and square of external debt*) have their right theoretical signs. Not all are statistically significant nevertheless, their sign corroborates the literature. Firstly, external debt shows a significant positive impact on growth. The long-run coefficient of (-28.18) indicates the positive impact of external debt on GDP growth in Ghana. Secondly, total debt servicing coefficient of (0.136) indicates a negative impact on growth. This captures the *crowding out effect* of external debt *on* growth implying that government receipts(fiscal receipts, export receipts among others) and other borrowings will be used for debt servicing as opposed to growth enhancing investment. We can extrapolate that the benefit of borrowing is curtailed by the high debt servicing cost the country has to endure. Furthermore, we found that the long-run investment parameter value of (-1.195) shows a positive impact between investment and growth but statistically insignificant. This finding differs from (Frimpong & Oteng-Abayie, 2006) who found a negative sign on investment. Lastly, the square of debt coefficient of (4.268) indicates a negative and statistically significant relationship between square of external debt variable and growth. This confirms the non-linearity between external debt and growth. The implication is that beyond a certain limit of external debt accumulation, additional debt is detrimental to growth.

Table 3: Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.911229	272.4071	159.5297	0.0000
At most 1 *	0.775113	177.9610	125.6154	0.0000
At most 2 *	0.632148	119.7669	95.75366	0.0004
At most 3 *	0.608634	80.76398	69.81889	0.0052
At most 4	0.429095	44.17762	47.85613	0.1063
At most 5	0.277456	22.31684	29.79707	0.2812
At most 6	0.201961	9.642751	15.49471	0.3092
At most 7	0.021420	0.844451	3.841466	0.3581

Trace test indicates 4 co-integrating eqn(s) at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

Table 4: Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None *	0.911229	94.44603	52.36261	0.0000
At most 1 *	0.775113	58.19414	46.23142	0.0018
At most 2	0.632148	39.00292	40.07757	0.0657
At most 3 *	0.608634	36.58636	33.87687	0.0232
At most 4	0.429095	21.86078	27.58434	0.2276
At most 5	0.277456	12.67409	21.13162	0.4827
At most 6	0.201961	8.798300	14.26460	0.3033
At most 7	0.021420	0.844451	3.841466	0.3581

Max-eigen-value test indicates 2 co-integrating eqn(s) at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

Table 5: Normalized Long Run Growth Equation for Co-integration Test

Variable	Coefficient	Standard error	t-statistic
LnDebt	-28.182	7.302	-3.859**
LnTDS	0.136	0.338	0.402
LnINV	-1.195	0.895	-1.33
FDI	0.287	0.127	2.259
LnExports	-6.048	0.787	-7.684***
Oil Rents	0.823	0.205	4.014**
Sqrt_LnDebt	4.268	0.883	4.833**

*Notes: *, **,*** denotes 10% , 5% and 1% level of significance*

3.1.2 Vector Error Correction Model (VECM)

In view of the fact that the variables show a common stochastic trend, we estimate a Vector Error Model to determine the dynamic features of the growth equation in the short term. We specify the short-run VECM as follows:

$$\Delta GDP_t = \psi_0 + \sum_{i=1}^{j} \psi_1 LnGDP_t + \sum_{i=1}^{j} \psi_2 \Delta LnDEBT_{t-1} + \sum_{i=1}^{j} \psi_3 \Delta LnTDS_{t-1}$$

$$+\sum_{i=1}^{j} \psi_4 \Delta INV_{t-1} + \sum_{i=1}^{j} \psi_5 \Delta FDI_{t-1} + \sum_{i=1}^{j} \psi_6 \Delta LnEXPORTS_{t-1}$$

$$+\sum_{i=1}^{j} \psi_7 \Delta OILRENTS_{t-1} + \sum_{i=1}^{j} \psi_8 \Delta Ln\, SQRTLnDebt_{t-1} + \gamma_1 ECT_{t-1} + \varepsilon_{1t} \quad (5)$$

Where all the variables are described as before , Where Δ = first difference operator, ECT_{t-1} = error correction term with one period lag , γ = is the shortrun coefficient of the error correction term which should be between -1 and 0. The results are presented in Table 6: Short-run Error Correction Growth Equation. Our short-run estimates do not differ in sign and significance from the long-run normalization estimate on GDP. In the short-run the lagged debt variable positively and significantly impacts growth. This meant that debt accumulation in the short-run might be a stimulus for growth. Our lagged debt coefficient seems large implying that growth is sensitive to accumulated debt in the short-run. Total debt servicing negatively impacts GDP growth but not statistically significant. The negative sign of the debt servicing variable captures *the crowding effect of external debt* in the short-run. Furthermore, investment negatively impact growth confirming *debt overhang* in the short-run. This debt overhang is deleterious to growth by decreasing capital formation and encourages capital flight due to future tax increase expectations (Krugman, 1988); (Sachs, 1989),(Anyanwu, 1994).The square of debt is negative and statistically significant confirming the existence of a non-linear relationship between external debt and growth in the short-run. Lastly, the error term is negative and statistically significant implying that GDP moves from short-run disequilibrium to long-run equilibrium at a speed of 0.57 percentage points.

