An empirical investigation into the impact of public debt on economic growth: The case of Zimbabwe (1980-2014)

BY

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DEDICATION

In loving memory of the late Mr and Mrs Mandizha whose tender love and guidance enabled me to discover myself. I will forever sadly miss you. To Lesley, Wesley, Chido, Enety and the rest of Mandizha family, I hope this milestone will keep you inspired.
ACKNOWLEDGEMENTS

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GOD BLESS!!!!!

ABSTRACT

Zimbabwe’s public debt has been mounting yet the real growth rate has been on average declining. Could this possibly mean that the escalating public debt is hampering the real growth rate of Zimbabwe? This study investigates the impact of public debt on economic growth in Zimbabwe for the period 1980-2014. The public debt stock is disaggregated into external debt and domestic debt in order to determine the impact of each on economic growth independently. The data was subjected to diagnostic tests before estimation. A long-run relationship was established amongst the variables real economic growth, domestic debt, external debt, budget deficit, external debt service and investment. Thus, a short-run Error Correction Model (ECM) had to be used to capture the dynamics in short-run disequilibrium towards the long-run equilibrium. The empirical results showed that external debt negatively affects the real growth rate of Zimbabwe, both in the short and long-run. This confirms the existence of ‘debt overhang’ in Zimbabwe. In the long-run, domestic debt positively affects economic growth. However, in the short-run, the effect is negative but insignificant. Several policy implications emerged from the empirical results. Zimbabwe should strengthen its debt management in order to keep the public debt within sustainable thresholds. Furthermore, the country can make use of debt to equity swaps by privatising underperforming parastatals. This would make them competitive and efficient. This move could attract more foreign direct investment inflows and create more employment thus lead to an increase in real growth rate of Zimbabwe.
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<th>Acronym</th>
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<tr>
<td>ADB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>ADF</td>
<td>Augmented Dickey-Fuller</td>
</tr>
<tr>
<td>AFRODAD</td>
<td>African Forum and Network on Debt and Development</td>
</tr>
<tr>
<td>BLUE</td>
<td>Best Linear Unbiased Estimators</td>
</tr>
<tr>
<td>DW</td>
<td>Durbin-Watson</td>
</tr>
<tr>
<td>ECM</td>
<td>Error Correction Model</td>
</tr>
<tr>
<td>ESAP</td>
<td>Economic Structural Adjustment Programme</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GNU</td>
<td>Government of National Unity</td>
</tr>
<tr>
<td>IFIs</td>
<td>International Financial Institutions</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>LDC</td>
<td>Least Developed Countries</td>
</tr>
<tr>
<td>MEFMI</td>
<td>Macroeconomic and Financial Management Institute of Eastern and Southern Africa</td>
</tr>
<tr>
<td>MDC</td>
<td>Movement for Democratic Change</td>
</tr>
<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>RBZ</td>
<td>Reserve Bank of Zimbabwe</td>
</tr>
<tr>
<td>SMP</td>
<td>Staff Monitored Programme</td>
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<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>WDI</td>
<td>World Development Indicators</td>
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<tr>
<td>ZAADDRS</td>
<td>Zimbabwe Accelerated Arrears Clearance, Debt and Development Strategy</td>
</tr>
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<td>ZADMO</td>
<td>Zimbabwe Aid and Debt Management Office</td>
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<tr>
<td>ZANU-PF</td>
<td>Zimbabwe African National Union Patriotic-Front</td>
</tr>
<tr>
<td>ZAREP</td>
<td>Zimbabwe Accelerated Re-Engagement Economic Programme</td>
</tr>
<tr>
<td>ZimAsset</td>
<td>Zimbabwe Agenda for Sustainable Socio-Economic Transformation</td>
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<td>ZIMSTAT</td>
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CHAPTER ONE
INTRODUCTION

1.0 Introduction

Economic theory suggests that reasonable levels of borrowing by a developing country can eventually boost economic growth (Patillo et al., 2002). At early stages of economic development, low-income countries like Zimbabwe borrow either domestically or externally to supplement low savings which are vital in enhancing investment prospects thereby improve the rate of growth of national income. As long as borrowed funds are ploughed back and properly exploited in productive capacities like investment, growth is thus expected to increase. This can only be possible in the absence of macroeconomic instability, distortionary economic incentives or spacious adverse internal and external shocks (Cohen, 1993).

Many least developed countries (LDCs) suffer from persistent internal deficiency of investable funds. This restrictive access regarding investable funds in the economy can be eradicated with the help of debt in LCDs where money markets and capital markets are not fully developed especially in sub-Saharan Africa (McKinnon, 1973). This critic contends that debt accumulation by the public sector either domestically or externally would alleviate the shortage of funds available for the economy. Such borrowing would channel funds to vibrant sectors in the economy with dominant linkages paving way for growth of the entire economy.

