



# The impact of government debt on economic growth: An empirical investigation of Namibia

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## **ABSTRACT**

This paper examines the impact of government debt on economic growth in Namibia with annual data spanning from 1980 to 2016. The paper investigates whether public debt promotes or dampens economic growth. We employ an Autoregressive Distribution Lag (ARDL) model that serves as an analysis of the short and long run link between public debt and economic growth. In addition, we explore other possible indicators that are likely to affect economic growth such as government expenditure, inflation, gross fixed capital formation and openness. Our findings are consistent with the existing literature that finds a negative correlation between public debt and economic growth.

The results of the long-run relationship disclose that public debt has an insignificant negative effect on economic growth in Namibia, however, only government expenditure and openness have a negative effect on economic growth. In the short-run, gross fixed capital formation and openness, promote economic growth, whereas the effect of public debt on economic growth is negative. Following this set-up, we provide policy recommendations that future debt acquired should be for projects that are vital and well-reviewed programs, self-sustainable and can enhance the productive capacity of Namibia. Moreover, the government should take a firm stand on fiscal consolidation and policies that are pro-growth.

**Key words:** public debt, economic growth, ARDL

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# 1. Introduction

## 1.1 Background

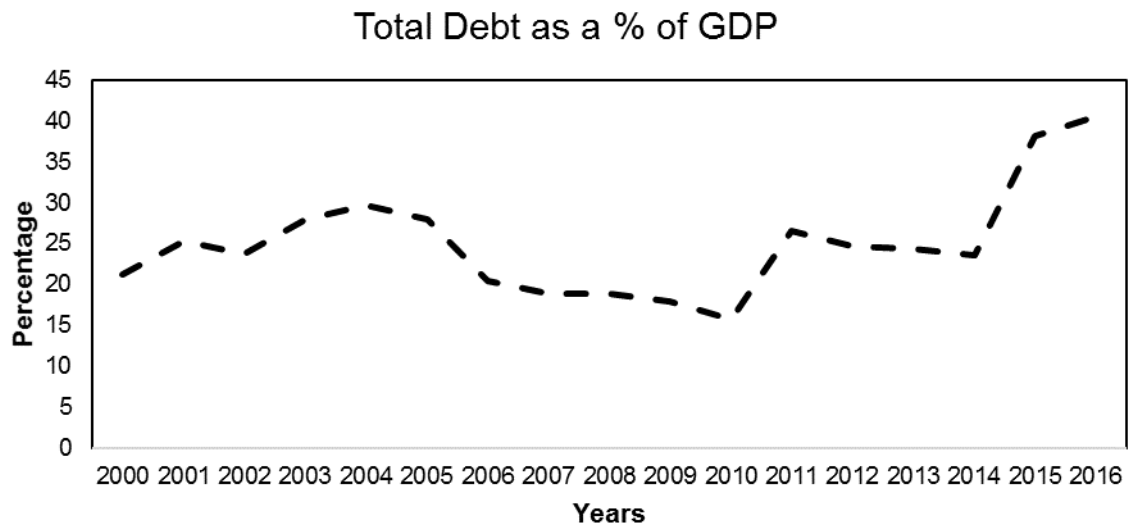
The 2009 global financial crisis has led to an exceptional increase in public debt across the world. This instigated serious concern surrounding fiscal sustainability and its impediment on economic performance. Empirical analysis remains limited regarding the obstruction of public debt on economic growth.

The escalation in a nation's sovereign debt has become worrisome, particularly in developing countries like Namibia. This has raised questions whether the debt will be sustainable in the medium to long-term, coupled with fears that the Namibian economy can fall into a debt crisis. Therefore, the paper seeks to investigate whether the Namibian economy is impeded by its debt situation. A country can only sustain debt if the debt-to-GDP (Gross Domestic Product) ratio is stationary in the long-run. The National Development Plan (NDP) and the Medium Term Expenditure Framework (MTEF) states that debt is sustainable if the debt-to-GDP is 25% (Bank of Namibia, 2015).

The main contributors of domestic debt are the Internal Registered Stock (IRS) and Treasury Bills (TBs). TBs are issued on a discount basis and the IRS consists of capital market instruments issued for longer maturity usually for a period exceeding 12 months. The number and value of government debt has been increasing since 2010 to date. For example, despite the redemption of government internal registered stock maturing in 2014, the total number of different types of domestic government bonds has also increased (Bank of Namibia, 2014). The report also displays the outstanding amount of domestic government bond amplified from N\$10,9 billion to N\$12,5 billion at the end of 2014.

With respect to foreign debt, Namibia's foreign debt stock consists of multilateral, bilateral, Eurobond and JSE-listed bonds. Multilateral loans are debt a country owes to international institutions like the International Monetary Fund (IMF) and the World Bank. While bilateral loans are, debt owed to other governments.

**Figure 1:** Trend for total debt as a percentage of GDP



*Source: Author's Compilation and values obtained from Bank of Namibia annual report*

During 2000, the total debt to GDP<sup>1</sup> stood at 21.0 percent this was mainly driven by increased disbursements from the Chinese government, European Investment Bank and the Development Bank of Southern Africa and domestic borrowing (Figure 1). It is worth noting that the Development Bank of Southern Africa disbursed a loan for the first time that was aimed to upgrade infrastructure in the Windhoek urban area. However, the debt to GDP kept increasing until the end of 2004 to a ratio of 30.0 percent this was a result of domestic borrowing in the form of treasury bills and government stock that gained momentum. In addition, external debt contributed to this increase reflected in both bilateral and multilateral loans the increase was because of the disbursements of funds on existing loans. However, it remained stable between 2005 and 2010.

The total debt to GDP increased to 28.5 percent by the end of 2011 mainly due the undertaking of a Eurobond that amounted to US\$500 million. Furthermore, during 2015 more Eurobonds were issued which further increased the total external debt by 72% to N\$56.3 billion at the end of 2015. Thus, the Eurobond remains the largest component of the government external debt, followed by multilateral loans (Bank of Namibia, 2015).

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<sup>1</sup> Thanks to the examiner, the paper provides a background on the debt to GDP ratio trend.

## 1.2 Research Problem

Public debt-to-GDP ratio is an important macroeconomic indicator; it also forms part of the country's image in international markets. It helps determine whether the country has the ability to repay its debt. Public borrowing is unavoidable and can stimulate economic growth if borrowed resources are spent correctly, for example, spending on infrastructure, health care and education to enhance human capital and in turn increase the economy's real return in the medium to long run, see Matiti (2013). The question is does public debt stimulates or dampen economic growth? Based on this, what are the possible policy implications that can be drawn from this relationship?

Recent literature focuses on the Ley approach<sup>2</sup> that is classified as a simple algebra of fiscal sustainability and the variables used in this approach are the nominal interest rate, GDP deflator, real output growth, real debt-to-GDP ratio and real interest rate (Zaaruka, 2007 and Zaaruka, et al., 2004). The paper will adopt an alternative methodology that is aimed to respond to the research question.

## 1.3 Goal and objective of the study

This paper examines the impact of government debt on economic growth by evaluating alternative channels and employing other forms of diagnostic tests to those in the existing literature.