Table 6: Short-run Error Correction Growth Equation

Dependent Variable: ΔGDP_t

Variable	Coefficient	Prob.
ECT_{t-1}	-0.572594	0.0027***
ΔGDP_{t-1}	0.082453	0.6183

$\Delta LnDebt_{t-1}$	42.12370	0.0641*
$\Delta LnTDS_{t-1}$	-2.357628	0.3749
$\Delta LnINV_{t-1}$	-0.917404	0.7490
ΔFDI_{t-1}	0.050025	0.9913
$\Delta LnEXPORTS_{t-1}$	6.240308	0.0539**
$\Delta OILRENTS_{t-1}$	-0.728851	0.2240
$\Delta SQRT\_LnDebt_{t-1}$	-5.263045	0.0798*

*Note: *, **, *** denotes 10% , 5% and 1% level of significance.*

3.1.3: Diagnostics Test

We performed (*serial correlation test, heteroscedasticity test and normality test*) on our model and the results are shown in **Table 7: Residual Diagnostic Test**.The Breusch-Godfrey serial correlation LM test has a null hypothesis of *no serial correlation in the residuals*. We *fail to reject* the null implying that our residuals are not serially correlated. Secondly, we test for heteroscedasticity (ARCH effect) in the residuals. We also *fail to reject the null hypothesis of no heteroscedasticity(No ARCH Effect)*. However, our Jargue Bera test for normality was rejected perhaps due to the presence of outliers.

The Cusum Test in Figure 1: Cusum Test for Model Stability show that our model satisfies the stability condition since the model lies within the 5% confidence band.

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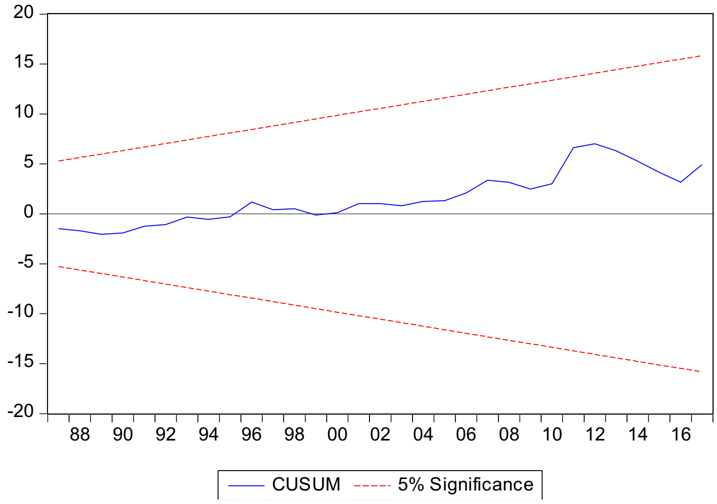
Table 7: Residual Diagnostic Test

Diagnostic test	**Prob.**
Serial correlation	0.5956
Heteroscedasticity	0.8830
Normality	0.000***

Note: *, **,*** denotes 10% , 5% and 1% level of significance.

Figure 1: The Cusum Test for Model Stability



4. CONCLUDING REMARKS

This paper used annual series from 1970-2017 to estimate the effect of external debt on economic growth in Ghana. We employed a Johansen co-integration test and an error correction model. We found that external debt stimulates growth both in the long-run and the short-run in Ghana. Our study also confirmed the *crowding out effect* of external debt in both the in short-run and long run. This is captured by the negative sign on the total debt servicing variable. This negative sign is expected to depress investment since government receipts are used to service debts instead of investing in growth enhancing projects. Furthermore, in the long-run, investment stimulates growth whilst the impact in the short-run is negative confirming *debt overhang* in the short-run only. We found evidence of a non-linear relationship between external debt and growth captured by the square of external debt variable giving an indication of the Debt Laffer Curve theory.

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