Conversely, unwarranted reliance on public debt may also have the potential of increasing macroeconomic risks that can deter economic growth. Even with a concessional stream of loans, a high public debt may effect amplified proceeds to service the debt which would unquestionably have social, economic and political repercussions in the absence of a broad fiscal space. As a result, the government may be left with no other alternative but rather to economise on public apportionments that can have positive externalities in the long-term (Iyoha and Iyare, 1994).

The size of public debt in the long-term comprising of domestic debt and external debt affects individual citizens, the government, privately owned corporate organisations and consequently the economy at large. Domestic debt consists of all debt liabilities of resident public sector units to the resident private sector within that country. External debt may be defined as the outstanding debt owed to non-residents by residents of an economy (IMF, 2003).
When governments borrow domestically, they exhaust available domestic private savings that would otherwise have been accessible to the private sector. In turn, the smaller residual pool of loanable funds in the market increases the cost of capital for private borrowers, reduces private investment demand and hence capital accumulation. The end result will be condensed growth and welfare. This is referred to as “crowding-out effect” on private investment (Diamond, 1965).

External borrowing has both benefits and costs to debtor countries. However, in the manifestation of debt crisis, the costs of foreign borrowing may surpass the benefits for many developing countries like Zimbabwe. Borrowing externally supplements the resource gap in debtor countries so as to enhance economic growth, whereas the detriment arises from debt service commitments. As the size of the debt or interest rate increase so does the debt service burden causing unsustainable debts.

Soludo (2003), opined that developing countries typically borrow for two broad reasons, that is, for fiscal reasons (to cover budget deficits, augment savings for investment and to increase consumption) or to finance transitory balance of payments deficit in the absence of reserves. This implies that an economy indulges in debt to boost economic growth. But when the initial debt stock propagates and exceeds a certain limit, then debt service commitments can crowd out investment and deter growth.

1.1 Statement of the research problem

Do high public debt levels boost or retard economic growth? This is an important policy question which have attracted a lot of attention from economists, policy makers and the public at large. As for Zimbabwe, the increasing amount of public debt since 1999 has been a cause of concern, the prevailing economic and financial condition remains challenging. Growth has slowed, unemployment is rising and economic activities are increasingly shifting towards the informal sector. The external position of the country remains precarious in spite of the economic reforms such as Economic Structural Adjustment Programme (ESAP) pursued in the early 1990s. Zimbabwe only recorded modest growth coupled with consecutive high levels of inflation, chronic budget deficits and unsustainable balance of payment deficits.

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1 Debt service is the successive payment of principal plus the accumulated interest, which is also referred to as amortization through the life of the loan (IMF, 2003. p. 7).

2
The swelling public debt might have prevented the country from accomplishing some of the Millennium Development Goals (MDGs)\(^2\) which were set for 2015, in particular, the development of global partnership for economic development and the eradication of extreme poverty and hunger. Substantial resources meant for critical areas like health care, education and social services which could enhance growth and development in the long-term have been diverted to service the escalating public debt (Saungweme and Mufandaedza, 2013). Furthermore, carrying this hefty debt burden has resulted in the country losing its credit worthiness as well as missing several opportunities to secure new lines of concessional funding owing to uncertainty in repaying back to creditors (UNDP, 2011).

High debt service also contributed in depleting domestic savings and foreign exchange revenues that could be ploughed back to further increase investments. Furthermore, the country's mounting public debt stock can scare away foreign investors due to uncertain macroeconomic environment (Checherita and Rother, 2010).

Could this possibly mean that the declining growth rate is a result of the escalating public debt? In light of this, it is important to clarify the effect that public debts (domestic and external debt) has on economic growth so that in the long-term, debts can be kept at acceptable thresholds.

### 1.2 Objectives of the study

The broad objective of this study is to empirically investigate the impact of domestic debt and external debt on economic growth independently.

The specific objectives include:

- To examine whether it is domestic debt or external debt that has a greater effect on economic growth.
- To establish the short-run and long-run relationship between domestic debt, external debt and economic growth.

### 1.3 Research questions

1) What relationship exists between domestic debt and economic growth in Zimbabwe?

\(^2\)The Millennium Declaration encompassed the following Millennium Development Goals by 2015. **Goal 1**: Eradicate extreme poverty and hunger, **Goal 2**: Achieve universal basic education, **Goal 3**: Promote gender equality and empower women, **Goal 4**: Reduce child mortality, **Goal 5**: Improve maternal health **Goal 6**: Combat HIV/AIDS, Malaria and other diseases, **Goal 7**: Ensure environmental sustainability, **Goal 8**: Develop global partnership for development
2) What effect does external debt have on economic growth in Zimbabwe?
3) Is the intensity of external debt on economic growth greater as compared to domestic debt or vice-versa?
4) Does a short-run and long-run relationship exist between domestic debt, external debt and economic growth in Zimbabwe?