To ensure the realisation of these goals the following objectives need to be disaggregated:

- To reveal the short-run and long-run relationship between public debt and economic growth.
- To recommend strategic policy implications that will assist the Namibian economy foster growth.

To attain these objectives, section two provides the theoretical framework and empirical literature on the liaison between public debt and economic growth. Section

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<sup>2</sup> The paper acknowledges the examiner and thus more emphasis on the Ley approach is expressed in Appendix 6.

three presents the methodology and the empirical model employed by the study. The fourth section displays the empirical results and discussions. Finally, the last section provides the conclusions and policy recommendations suggested by the paper.

## 2. Literature Review

### 2.1 Theoretical Literature

The literature surrounding this topic backdates to the work of Adam Smith, Ricardo and Keynes who viewed the economic effect of public debt on a country as vicious (Bal & Rath, 2014). A recent theory surrounding this topic is the debt overhang theory, which was first formalized by Myers (1977).

#### 2.1.1 Ricardian Equivalence Theory

The classical economist Ricardo brought forth the well profound Ricardian Equivalence theory that argues that public expenditure financed through taxation and borrowing is equivalent i.e. the effect of public debt on economic growth is neutral. According to Piero & Dobb (1955), Ricardo's argument was that the repayment of debt would be financed through future taxation; individuals will have the incentive to increase their savings through the purchase of securities issued by the government<sup>3</sup>. Hence, the effect remains neutral since future increased taxes will be financed through individual savings.

#### 2.1.2 The Keynesian theory

Keynesians argue that increases in government debt that finances expansionary fiscal policy can elevate the level of income, money demand and prices. Keynesians argue that if the private sector perceives government securities as net wealth, then a fiscal deficit will further increase private consumption, transaction demand and prices. However, according to monetarists, the macroeconomic effects of debt financed expansionary fiscal policy are to crowd out private investment by raising interest rates. Therefore, according to this theoretical view, the consequence of public debt on economic growth is expected to be negative see Bal and Rath (2014).

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<sup>3</sup> More emphasis on the Ricardian Equivalence theory can be found in Piero & Dobb (1955).

### 2.1.3 The debt overhang theory

The arguments postulated by Myers (1977)<sup>4</sup> is that a firm with risky debt outstanding which often acts in the interest of the stockholders will follow a different decision rule than a firm which can issue risk-free debt or no debt. The firm financed with risky debt is likely to pass up valuable investment opportunities. Therefore, issuing risky debt reduces the present market value of the firm by inducing a future investment strategy that is suboptimal (Myers, 1977). The model does not clearly analyse growth, but the repercussion is that a huge debt stock will lower through the channel of reduced investment. Debt tends to benefit the government to finance its operations; the high levels of debt suggest an expansion in expected future taxation or budget cuts (Krugman, 1988). Thus, the debt overhang theory suggests that there will be a bigger sum of debt than the government's ability to reimburse. In addition, Burhanudin et al (2017) states that the expected debt-service expenses will weaken domestic and foreign investments. In actual fact, the expected rate of return from the productive investments projects will be too low to enhance the economy. It is also worth mentioning that the debt overhang theory discourages economic development since private investors suffer from uncertainty.

### 2.1.4 Theoretical relationship between government debt and economic growth

According to Checherita and Rother (2010), economic theory suggests a negative relationship exists amid public debt and economic growth, they further argue that rising levels of government debt are barriers to economic development and growth, but only after a definite threshold has been reached. Kumar & Woo (2010) argue that a large public debt is likely to affect private sector capital accumulation, productivity and ultimately reduce economic growth. This can only happen through certain channels, namely high long-term interest rates, the possibility of tax distortion, inflation rates being extremely high and vulnerability to crises. Such channels can possibly negatively influence economic growth and thus the country's ability to pay

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<sup>4</sup> Thanks to the examiner the debt overhang theory is clearly expressed.

off debt worsens. However, despite what theory suggests, there is no solid evidence that large public debt hinders economic growth.

Theory specifies that countries in their early stages of development are likely to borrow to finance their operations because they are likely to have investment opportunities that have higher rates of return. This can only be effective if the borrowed funds are utilised for investment that is more productive and the economy should not suffer from macroeconomic instability, policies that distort economic incentives, or sizeable adverse shocks (Egbetunde, 2012). Based on theory, economic growth can allow timely repayment of foreign and domestic debt. The estimate is likely to hold in theory based on a more realistic postulation that countries cannot borrow freely due to high chances of debt denial. The fundamental aspect of the theory is that the debtor can only share partially in an increase in output and export since a fraction of the increase has to finance external debt.

Despite debt being an instigator of development, contradiction arises when the borrowing is financing the wrong intended purpose, leaving the developing nation vulnerable to capital withdrawals and a possibility of a financial crisis. There are unforeseen hitches although government borrowing was initialized to finance a sound investment there can be unexpected drops in export price and increases in interest rate and oil prices. These types of unexpected shocks can turn investment projects into a failure, ultimately leaving the government with high debt which constraints them to make challenging decisions of whether to repay foreign lenders or continue spending on education, health and poverty.

## 2.2 Empirical Literature

The empirical literature behind this is limited, but it puts more emphasis on external debt in developing nations. Egbetunde (2012) inspected the causal nexus between public debt and economic growth in Nigeria by using a Vector Autoregressive (VAR). The main variables in the study are public debt and real gross domestic product. The variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) and the Phillips Perron (PP) and they were stationary after first difference. This then led to the testing of cointegration, which discovered the presence of cointegration between the level of public debt and the level of output. This result of cointegration depicts the existence of a long run relationship. Thus, the implication for Nigeria was

that they should seek for loans within the economy, as this will ensure that the principal and interest on loans are paying back; this will serve as a crowding-in-effect and promote economic activities within the country.

Balassone et al. (2011) explored the link between government debt-to-GDP ratio and real per capita income growth in Italy. They made use of an Autoregressive Distribution Lag (ARDL) model and the results were in full support of the hypothesis of a negative relationship between public debt and economic growth. Moreover, the stronger effect is of external debt compared to domestic debt. Balassone et al. (2011) also postulate that the government debt effect on economic growth is through reduced investment. A similar study that aimed to confirm whether government debt spurs economic growth in Malaysia was conducted using ARDL cointegration model (Burhanudin, et al., 2017). Their findings revealed a positive and significant effect of government debt on sustainable economic growth in the short and long run. Other variables like gross fixed capital formation and labour force are positive and significantly affecting economic growth at 5 percent level of significance.

Owusu-Nantwi & Erickson (2016) examined the liaison between public debt and economic growth in Ghana. They used the Johansen cointegration as well as the vector error correction model. The long-run relationship estimates pointed out that public debt-to-GDP ratio, government consumption expenditure, investment and population growth rate have a positive impact on the economy and were all statistically significant. On the other hand, the short run causality estimates display a significant casual link between public debt-to-GDP and the real GDP growth rate. That meant that in the short run, we expect public debt-to-GDP ratio to Granger cause the real GDP growth rate.