1.4 Hypothesis of the study

Hypothesis 1 \( H_0: \) Domestic debt positively affects economic growth

Hypothesis 2 \( H_0: \) External debt negatively affects economic growth

1.5 Justification of the study

The empirical literature which tried to separate the impact of public debt into domestic debt and external debt is relatively scarce. The available literature on public debt and economic growth has typically concentrated more on external debt in isolation, (see Sulaiman and Azeez, 2012; Clements et.al, 2003; Boboye and Ojo, 2012). Very little attention has however been devoted to the subject matter of domestic debt in developing countries like Zimbabwe despite its potentially significant impact on macroeconomic stability, private sector lending, government budgets and the ultimate growth performance.

This study is therefore aimed at filling this gap left by previous authors like Rabia and Malik (2012) carrying out similar research and contribute on the basis of empirical findings by incorporating the influence of domestic debt on economic growth. By using the most recent data from the period 1980 to 2014 to investigate the impact of public debt on economic growth in Zimbabwe, the study will investigate whether the declining growth rate of Zimbabwe is as a consequence of the mounting public debt. The effect of public debt will be disaggregated into domestic debt and external debt to analyse the possible consequences of internal and external borrowing on Zimbabwe’s growth initiatives.

The research will provide current information which may be necessary in resolving the country’s debt situation. Policy recommendations in this research can be exploited by the government in crafting debt policies in order to resolve the country’s debt problem and further enhance economic growth. The recommendations provided by this research may be useful to agencies like Ministry of Finance and Economic Development, Reserve Bank of Zimbabwe and Zimbabwe Aid and Debt Management Office (ZADMO) as they are the ones involved in the country’s debt resolution.
1.6 Organization of the rest of the study
This study is divided into six chapters. Contents in the first chapter include the introduction on the relationship between public debt and economic growth. Chapter two provides the background on the origins of Zimbabwe’s public debt, debt structure and trend analysis. Chapter three reviews both theoretical and empirical literature on previous studies. The focus of the fourth chapter is to outline the econometric methodology that is going to be used in this study, justification of variables used in the model and estimations to be carried out. Chapter five presents econometric estimations and interpretation of empirical results. The sixth chapter provides the summary, conclusion, policy recommendations, weaknesses of the study and suggests areas for further research.
CHAPTER TWO
PUBLIC DEBT AND ECONOMIC GROWTH

2.0 Introduction
This chapter provides an overview of the origins of Zimbabwe’s public debt and strategies carried out to resolve the public debt burden. The structure and composition of Zimbabwe’s public debt is reviewed in the period under study (1980-2014). Tables and trends of public debt and Gross Domestic Product (GDP) growth rates will also be analysed to give a clear view of developments in the public debt.

2.1 Origins of Zimbabwe’s public debt
Figure 1 below shows the trends of Zimbabwe’s real growth rate, domestic debt and external debt from 1980 to 2013.

Figure 1: Trend of Real GDP, External Debt and Domestic Debt

![Trend of Real GDP, External Debt and Domestic Debt (1980-2013)]

Source: Author’s own computation using data from World Bank (2015)- RGDP-Real Gross Domestic Product, ED-External Debt Stock, DD-Total Domestic Debt Stock

From figure 1 above, the economy grew by an average of 2.1 percent between 1980 and 2013. A record drop of -18 percent was recorded in 2008 where hyperinflation almost brought the entire country to a halt. External debt (ED) has been increasing over the years since 1980 averaging 40.6 percent of real GDP due to mostly interest payments and penalties on defaults. Domestic debt has been increasing steadily by an average of 20.4 percentage of real GDP from 1980 to 2013. Since 2009, both external and domestic debt have been declining when the
economy dollarised, easy access to foreign currency and stability of the major anchoring currency the US$ facilitated in servicing the public debt.

From figure 1, it can be seen that Zimbabwe entered 1980 with a public debt that date back to phases before independence. Upon the attainment of independence in 1980, a debt of US$700 million was inherited from the Rhodesian government (Jones, 2011). This inherited and unwarranted debt was short-term and of high interest imposing a large repayment burden. Although constrained by this debt burden, the economy of Zimbabwe was at its best performance soon after independence in 1980. The economy grew by an average of around 5.5 percent higher than the average for sub-Saharan African (SSA) countries which stood at 3.8 percent (AFRODAD, 2015). The economy was characterised by robust economic linkages, that is, the backward and forward inter-sectoral connections which stimulated growth and development.

The government assumed direct control in some areas of production with the view of mitigating socio-economic disparities between the white minority and the black majority. Price controls and subsidies were effected as key tenets of a socialist ideology adopted by the government just after independence. Even though the ideology was good from a social perspective, it resulted in the creation of large and inefficient administrative sectors in the economy. Towards the end of 1980, the central government disbursements increased from 32.5 percent of GDP in 1979 to 44.6 percent in 1989 (Jones, 2011). Public spending skyrocketed, particularly in civil service and this in turn generated prolonged budget deficits. The excess government expenditures had to be met by borrowing from foreign sources since the domestic market had very little to offer to the government. The government had access to external funding during that time, but the unwarranted dependence on external borrowings for financial budgetary support instigated the genesis of Zimbabwe’s public debt.

Natural disasters also played a role in worsening the debt level. In 1983, 1985 and 1988, the country experienced severe droughts which forced the government to commit resources towards drought alleviation measures. This further worsened the country’s fiscal and debt position thereby forcing the government to further borrow externally in order to relieve the natural catastrophe (Saungweme and Mufandaedza, 2013).

Zimbabwe entered the 1990s with a large fiscal imbalance emanating from high government spending and declining export tax revenues caused by the collapse of world commodity prices in the late 1980s. Budget deficits in excess of 7 percent of GDP led to rapid monetary growth,
high inflation, and large current account deficits (Moss and Leo, 2009). External debt increased sharply from 1990. In this period, the government of Zimbabwe began to implement a rapid liberalisation programme called the Economic Structural Adjustment Programme (ESAP). ESAP was initiated by the IMF in a move that was meant to drive the economy towards capitalism and geared towards restoring macroeconomic stability and creation of an efficient and effective economic environment.

ESAP was presented as being a homegrown policy, but however, lenders such as the World Bank also made it a pre-condition for Zimbabwe to receive new funding in order to keep paying previously borrowed funds (Moss and Leo, 2009). Under the ESAP, the government of Zimbabwe’s fiscal policy objective was to reduce the budget deficit from 11 percent of GDP in 1990/91 to 5 percent of GDP by 1994/95. The reduction in budget deficit was to be met by cutting public expenditure to 38 percent while reducing the tax burden to about 33 percent of GDP (Moss and Leo, 2009).

The IMF followed by the World Bank began disbursing loans to support the ESAP and were soon accompanied by other lenders such as the African Development Bank (ADB) and bilateral donors such as the Danish, British, German and Swedish governments. An estimated US$370 million of Zimbabwe’s debt to the World Bank comes from these structural adjustment loans. African Development Bank also gave loans to support structural adjustment disbursing US$200 million, IMF disbursed US$440 million in loans between 1992 and 1995 both to support the structural adjustment programme and to assist in response to the drought (UNDP, 2011). In this period, the real growth rate was declining by an average of 5 percent due to severe droughts.

Zimbabwe’s last chance to secure developmental assistance from the World Bank was the US$30 million credit facility provided to small project businesses disbursed between 1996 and 2000. The World Bank argued that there was effectively a negative financial return on the project as the deterioration of the Zimbabwean economy severely impacted on small business borrowers. The economy started slowing down from 9.6 percent growth recorded in 1996 to negative 8.1 percent in 2000 (AFRODAD, 2015). Even though growth was falling, the World Bank maintained that trade liberalisation and investment deregulation carried out under the ESAP were successful. The blame however was put on droughts, external economic shocks such as the Asian financial crisis, devaluation of the South African rand and government’s unbudgeted spending increases.
Other factors that contributed to an increase in the public debt in the 90s includes: the war in the Democratic Republic of Congo in 1998 which cost the government US$360 million a year, support for newly resettled farmers under the land reform programme in 2000, liberation gratuities to war veterans in 1997, financial liberalisation and tax reductions which increased government deficits. All these factors deterred investment and growth (UNDP, 2011).

Zimbabwe started to default on its debt service payments around 1999. The accumulation of arrears on the principal debt impacted negatively on the country's creditworthiness, resulting in the withdrawal of financial assistance by the country's traditional financiers in 2000. Following the withdrawal of financial assistance, government resorted to domestic borrowing resulting in domestic debt stock progressively increasing by an average of 21 percent of GDP over the years (AFRODAD, 2015).

The formation of a coalition Government of National Unity (GNU) between ZANU-PF and MDC led to the stabilisation of the Zimbabwean economy in 2009, economic growth in this period was supported by high prices for the country’s commodity exports owing to the adoption of multicurrency system. A historic rise in economic growth was recorded in 2009 with 11.3 percent rise in GDP (Bonga et al. 2015). The GNU also provided a platform for the re-engagement of Zimbabwe with the international community which led to a closer collaboration between development partners and state institutions.

In 2009, the Reserve Bank of Zimbabwe managed to repay a large local currency denominated debt. Hyperinflation which reached over 500 billion percent 2008, made the value of the domestic debt valueless. Hence, the government was able to flawlessly clear these obligations with a qualified simplicity. The move saw domestic debt falling sharply from 60 percent of GDP in 2008 to 43 percent in 2009. The remainder of domestic debt was denominated in foreign-currency (AFRODAD, 2015).

Zimbabwe is set to receive more development assistance estimated at $468.2 million in 2016 with bilateral partners having pledged $249 million and multilateral partners $219 million. Projects to be financed using these loans include social services, poverty reduction and infrastructure utilities. Of the stated loan amounts, US$557 million was expected in the year 2015 in the form of loans and joint venture arrangements. These loan resources will be channeled towards various Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZimAsset) infrastructure development projects, necessary for supporting the productive sectors of the economy (AFRODAD, 2015).
As at 2015, the country’s public debt was estimated at US$8.4 billion with US$7.1 billion being external debt and US$1.3 billion being domestic debt. The ever growing external debt stock for the country is mainly a result penalties and interest on un-serviced debts. Of the mentioned US$7.1 billion external debt, accumulated arrears account for 81 percent of the total external debt (IMF, 2015). The table below gives an overview of Zimbabwe’s domestic and external debt.