Swamy (2015) conducted research on the dynamics of government debt and economic growth where he discovered a negative relationship between government debt and economic growth. The study tested the bivariate and linear relationship between debt and growth. The empirical results suggest a 10%-point increase in the debt-to-GDP ratio linked with a 2 to 23 basis point decline in average growth (Swamy, 2015). The results also pointed to a non-linear connection between public debt and economic growth.

The empirical results of the link between public debt and economic growth can be quite different. Several findings suggest a non-linear impact of external debt on economic growth, with harmful effects only if the debt-to-GDP ratio exceeds a certain threshold. Checherita & Rother (2010) conducted a cross-sectional study for 12 Euro Area countries and it discloses a concave relationship between debt and growth rate with the debt turning point of about 90%-100% of GDP. Thus, a high debt-to-GDP ratio is associated on average with minor long-term growth rates when debt levels are above 90%-100% of GDP (Checherita & Rother, 2010). From an econometric perspective, the research had an endogeneity problem particularly with the matter of reverse causation, which comprises of; potential & trend GDP growth rates and mitigating the impact of an economic cycle. This was done using a quadratic relationship in debt, while the linear one is not significant by employing instrumental variable estimation models.

The changes of debt ratio after first difference pointed to a negative relationship with economic growth. For this reason, the channels through which public debt can impede economic growth are private savings, public investment, factors of production and long-term nominal and real interest rates (Checherita & Rother, 2010). This ends with saying that a change in debt ratio and the budget deficit are linearly and negatively related to growth, hence, points to a detrimental influence of the public debt even below the recommended threshold. This means should the government target high debt level to support growth it will result into a policy failure.

Calderon & Fuentes (2013) have conducted empirical evidence on the impact of high debt on growth rate particularly for advanced panels and emerging market economies. Their empirical results used a variety of econometric techniques, focused mainly on reverse causality, endogeneity and outliers, and hence explore nonlinearities and threshold effects. The results based on the techniques employed indicated an inverse relationship between initial debt and subsequent growth. There is evidence of non-linearity in the study with only high debt level having a significant negative effect on growth. The study recommends that not only a stabilizing policy should be in place, but also debt should be on a downward trajectory in the medium and long-term.

## 3. Methodology

### 3.1 Data Sources

The study used secondary data obtained from various data sources; Namibia Statistics Agency, Bank of Namibia and the Ministry of Finance. The paper makes use of annual data for the period of 1980 through to 2016; the selection of this sample is essentially driven by the availability of data on debt<sup>5</sup>.

### 3.2 Short Description of Variables<sup>6</sup>

Real GDP growth rate will be our dependent variable in our analysis. The independent variables are as follows; government consumption expenditure as a percentage of GDP, central government debt as a percentage of GDP, gross capital formation as a percentage of GDP, consumer price inflation, population growth and trade balance.

Government consumption expenditure is usually obtained from national accounts and consists of two main components: expenditure on final goods, and wage and salary accruals. In the paper we analyse government consumption expenditure as a percentage of GDP and based on empirical analysis conducted the expectation of the sign remains disputable.

Total government debt captures both domestic (contains IRS and TBs) and external debt (consists of multilateral, bilateral, Eurobond's and JSE-listed bonds) and therefore will be used to proxy for public debt. The effect remains ambiguous as different theories provide different perspectives.

Gross fixed capital formation (GFCF) measures the value of acquisitions of new or existing fixed assets mainly by the business, government and households less disposals of fixed assets. The investment is a sum of GFCF plus other inventories were private investment has the biggest chunk followed by the government.

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<sup>5</sup> It is also vital to bear in mind that internal registered stock before independence was guaranteed by South Africa. The pre-independence external debt was rescheduled in 1992 and became Bank of Namibia's liability since then.

<sup>6</sup> The paper acknowledges the input of the examiners and thus delves into explaining the variables.

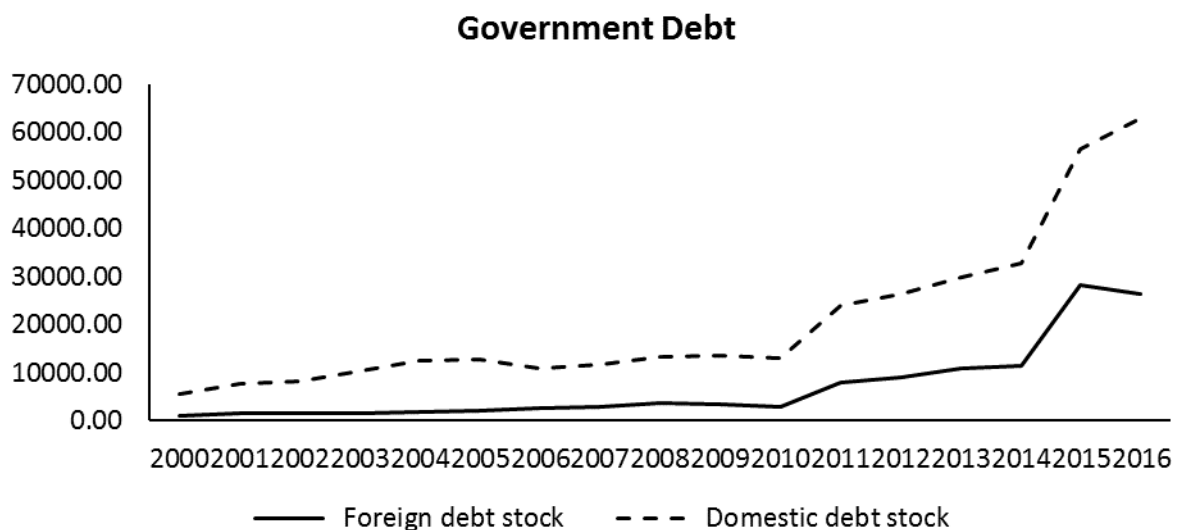
According to Ikechi & Emmanuel (2015) GFCF is a component of the expenditure on GDP and therefore shows how much of the new value added in the economy is invested rather than consumed. In this regard, the paper use GFCF as a percentage of GDP to proxy for investment, the study expects a positive relationship between investment and economic growth.

Inflation which is defined as the continues increase in the prices of goods and services. The variable is fundamental in determining macroeconomic stability; Namibia in most cases targets a well-stabilized inflation rate as a tool to incentivize investment expenditure and stimulate economic growth. Therefore, our prior expectation is that there is a negative relationship between inflation and economic growth.

Openness that implicitly refers to trade policy orientation and in most existing literature it helps to assess the impact of trade policy on economic growth. Openness is estimated as the ratio of Namibia’s total trade, which is calculated as the sum of exports plus imports as a percentage of GDP. Openness will serve as a proxy for capital mobility thus, if capital flows are more mobile the expectation is that economic growth will increase through foreign direct investment and portfolio flows.

Before outlining the empirical model this study, presents figure two that plot the trends of foreign and domestic debt of Namibia.

**Figure 2:** Trends for foreign and domestic debt in N\$ millions



Source: Author’s Compilation and values obtained from Bank of Namibia annual reports

Figure 2 shows that government debt is dominated by domestic debt, in most cases, this is a good thing since the debt will be dominated in local currency. However, according to Zaaruka (2007), less attention has been given to countries with low external debt and high domestic debt regardless the impact it has on government budgets, macroeconomic stability and economic performance. The figure clearly shows that both foreign and domestic debt started to rise during 2010 to most recent years.