Table 1: Structure of Zimbabwe’s Public Debt in (US$ millions)

<table>
<thead>
<tr>
<th></th>
<th>Debt</th>
<th>Arrears</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Debt</td>
<td>1290</td>
<td>0</td>
<td>1290</td>
</tr>
<tr>
<td>External Debt</td>
<td>1444</td>
<td>5634</td>
<td>7078</td>
</tr>
<tr>
<td>Bilateral Creditors</td>
<td>1070</td>
<td>2959</td>
<td>4029</td>
</tr>
<tr>
<td>Paris Club</td>
<td>226</td>
<td>2808</td>
<td>3034</td>
</tr>
<tr>
<td>non-Paris Club</td>
<td>844</td>
<td>151</td>
<td>995</td>
</tr>
<tr>
<td>Multilateral Creditors</td>
<td>374</td>
<td>2088</td>
<td>2462</td>
</tr>
<tr>
<td>Reserve Bank External</td>
<td>0</td>
<td>587</td>
<td>587</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2734</td>
<td>5634</td>
<td>8368</td>
</tr>
</tbody>
</table>

Source: Ministry of Finance (2014)

From table 1 above, statistics reveals that the total public debt has breached US$8.368 billion. The bulk of this public debt is external whilst a small but significant fraction is domestic. External debt comprises of new payment arrears, interest and penalty charges on existing payment arrears of US$5.6 billion against an outstanding debt of US$2.7 billion. Domestic debt is as a consequence of treasury bills issued for budget cash flow support, statutory reserves, Reserve Bank capitalisation and input suppliers (AFRODAD, 2015)

The bulk of the US$7.078 billion external debt is owed to bilateral creditors (US$4 billion) whilst multilateral institutions are owed US$2.5 billion, Reserve Bank of Zimbabwe’s external borrowings constituting US$587 million (Government of Zimbabwe, 2015). A breakdown of the external debt owed to multilateral creditors is illustrated in the figure below:
From figure 2 above, the World Bank occupies a greater share of Zimbabwe’s external debt with IMF constituting a small fraction. Amongst the Bilateral Creditors, the Paris Club\(^3\) is owed US$3.034 billion and non-Paris Club\(^4\) members US$995 million.

Clearing Zimbabwe’s debt and arrears as well as securing comprehensive debt relief will be a critical step in eventual economic recovery. By so doing, the government will secure new lines of concessional funding, create a conducive investment climate which would enhancement the overall macroeconomic performance. It will untangle hundreds of millions of dollars in new concessional funding and external assistance for critical reconstruction programs that would improve Zimbabwe’s growth prospects.

### 2.2 Public debt resolution strategies

The Government established the Zimbabwe Aid and Debt Management Office (ZADMO) within the Ministry of Finance in 2010 in order to strengthen its debt management. Financial support for ZADMO came from development partners such as the African Development Bank (AFDB) and the United Nations Development Programme (UNDP). Technical support came from the Macroeconomic and Financial Management Institute of Eastern and Southern Africa (MEFMI) and partners such as the United Nations Conference on Trade and Development

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\(^3\) Major Paris Club members includes Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Norway, Italy Japan, Holland, USA, Sweden, Spain, Switzerland, UK and Russia.

\(^4\) Major non-Paris Club bilateral creditors include China, Kuwait, Libya, and Saudi Arabia.
(UNCTAD). ZADMO has been able to carry out activities such as data validation and reconciliation and managed to set up structures necessary for effective debt management (Monyau and Bandara, 2014)

In line with ZADMO, The government also adopted the Zimbabwe Accelerated Arrears Clearance, Debt and Development Strategy (ZAADDS)\(^5\). ZAADDS is aimed at accelerating the re-engagement of creditors, including International Financial Institutions (IFIs). As part of ZAADDS, the government through the Ministry of Finance has begun a process of re-engaging creditors, including multilateral financial institutions. Since 2009, the government has made efforts to restructure the economy and came up with several strategies including the adoption of the multi-currency system.

The Government of Zimbabwe adopted a Staff Monitored Programme (SMP) initiated by IMF in 2013. The SMP is viewed as an essential element of the ZAADDS together with the Zimbabwe Accelerated Re-Engagement Economic Programme (ZAREP). If the SMP is completed, the government will be in a position to settle all outstanding arrears owed to international creditors and secure new funding (Government of Zimbabwe, 2015).

An arrears clearance strategy was also approved by creditors in 2015 to address Zimbabwe’s huge debt burden. The plan involves clearing US$1.8 billion arrears to three creditors through an amalgamation of using the country’s own resources, arrangement of bridge finance with regional and international banks and the usage of bilateral loan facilities. It comprises of clearing arrears to three institutions with the IMF (US$110 million), the World Bank (US$1,15 billion) and the ADB (US$601 million) by the end of April 2016. Zimbabwe will also develop a new comprehensive country financing programme supported by the ADB, IMF and the World Bank. The programme will attract long-term financing to promote growth and debt sustainability by engaging the European Investment Bank, the Paris Club and non-Paris Club bilateral creditors for debt resolution (Government of Zimbabwe, 2015).

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\(^5\) Zimbabwe Accelerated Arrears Clearance, Debt and Development Strategy (ZAADDS) has the following key policy elements: (i) Establishment and operationalization of a Debt Management Office; (ii) Undertaking a validation and reconciliation exercise of Zimbabwe’s external debt database with all creditors; (iii) Re-engagement with the international community for the removal of sanctions; (iv) Negotiating with creditors and the development partners for arrears clearance, debt relief and new financing; and (v) Leveraging Zimbabwe’s natural resources in pursuit of debt relief (ZAADDS, 2010) .
2.3 Conclusion
This chapter exposed the genesis of Zimbabwe’s public debt since the attainment of independence in 1980. External debt constitutes the bulk of Zimbabwe’s total public debt. The rising external debt is mainly as a result of the principal amount, interest on arrears and penalties on default. Multilateral institutions occupy a huge portion of this external debt with the World Bank being the highest creditor. Zimbabwe is finding it difficult to deal with this hefty burden thus, there is need to devise solutions to deal with this problem which could be affecting economic growth. In order to assess the impact of public debt on economic growth, it is important to reflect on what theoretical literature entails about the relationship between public debt and economic growth. Therefore, the next chapter reviews both theoretical and empirical literature on the impact of public debt on economic growth.
CHAPTER THREE
LITERATURE REVIEW

3.0 Introduction
The main objective of this chapter is to review both theoretical and empirical literature. It serves to highlight various established channels which public debt can affect economic growth. The first section looks at theoretical literature between public debt and economic growth which forms the backbone of this study. The second section highlights the empirical literature that relates public debt and economic growth.

3.1 Theoretical Literature Review

3.1.1 Classical views on public debt
The views of Classical economists on public debt are centred around their faith regarding the roles of the government in the economy. The Classicals had the view that the State functions should be minimum. The government had to maintain only internal law and order, defence from external aggression and look after some public works. Smith (1776) and Ricardo (1817) were of the view that the governments were wasteful and unproductive. It diverts borrowed funds away from private capitalists and deprived them of capital which is needed for promoting production and trade so as to enhance economic growth. Therefore, there is no need for government intervention in the smooth going economic activities and if any calamity befalls, it will be brought to equilibrium point automatically.

When the government is performing minimum functions, then there will be no huge public expenditures that demands large revenues. Furthermore, the government does not require raising funds in the form of public debt, according to Ricardo (1817), a public debt can be regarded as an evil which almost any sacrifice would not exterminate. It distorts the free play of market forces and destroys equilibrium prices. A debt results in higher taxes and inflation which rewards spending-tariffs and shoves away savers. It weakens the productive capability of the people and eventually weakens and destroys even a wealthy nation. Thus, public debt will inflict unnecessary burden on the shoulders of the community.

A public debt is created when the government borrows funds from the private sector. This interference will distabilise the natural order of the economy which is conducive for the creation of wealth and an increase in the material welfare of the nation. Government borrowing
makes future financing more difficult by increasing the amount of taxes which must be paid to finance the interest rate on the debt. Though deficits are less painful than current taxes, unbalanced budgets will cause an expansion of government spending and can invite reckless administrative actions (Smith, 1776).

The Classicals’ theory can be criticised mainly on two grounds. Firstly, not all government expenditures are unproductive, hence public borrowing may not always be a burden upon the economy at large. Secondly, the traditional view regarding the shifting of debt may not be correct. The real burden can also be borne in the same period the expenditures are incurred thus, there will be no inter-generational transfer but a transfer within the same generation.

3.1.2 Keynesian Theory of Public Debt.

The Keynesian revolution fashioned theoretical results exclusively different from the body of economic thought prevailing in the Classical era. The Classical theory of public debt had absolutely collapsed, it had taken for granted full employment and unproductiveness of public expenditures during the Great Depression of 1930s.

Keynes (1936:36) recommended that the absolute size of the public debt does not matter. What matters most are the large interest payments that have to be made, but they do not institute any burden upon the society at large. A huge public debt can be treated as a national asset rather than a liability. Through debt creation, the government can tap savings streams, place the resources to productive use which together would promote economic growth.