The increasing debt has become an issue of concern, raising a few thoughtful questions of whether the policies in place will foster the economy further given the current trend of government debt. The consequences involved in a high government debt can be tax distortion and increasing inflation.

### 3.3 Empirical Model

The design that will help us determine the influence of government debt on economic growth follows the work of Burhanudin, et al., (2017). This paper uses the Autoregressive Distributed Lag (ARDL) model which performs better in small finite samples. This paper uses the F-test to determine the existence of a long run relationship among the variables. The test assumes that lower bound critical values are integrated of order zero, whilst the upper bound critical values are postulated that the regressors are integrated of order one (Bal & Rath, 2014). To confirm the robustness of our estimate we will perform a test for normality of residuals, autocorrelation and heteroscedasticity. In line with Burhanudin, et al., (2017) we employ the following modified modelling strategy:

$$\log Y_t = \alpha + \delta_1 \log GovD_t + \delta_2 \log GovExp_t + \delta_3 \log \pi_t + \delta_4 \log GFCF_t + \delta_5 \log Openes_t + \varepsilon_t$$

(1)

$\log Y_t$  Represents the level of real GDP growth rate which measures economic growth,  $GovD_t$  represents total government debt which comprises of foreign and domestic debt and thus can be specified as  $\log GovD_t = f(\text{foreign debt, domestic debt})$ . However, often other forces promote economic growth such as government expenditure ( $\log GovExp_t$ ), the ratio of gross capital formation to GDP

$(\log GFCF_t)$ ,  $\log \pi_t$  signifies inflation rate,  $\log Openess_t$  denotes exports minus imports i.e. the trade balance and  $\varepsilon_t$  is the stochastic component.

We can then progress to test whether the variables are stationary<sup>7</sup> or not, and it is vital to determine the order of integration of each series and if the time series has unit root we need to difference the series to achieve stationarity. The paper makes use of one-autoregressive model as a foundation for expressing this test.

$$\Delta y_t = \delta_0 + \delta_1 t + \varphi y_{t-1} + \sum_{i=1}^p \zeta \Delta y_{t-i} + \varepsilon_t \quad (2)$$

The autoregressive model<sup>8</sup> (2) is a random walk with a drift and intercept. In the stated equation we are more interested in  $\varphi$  and if  $\varphi=0$  then  $y_t$  contains a unit root, which is done by comparing the t-statistics with the critical values that will be obtained by running the Phillips Perron test statistics. Alternative to this, the paper makes use of the KPSS test statistics that was proposed by Kwiatkowski, et al., (1992). The KPSS test considers the null hypothesis that a series is stationary whilst the alternative hypothesis is that the variable is nonstationary.

## 4. Empirical Results and Discussion

### 4.1 Descriptive Statistics

**Table 1: Descriptive Statistics**

|                  | Y         | GOVTDEBT | GOVEXP   | INFL     | GFCF     | OPENNESS  |
|------------------|-----------|----------|----------|----------|----------|-----------|
| <b>Mean</b>      | 3.484117  | 19.04951 | 20.29871 | 9.235612 | 26.00221 | -10.10053 |
| <b>Median</b>    | 3.430731  | 18.86248 | 20.05171 | 8.976306 | 25.98029 | -7.039670 |
| <b>Maximum</b>   | 12.26955  | 40.56353 | 34.23442 | 17.85833 | 28.08300 | 6.467839  |
| <b>Minimum</b>   | -1.823451 | 4.635466 | 12.01504 | 2.258333 | 21.79021 | -72.30966 |
| <b>Std. Dev.</b> | 2.947766  | 8.249490 | 5.384632 | 3.722707 | 1.595114 | 14.60198  |

<sup>7</sup> All time series variables are likely to have unit root, for robustness two tests are used, the Phillips Perron (PP) with a null of a unit root and Kwiatkowski, et al., (1992) (KPSS) with a null of stationarity are performed and the table is provided in the empirical findings. However, to visually inspect the data the trends are provided; see Appendix 1.

<sup>8</sup> The reason for selecting an AR model with an intercept and trend is due to that if the unit root null is rejected using the test including only an intercept as a deterministic term the series is stationary. Should we fail to reject the null hypothesis the unit root test including both an intercept and trend is more likely to provide better estimates.

|                     |          |          |          |          |           |           |
|---------------------|----------|----------|----------|----------|-----------|-----------|
| <b>Skewness</b>     | 0.518637 | 0.522284 | 0.624588 | 0.240840 | -0.779392 | -2.712980 |
| <b>Kurtosis</b>     | 3.614313 | 3.198901 | 3.343271 | 2.425974 | 3.011230  | 11.41638  |
| <b>Jarque-Bera</b>  | 2.179978 | 1.696026 | 2.517411 | 0.842283 | 3.644896  | 150.4148  |
| <b>Probability</b>  | 0.336220 | 0.428265 | 0.284021 | 0.656297 | 0.161630  | 0.000000  |
| <b>Sum</b>          | 125.4282 | 685.7824 | 730.7535 | 332.4820 | 936.0797  | -363.6190 |
| <b>Sum Sq. Dev.</b> | 304.1263 | 2381.893 | 1014.799 | 485.0492 | 89.05358  | 7462.619  |
| <b>Observations</b> | 36       | 36       | 36       | 36       | 36        | 36        |

*Authors compilation.*

Table 1 above displays the descriptive statistics for all seven variables. How the variables are distributed will be determined by skewness & kurtosis and it is said to follow a normal distribution if the skewness approaches zero and kurtosis approaches three. The skewness coefficient for the level of real GDP growth is 0.518 indicating that the distribution is positively skewed whilst the kurtosis coefficient is 3.614, which measured the thickness of the tails and it is considered to be slightly above three. Similarly, government debt, government expenditure and inflation are positively skewed with kurtosis revolving around three. On the other hand, investment and openness are negatively skewed but the associated kurtosis for openness is 11.416, which is above three indicating slightly longer and fat tails.

## 4.2 The Unit Root Test

**Table 2:** Unit root testing using the PP and KPSS

| Variables            |                   | PP         |                  | KPSS      | Order of Integration |
|----------------------|-------------------|------------|------------------|-----------|----------------------|
|                      |                   | Level      | First Difference | Level     |                      |
| <b>LogGDP Growth</b> | Trend & Intercept | -5.131640* | —                | 0.124505* | I(0)                 |
| <b>LogGovtDebt</b>   | Trend & Intercept | -2.096114  | -4.884046*       | 0.066492* | I(1)                 |
| <b>LogInflation</b>  | Trend & Intercept | -4.364570* | —                | 0.140705* | I(0)                 |
| <b>LogGFCF</b>       | Trend & Intercept | -4.411858* | —                | 0.144887* | I(0)                 |

|                    |                   |             |   |           |      |
|--------------------|-------------------|-------------|---|-----------|------|
| <b>LogOpenness</b> | Trend & Intercept | -5.588358*  | — | 0.192221* | I(0) |
| <b>LogGovtExp</b>  | Trend & Intercept | -3.884764** | — | 0.140705* | I(0) |

Source: author's compilation and estimated values obtained from Eviews

Notes: \* & \*\* denotes rejection of null hypothesis at 1% and 5% level significance.