The increased streams of income from debt creation would facilitate the payment of taxes to service the debt. At the time of unemployment, increase in public debt subsidises current capital formation. It will stimulate the development of progressively more institutionalised sources of savings like banks, stock markets and insurance companies. It helps to curb consumption, encourages savings and promotes capital formation which will make it possible for the people to improve their standards of living. Therefore, according to Keynes’s proposition, a large debt if used productively in investment capacities would stimulate a multiple chain of causation in the circular flow of income. The process works through the ‘multiplier process’ where an initial injection in the form of government spending will generate multiple increase in national income.
3.1.3 Ricardian equivalence

In contrast to the Classicals and Keynesian views on public debt, the Ricardian Equivalence proposition found its roots in the following assumptions: (a) perfect capital markets with no borrowing constraints (b) non distortionary taxes (c) perfect certainty about future taxes and (d) equal planning horizon for private and public sector. Ricardo (1817:245) stated that a public debt is equivalent to future taxes, and if consumers are forward-looking, future taxes are equivalent to current taxes. Hence, financing the government by debt is equivalent to financing it by taxes.

The implication of Ricardian equivalence is that a debt-financed tax cut leaves consumption unaffected. Households save the extra disposable income to pay the future tax liability that the tax cut implies. This increase in private saving exactly offsets the decrease in public saving. The sum of private and public saving remains the same leaving real consumption, investment and output are unaffected.

Following the renowned work of Barro (1974), the equivalence proposition received a rehabilitated consideration. Barro (1974) suggested that for a given path of government consumption, the timing of taxes or equivalently the accumulation or decumulation of public debt does not affect private consumption, savings and national income. In a closed economy, it consequently leaves the interest rate, investments and output unchanged.

If this proposition holds, the possibility of fiscal policy as a stabilisation device of the economy will be very restricted. This is in a sharp contrast to the basic Keynesian perspective. From the Keynesian point of view, public debt accumulation or a tax reduction in one period increases private consumption and hence affects other macroeconomic variables such as output and unemployment. Barro (1974) strongly argued that, government debt does not affect consumption, savings, private investment or economic growth.

3.1.4 Debt-Overhang Hypothesis

One central question on public debt and growth is "why huge levels of accumulated debt retard the growth rate of a country?". A well-known justification comes from the “Debt-Overhang Hypothesis”. Debt-Overhang depicts a situation whereby a country’s debt is very large to an extent that the domestic resources cannot be dissolved to service the debt. The consequences associated with debt servicing can deter domestic and foreign investment which can obstruct economic growth (see Krugman 1988; Sachs 1989; Cohen 1993).
Fearing that their returns in the domestic economy will be effectively taxed away, potential domestic and foreign investors will be reluctant to increase their present investment expenditures for the sake of future increased output, and thus, economic growth is depressed. The debt-overhang theory spins around the adverse effects of debt on investment in physical capital. Borensztein (1990) also defined debt overhang as a situation in which the debtor nation benefits marginally from the returns on additional investment due to huge debt service obligations. The “debt overhang effect” comes into play when accrued debt stock discourages investors from investing in the private sector for fear of heavy tax placed on them by the government. This is known as tax disincentive.

Agenor and Montiel (1996) contend that investment and growth are correspondingly tumbled by debt overhang through increasing uncertainty. As the size of the public debt increases, there will be growing uncertainty about future actions and policies that the government may pursue in order to meet its debt servicing commitments. When the stock of public debt rises, investors might have the perception that the government may finance its debt service obligations by increasing taxes. Serven (1997) contended that private investors may postpone their investments if they anticipate uncertain payoffs on their investments. Investments undertaken prior to an uncertain economic environment will be sub-standard and cannot facilitate sustainable growth.

### 3.1.5 Debt Laffer Curve hypothesis

The Debt Laffer Curve hypothesis proposes that debt financing by the public sector can enhance investment and growth up to a certain level, beyond that level, its impact will be detrimental to investment and growth. As designated by Cohen (1993), when the stock of debt surpasses a certain limit, the possibility of paying back the borrowed funds becomes uncertain thus depresses economic growth. A country can still grow when the debt level is low because the possibility of paying back will be very high (zero probability of default). There will be growing uncertainty in repaying back when the size of the debt grows so large. The probability of defaulting will start to rise leading to growth increasing at a decreasing rate until it finally diminishes as depicted by diagram 1 below:
Diagram 1: Debt Laffer Curve

From diagram 1 above, the relationship between economic growth and debt stock accumulation can be explained by the Debt-Laffer curve. The vertical axis ($G$) denotes the growth rate of a country and the horizontal axis ($D$) represents the size of the debt stock. The point $D^*$ is the threshold level which a debt can accumulate. The size of the debt will have positive effects on growth at all points to the left side of $D^*$. However, growth will start to increase at a diminishing rate beyond point $A$ on the curve. When the curve is at its peak at point $E$, any further increase in debt will reduce the growth rate of a country. Therefore, the maximum limit to debt accumulation is the point $H$ which corresponds to the debt stock $D^*$. Beyond is the threshold level, any further increase in debt will retard economic growth.