In table 2 the PP reports that most of the variables are integrated of order I(0) i.e. reject the null of a unit root at 1 percent level of significance besides government debt that is integrated of order one. KPSS reveals that all the variables are integrated of the same order I(0) i.e. we fail to reject the null hypothesis at 1 percent significance level and conclude that all the variables are stationary. The results of the unit root tests show that some of the variables in the model are I(0) and I(1) variables, this allows us to proceed to estimate the ARDL model.

The first step to estimate the ARDL model is to conduct the bound test for the null hypothesis of no long-run relationship exists against the alternative of the existence of long-run relationship. In order to report the F-test, the selection of maximum lag length is vital in this case it was done through selecting a model that yields the lowest Akaike Information Criteria (AIC). Therefore, the selected maximum lag length is 2 and we only have 35 observations and 5 parameters (k). Table 3 below summarises the results of the F-test for the stated level of significance.

**Table 3: Bound Test**

| Test Statistics       | Value      | K          |
|-----------------------|------------|------------|
| F-Statistic           | 9.945738   | 5          |
| Critical Value Bounds |            |            |
| Significance          | I(0) Bound | I(1) Bound |
| 10%                   | 2.26       | 3.35       |
| 5%                    | 2.62       | 3.79       |
| 1%                    | 3.41       | 4.68       |

Source: author's compilation and estimated values obtained from Eviews

Notes: \* & \*\* denotes rejection of null hypothesis at 1% and 5% level significance.

The results of the bound test reveal that the F-statistic (9.945738) is greater than the upper bound of the critical values at all significance level. This is a clear indication of

the existence of a cointegrating relationship among the variables. The next step in the ARDL approach is to determine the long run coefficients for the stated equation.

**Table 4:** Estimation of the Long-run relationship

| Long run estimation (2,0,2,1,2,2) |             |            |              |        |
|-----------------------------------|-------------|------------|--------------|--------|
| Variables                         | Coefficient | Std. Error | T-Statistics | Prob.  |
| LOGGOVTDEBT                       | -0.126544   | 0.342774   | -0.369177    | 0.7159 |
| LOGGOVTEXP                        | -1.787443*  | 0.834642   | -2.141567    | 0.0447 |
| LOGINFLATION                      | -0.844121   | 0.572152   | -1.475343    | 0.1557 |
| LOGGFCF                           | 2.750442    | 2.385613   | 1.152929     | 0.2625 |
| LOGOPENNESS                       | -0.664240*  | 0.295397   | -2.248633    | 0.0360 |
| C                                 | -0.928375   | 7.234262   | -0.128330    | 0.8992 |

Source: author's compilation and estimated values obtained from Eviews

Notes: \* & \*\* denotes rejection of null hypothesis at 1% and 5% level significance.

The AIC had selected a model of ARDL (2,0,2,1,2,2)<sup>9</sup> specification. The long-run estimation results confirm a negative relationship between public debt and economic growth. However, the impact is insignificant which is consistent with Hayati & Rahman (2012). The reason behind this insignificant relationship can be ineffective utilisation of borrowed funds i.e. not being used properly in production process of the economy, mismanagement and corruption may also be part of this relationship.

On the other hand, government expenditure is statistically significant at 5 percent, it implies that on average government expenditure decreases GDP growth rate by 1.787 percent in the long-run, *ceteris paribus*. In the long-run the paper also expects openness to have a negative effect on GDP growth rate, this is supported by Owusu-Nantwi & Erickson (2016). Trade liberalization or the degree of openness maintained a negative sign it confirms the existence of a chronic deficit in the balance of payment. Similarly, the negative insignificant relationship between inflation and economic growth is also supported by Owusu-Nantwi & Erickson (2016). Inflation is expected to maintain a negative effect on economic growth, this is in support of the basic economic theory that states that an increase in the level of inflation raises the

<sup>9</sup> Appendix 4 graphically illustrates the ARDL model to select amongst the top 20 models and in this case ARDL (2,0,2,1,2,2) yields the lowest AIC.

cost of borrowing thus, affecting private investment thereby negatively influencing economic growth.

The next step of the ARDL model is the error correction and this is used to determine the speed of adjustment over the longer period and to determine the short-run dynamics. The results of the error correction model are presented in table 4 below.

**Table 5: Error Correction Model**

| <b>Cointegrating Form</b> |                    |                   |                    |              |
|---------------------------|--------------------|-------------------|--------------------|--------------|
| <b>Variable</b>           | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-Statistic</b> | <b>Prob.</b> |
| D(LOGGDP_GROWTH(-1))      | 0.356689           | 0.167837**        | 2.125214           | 0.0462       |
| D(LOGGOVTDEBT)            | -0.197735          | 0.538030          | -0.367517          | 0.7171       |
| D(LOGGOVTEXP)             | 0.854270           | 1.398378          | 0.610901           | 0.5481       |
| D(LOGGOVTEXP(-1))         | 1.757036           | 1.370009          | 1.282500           | 0.2143       |
| D(LOGINFLATION)           | 0.140610           | 0.712902          | 0.197236           | 0.8456       |
| D(LOGGFCF)                | -0.936867          | 5.470404          | -0.171261          | 0.8657       |
| D(LOGGFCF(-1))            | 9.857633           | 4.605271**        | 2.140511           | 0.0448       |
| D(LOGOPENNESS)            | 1.798725           | 1.401455          | 1.283469           | 0.2140       |
| D(LOGOPENNESS(-1))        | 3.664722           | 1.361224**        | 2.692226           | 0.0140       |
| ECT(-1)                   | -1.562578          | 0.243289*         | -6.422722          | 0.0000       |
|                           |                    |                   |                    |              |

Source: author's compilation and estimated values obtained from Eviews

Notes: \* & \*\* denotes rejection of null hypothesis at 1% and 5% level significance.

The error correction term ECT(-1) confirms that there exist a stable long-run relationship among the variables since it is significant and negative. The fact that the series is negative and significant implies that the series is non-explosive and that a long-run equilibrium is possible (Bal & Rath, 2014). The possibility attributed to the error correction model that measures the speed at which the endogenous variable adjusts to changes in the independent variables before converging to its equilibrium level. The coefficient associated with ECT(-1)<sup>10</sup> proposes an adjustment of approximately 150% towards the long run equilibrium. The results reveal that in the

<sup>10</sup> The coefficient proposed by the ECT of -1.5 that is statistically significant is consistent with the error correcting behavior though the desirable values of the ECT lies between 0 and -1. The coefficient of -1.5 means that the system corrects its previous disequilibrium at a speed of 150 percent and it indicates the sizeable speed of adjustment of disequilibrium correction for reaching long run equilibrium steady state position.

short-run the lag value of GFCF has a positive effect on economic growth. The t-statistics also indicate that the estimated coefficient for the lagged value of openness is statistically significant at the level of 5%. This is worth noting that the behaviour of GFCF is in-line with *our prior* expectation that the variables will have a positive effect on economic growth, holding all other factors constant. Openness failed to affirm to the postulated theory and sign (negative) in the short run analysis this can be attributed to the fact that the country exports mainly primary goods that are not likely to enjoy good terms of trade (Adu & Ackah, 2015). As for GovtDebt, Inflation and GovtExp, the impact they have on economic growth remains insignificant in the short run.

The final step of the ARDL model is to test the reliability of the short run and long run models through introducing the cumulative sum and cumulative sum of square on residuals of the estimated model.

## 5. Conclusions and policy recommendations

### 5.1 Conclusions

The paper examines the impact of government debt on economic growth in Namibia over the period of 1980 to 2016. The objective of the paper is to investigate whether public debt spurs or promotes economic growth. To ensure that we fully scrutinize this objective, this paper examines the theoretical predictions about public debt and economic growth. The paper evaluates Ricardian equivalence theory, Keynesian theory and the Debt overhang theory.

The analysis quantified economic growth through real GDP growth rate whilst public debt contained both domestic and external debt. The methodological approach used in this paper is an ARDL model that serves as an analysis of the short and long run connection between public debt and economic growth. Before estimating the model we tested for unit root by employing the PP and KPSS test. The findings revealed a mixture of  $I(0)$  and  $I(1)$  which then suggests an ARDL model.

In order to estimate the long run relationship in an ARDL model estimation technique, we need to employ the bound test, as it will suggest whether there is an

existence of this relationship. In our case, the bound test points to a long run relationship amongst the variables. The results of the long-run relationship show that the coefficient associated with public debt is negative but insignificant<sup>11</sup>. This is because of ineffective utilization of borrowed funds that are not being used properly in production process of the economy, mismanagement and corruption.

The long-run analysis also shows that government expenditure and openness have a negative effect on economic growth. As a corollary, only government expenditure and openness are more likely to have an effect on the economy in the long run. The arguments surrounding government expenditure is that the Namibian government spend most of its funds on operational expenditure rather than investment expenditure, which in turn can enhance the productive capacity of the economy.

The paper also reveals the short run dynamics between the variables. In this case, the lagged value of gross fixed capital formation suggests a positive impact on economic growth. As a result, a high gross fixed capital formation will essentially drive economic growth. Openness on the other hand, suggests a positive link with economic growth, this is in contradiction with what we expected. As specified by the study, these might be driven by the export of primary products that do not enjoy terms of trade.

## 5.2 Policy recommendations

The paper shows that the effect of public debt has proved to be negative and insignificant for Namibia this can be attributed to domestic debt dominating the total debt and thus the risk remains moderate. However, in recent years the debt-to-GDP ratio is above the targeted range therefore, though the effect is not significant the long-run effect might be serious (Checherita & Rother, 2010). As a corollary, debt acquired should be for projects that are vital and well-reviewed programs, self-sustainable and can enhance the productive capacity of Namibia. The government should also take a firm stand on fiscal consolidation, policies that are pro-growth and as well practising fiscal discipline<sup>12</sup>.

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<sup>11</sup> The paper acknowledges the examiners input and thus delves into explaining the reason for the insignificant relationship.

<sup>12</sup> Zaaruka (2007) also supports this.

Namibian policy makers should make an effort role in monitoring the public debt position to escape the risk of being trapped in the debt overhang predicament. This paper also reports that government consumption has a negative effect on economic growth. Thus, there is a need to improve and effectively manage government consumption as a tool of reducing public debt. In addition to this openness demonstrated to be helpful in terms of stimulating economic growth. For that reason, the paper seeks to motivate the country to be involved in trade related projects<sup>13</sup>. Moreover, Namibia should continue to borrow from the domestic economy, as the risk involved is lower since it will be dominated in Namibia dollar and it allows participants to share real profits.

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<sup>13</sup> An export-led growth strategy will come in handy to finance development activities and ultimately reduce the debt burden.

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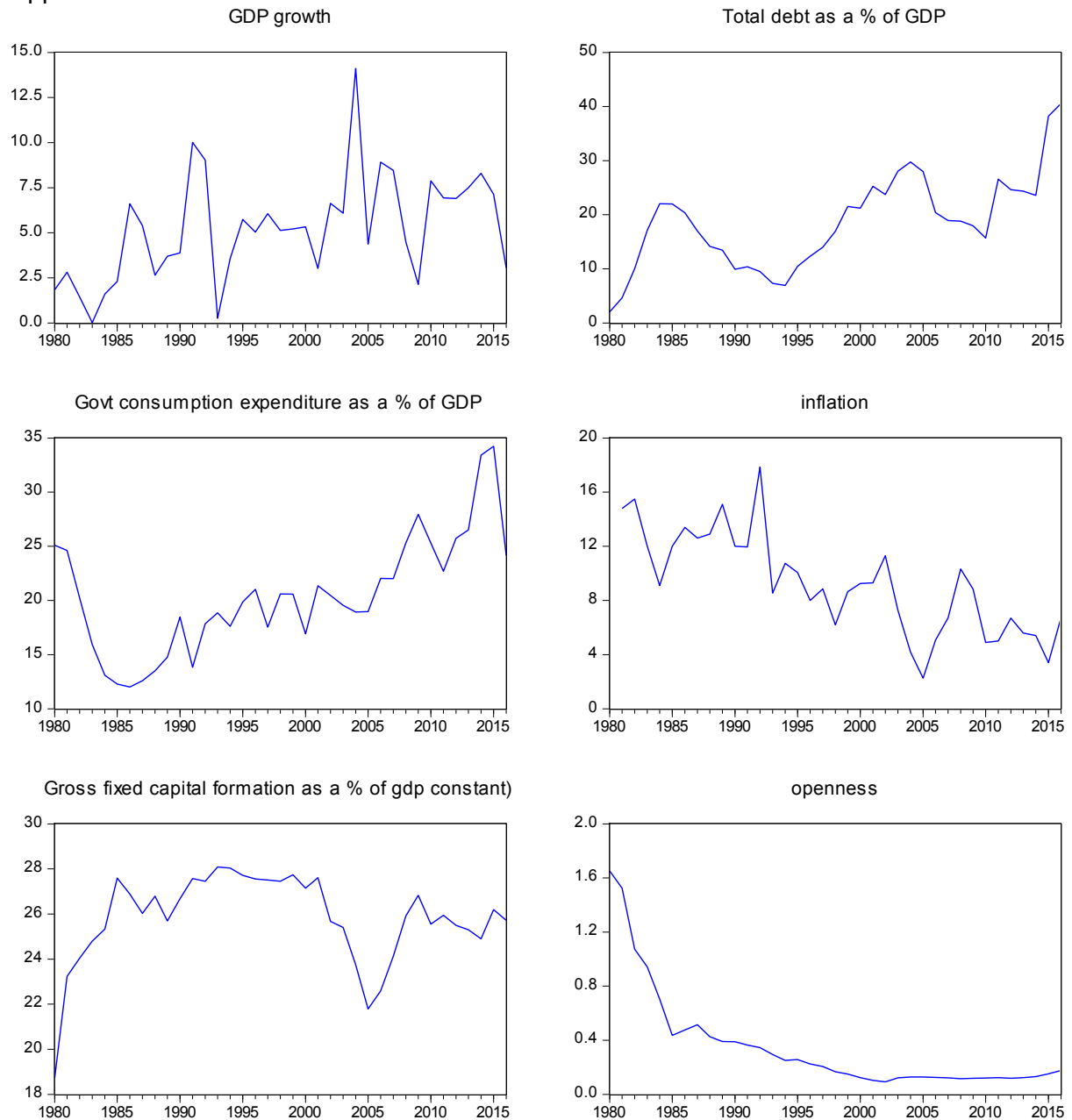
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# Appendices

## Appendix 1:



## Appendix 2.1:

### Breusch-Godfrey Serial Correlation LM Test:

|               |          |                     |        |
|---------------|----------|---------------------|--------|
| F-statistic   | 1.998771 | Prob. F(2,28)       | 0.1544 |
| Obs*R-squared | 4.497580 | Prob. Chi-Square(2) | 0.1055 |

## Appendix 2.2:

### Heteroskedasticity Test: Breusch-Pagan-Godfrey

|                     |          |                     |        |
|---------------------|----------|---------------------|--------|
| F-statistic         | 0.433381 | Prob. F(5,30)       | 0.8217 |
| Obs*R-squared       | 2.425118 | Prob. Chi-Square(5) | 0.7877 |
| Scaled explained SS | 2.406816 | Prob. Chi-Square(5) | 0.7905 |

Appendix 3: Short Run Model

Dependent Variable: LOG(GDP\_GROWTH)

Method: ARDL

Date: 01/05/18 Time: 09:05

Sample (adjusted): 1982 2016

Included observations: 35 after adjustments

Maximum dependent lags: 2 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic): LOG(GOVTDEBT) LOG(GOVTEXP)

LOG(INFLATION) LOG(INV) LOG(OPENNESS)

Fixed regressors: C

Number of models evaluated: 486

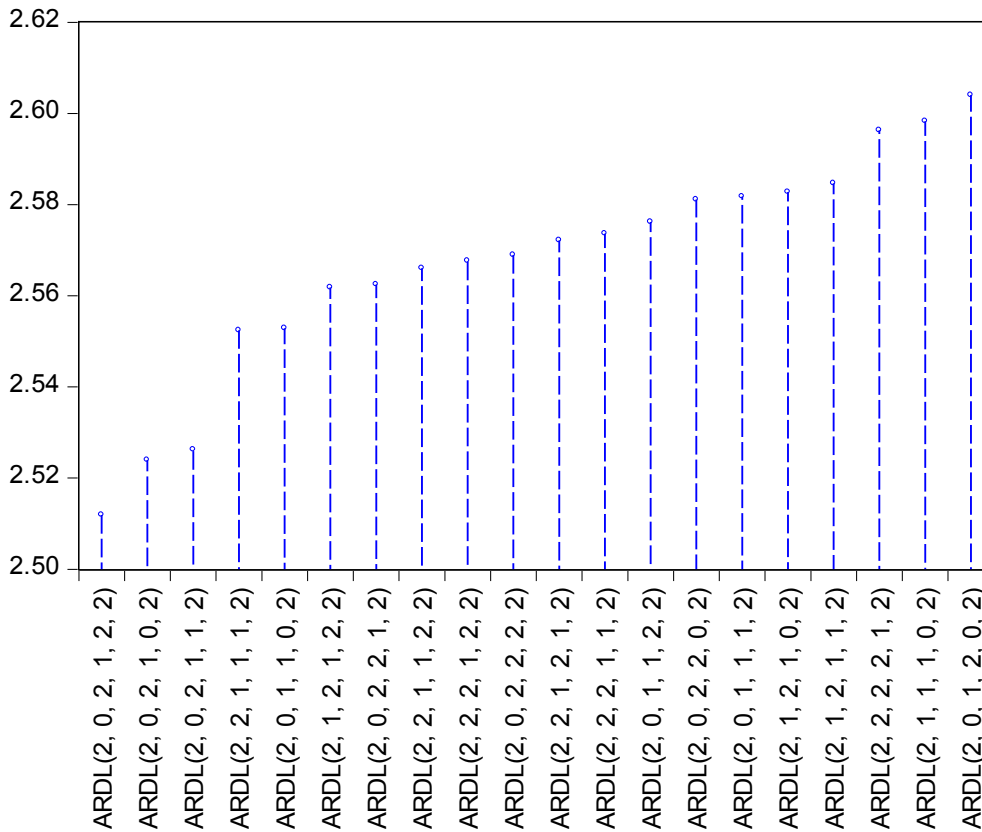
Selected Model: ARDL(2, 0, 2, 1, 2, 2)

Note: final equation sample is larger than selection sample

| Variable            | Coefficient | Std. Error            | t-Statistic | Prob.*   |
|---------------------|-------------|-----------------------|-------------|----------|
| LOG(GDP_GROWTH(-1)) | -0.205889   | 0.159885              | -1.287737   | 0.2125   |
| LOG(GDP_GROWTH(-2)) | -0.356689   | 0.167837              | -2.125214   | 0.0462   |
| LOG(GOVTDEBT)       | -0.197735   | 0.538030              | -0.367517   | 0.7171   |
| LOG(GOVTEXP)        | 0.854270    | 1.398378              | 0.610901    | 0.5481   |
| LOG(GOVTEXP(-1))    | -1.890253   | 1.571852              | -1.202564   | 0.2432   |
| LOG(GOVTEXP(-2))    | -1.757036   | 1.370009              | -1.282500   | 0.2143   |
| LOG(INFLATION)      | 0.140610    | 0.712902              | 0.197236    | 0.8456   |
| LOG(INFLATION(-1))  | -1.459615   | 0.569823              | -2.561525   | 0.0186   |
| LOG(INV)            | -0.936867   | 5.470404              | -0.171261   | 0.8657   |
| LOG(INV(-1))        | 15.09228    | 6.094866              | 2.476228    | 0.0223   |
| LOG(INV(-2))        | -9.857633   | 4.605271              | -2.140511   | 0.0448   |
| LOG(OPENNESS)       | 1.798725    | 1.401455              | 1.283469    | 0.2140   |
| LOG(OPENNESS(-1))   | 0.828070    | 1.950119              | 0.424625    | 0.6756   |
| LOG(OPENNESS(-2))   | -3.664722   | 1.361224              | -2.692226   | 0.0140   |
| C                   | -1.450658   | 11.27453              | -0.128667   | 0.8989   |
| R-squared           | 0.694059    | Mean dependent var    |             | 1.371034 |
| Adjusted R-squared  | 0.479901    | S.D. dependent var    |             | 1.193923 |
| S.E. of regression  | 0.861032    | Akaike info criterion |             | 2.836158 |
| Sum squared resid   | 14.82753    | Schwarz criterion     |             | 3.502735 |
| Log likelihood      | -34.63276   | Hannan-Quinn criter.  |             | 3.066260 |
| F-statistic         | 3.240867    | Durbin-Watson stat    |             | 1.994707 |
| Prob(F-statistic)   | 0.008304    |                       |             |          |

Appendix 4: AIC Models

Akaike Information Criteria (top 20 models)



Appendix 5: ARDL Cointegrating and Long Run Form

Dependent Variable: LOGGD\_GROWTH

Selected Model: ARDL(2, 0, 2, 1, 2, 2)

Date: 01/05/18 Time: 09:40

Sample: 1980 2016

Included observations: 35

| Cointegrating Form   |             |            |             |        |
|----------------------|-------------|------------|-------------|--------|
| Variable             | Coefficient | Std. Error | t-Statistic | Prob.  |
| D(LOGGDP_GROWTH(-1)) | 0.356689*   | 0.167837   | 2.125214    | 0.0462 |
| D(LOGGOVTDEBT)       | -0.197735   | 0.538030   | -0.367517   | 0.7171 |
| D(LOGGOVTEXP)        | 0.854270    | 1.398378   | 0.610901    | 0.5481 |
| D(LOGGOVTEXP(-1))    | 1.757036    | 1.370009   | 1.282500    | 0.2143 |
| D(LOGINFLATION)      | 0.140610    | 0.712902   | 0.197236    | 0.8456 |
| D(LOGGFCF)           | -0.936867   | 5.470404   | -0.171261   | 0.8657 |
| D(LOGGFCF(-1))       | 9.857633*   | 4.605271   | 2.140511    | 0.0448 |
| D(LOGOPENNESS)       | 1.798725    | 1.401455   | 1.283469    | 0.2140 |
| D(LOGOPENNESS(-1))   | 3.664722*   | 1.361224   | 2.692226    | 0.0140 |
| CointEq(-1)          | -1.562578*  | 0.243289   | -6.422722   | 0.0000 |

Cointeq = LOGGDP\_GROWTH - (-0.1265\*LOGGOVTDEBT -1.7874

\*LOGGOVTEXP -0.8441\*LOGINFLATION + 2.7504\*LOGINV -0.6642

\*LOGOPENNESS -0.9284 )

Long Run Coefficients

| Variable     | Coefficient | Std. Error | t-Statistic | Prob.  |
|--------------|-------------|------------|-------------|--------|
| LOGGOVTDEBT  | -0.126544   | 0.342774   | -0.369177   | 0.7159 |
| LOGGOVTEXP   | -1.787443*  | 0.834642   | -2.141567   | 0.0447 |
| LOGINFLATION | -0.844121   | 0.572152   | -1.475343   | 0.1557 |
| LOGGFCF      | 2.750442    | 2.385613   | 1.152929    | 0.2625 |
| LOGOPENNESS  | -0.664240*  | 0.295397   | -2.248633   | 0.0360 |
| C            | -0.928375   | 7.234262   | -0.128330   | 0.8992 |

Appendix 6: Ley Approach

The ley approach used by the existing literature involves using a simple algebraic application to test fiscal sustainability of the central government. These approach is a window based (excel) used to determine whether debt is explosive or convergent using the variables nominal interest rate, GDP deflator, real growth rate and real effective interest rate.

The approach defines debt sustainability as a scenario whereby a borrower is expected to service its debts without an unrealistically large future correction to the balance of income and expenditure (Ley, 2003). According to Ley (2003) debt becomes unsustainable when it accumulates at a faster rate than the borrower's ability to service it.

The Ley approach is expressed as follows:

$$D_t = (1 + r_t)D_{t-1} - B_t - M_t \quad (1)$$

Equation (1) express the government budget constraint where  $D_t$  denote the stock of Government debt at the end of year  $t$  where  $r_t$  represents the nominal interest rate,  $B_t$  primary balance (when  $B^t > 0$  means that the Government has a surplus) and let  $M_t$  denote the end-of-period stock of high-powered money.

The law of motion of the Government debt to GDP ratio is expressed as follows:

$$d_t = \frac{(1 + r_t)}{(1 + g_t)(1 + \pi_t)} d_{t-1} - (b_t + \mu_t) \quad (2)$$

$$d_t = \frac{(1 + i_t)}{1 + g_t} d_{t-1} - (b_t + \mu_t) \quad (3)$$

$$d_t = \varphi_t d_{t-1} - (b_t + \mu_t) \quad (4)$$

Where it is the real interest rate,  $t$  is the seigniorage,  $g_t$  is the real economic growth,  $d_t$  is stock of Government debt,  $b_t$  is the primary balance, and  $\varphi_t$  is a discount factor defined as  $\varphi_t = (1 + i_t) / (1 + g_t)$ . Equation (4) is the fundamental fiscal-sustainability identity. It is worth noting that  $\varphi_t$  is an endogenous factor. The most common

case in developing countries (and recently in developed countries) is that they have a positive interest rate differential ( $i_t < g_t$ ). If the interest—growth differential is positive or large, the debt-to-GDP ratio is regarded as being Explosive Debt-Dynamics ( $i_t > g_t \Rightarrow \varphi_t > 1$ ) as contrast to Convergent Debt-Dynamics ( $i_t < g_t \Rightarrow \varphi_t < 1$ ). If the interest-growth differential is positive or the large debt-to-GDP ratio will blow up unless the last term in equation (4) i.e.  $B_t$ , which is basically the Government primary surplus, is large enough to compensate for the explosiveness of the debt stock. This means that if the Government wants to achieve a target of debt-to-GDP ratio by a certain time period, while at the same time debt/GDP ratio is explosive they must run primary surpluses (equation 6), large enough to fill the gap each year. Stabilizing debt-to-GDP ratios subtract  $d_{t-1}$  on both sides of equation (3) to obtain an expression for the change in the debt-to-GDP ratio:

$$\Delta d_t = \frac{(i_t - g_t)}{1 + g_t} d_{t-1} - (b_t + \mu_t) \quad (5)$$

If we want  $\Delta d_t = 0$ , solve for  $(b + \mu)$  ...to obtain:

$$(b_t + \mu_t) = \frac{(i_t - g_t)}{1 + g_t} d_t - 1 \quad (6)$$

However, for a detailed methodology and the underlying assumptions on the Ley approach, see Ley (2003).

#### Appendix 7: Explanation of the ARDL model

The study adopted an ARDL approach to estimate the relationship between public debt and economic growth since this methodology allows for the inclusion of dynamic variables to mitigate the impact of the endogeneity of the explanatory variables. The model performance better than other cointegration techniques when variables of concern are of different orders of integration since it does not impose restrictive assumption that the variables must be intergrated of the same order. Ekanayake (2012) postulates that this feature minimized the possibility of estimation spurious relations, while retaining long-run information in addition for a finite sample, the model provides precise estimators and valid t-statistics. He further argues that the ARDL model has an advantage of lagging all independent variables that enter an equation, which mitigates any concurrent causation from the dependent variable to the independent variables, which consequently could be a biased estimate. Furthermore, The ARDL model has the advantage of yielding consistent estimates of the long-run coefficients that are asymptotically normal and this approach is carried out using ordinary least squares ascertaining the long-run relationships. Thus a ARDL bound tests for cointegration was carried in our analysis to test this long-run relationships and short-run dynamic interactions among the variables of interest. Moreover, the model uses only a single reduced form equation and it is necessary to avoid bi-directional causality the variables of concern (Ekanayake, 2012).