3.1.6 “Crowding-Out” Hypothesis
Cohen (1993) rejected the debt-overhang hypothesis and perceived that apart from the effect of high debt stock on investment, debt can also affect growth through the accumulated debt service payments. These debt service payments have the possibility of crowding-out private and public investment in the economy. The crowding-out effect refers to a situation whereby a nation’s revenues are used to make debt service payments. This limits the resources available for use in the domestic economy as most of it is used to service the debt burden which will result in depressed investment level.
The impact of debt servicing on economic growth is damaging as a result of debt-induced liquidity constraint which diminish government expenditure in the economy. These liquidity constraints arise as a result of debt service requirements which shift the attention of the government and potential investors from developing the domestic economy to repayments of the debt. Public expenditure on social infrastructure will be reduced substantively and this affects the level of public investment in the economy resulting in reduced economic growth (Cohen, 1993).

Clements et.al (2003) also proposed that external debt servicing as opposed to the stock of debt can crowd out private investment thus leading to depressed growth by shifting the composition of public expenditure. Moreover, debt service payments can also have adverse effects on the alignment of public spending by embracing the resources available for infrastructure and human capital resulting in lower growth rate of the economy.

3.2 Empirical literature review

Empirical literature on public debt and economic growth is relatively scarce. Recent studies by Sulaiman and Azeez (2012) and Faraji and Makame (2013) have concentrated on impact of external debt on economic growth independently. These studies have neglected the adverse effects of domestic debt on an economy. Domestic debt statistics are poorly structured owing to the under-development of financial markets especially in developing countries like Zimbabwe. Therefore, developing countries often relies on estimated figures on domestic debt statistics which in most cases jeopardise their policy formulation. This section will attempt to segregate the empirical literature with reference to the impact of external debt and domestic debt on economic growth separately then the combined effect of total public debt on economic growth.

3.2.1 External Debt and Economic Growth

Sulaiman and Azeez (2012) carried out a study on the effect of external debt on economic growth in Nigeria. An annual time series data covering the period 1970-2010 was used. The empirical analysis carried out using the Ordinary Least Squares (OLS) revealed that a long-run relationship exist between external debt and economic growth. The findings from the error correction model revealed that external debt contributes positively to economic growth of the Nigerian economy. The findings supported the Keynesian proposition which states that the
absolute size of the debt does not matter, but what matters most are the interest payments on the debt. Foreign funding can supplement domestic savings so as to boost economic growth. In addition, the study also recommended that the Nigerian economy should ensure political and economic stability so as to ensure effective debt management.

A similar study by Faraji and Makame (2013) found mixed results whilst investigating the impact of external debt on the economic growth in Tanzania. Time series data on external debt and economic growth covering the period 1990-2010 was used. The Johansen test of co-integration showed that there is no long-run relationship between external debt and economic growth in Tanzania. Nevertheless, the findings showed that external debt stock and debt service both have significant impact on real GDP growth. Total external debt stock had a significant positive effect and debt service payment had a significant negative effect on economic growth. The findings favour the Crowding-Out hypothesis which states that debt service payments have more detrimental effects to economic growth rather than the debt stock.

Contrary to the above findings, Clements et.al (2003) found a non-linear relationship between external debt and economic growth using a panel dataset of 55 low-income countries over the time period 1970 to 1999. The researchers estimated that the critical threshold turning point in the net present value of external debt is in the range of 20 percent to 30 percent of GDP. Their conclusion is closely related to the Debt-Overhang hypothesis as defined by Krugman (1988). Beyond a certain threshold, the value of the debt will have opposing effects on growth due to growing uncertainty over a country’s repayment ability. The end result will be reduced investment incentives and potential growth.

Similar findings to Clements et.al (2003) were obtained by Boboye and Ojo (2012) when the researchers were investigating the effect of debt burden on economic growth and development in Nigeria. A regression analysis of OLS was used on variables which comprise of national income, debt service payment, external reserves and interest rate. The findings revealed that external debt burden had an adverse effect on national income and per capita income in Nigeria. High levels of external debt led to devaluation of the national currency, increase in retrenchment of workers, continuous industrial strike and poor educational system which led to economic depression. Based on these findings, the researchers recommended that debt service commitment should not rise beyond foreign exchange earnings. Foreign funds should be used for suitable lucrative investments where they can prompt sensible amounts of money to fund debt repayment.
3.2.2 Domestic Debt and Economic Growth
Sheikh et.al (2010) investigated the impact of domestic debt on economic growth in Pakistan for the period 1972 to 2009. They used the OLS technique and found that domestic debt favourably affects economic growth in Pakistan. This implies that the funds generated through domestic borrowing have been used to finance crucial expenditures of government that contributed to the growth of real GDP. The principle is that domestic as well as external debt should be spent on long-term development commitments. Another reason for the positive relationship between domestic debt and economic growth was that domestic debt is marketable because of Pakistan’s well developed financial market.

Putunoi and Mutuku (2013) concentrated on the effect of domestic debt on economic growth as a result of a shift in the composition of public debt in Kenya. The study used quarterly time series data from 2000 to 2010. The long-run relationship between domestic debt and economic growth was investigated using the Engel-Granger residual test and Johannes VAR based co-integration tests. There was clear evidence of co-integration hence an error correction model had to be used to capture short-run dynamics. The results showed positive and significant effect of domestic debt on economic growth in Kenya. The researchers suggested that the Kenyan government should encourage sustainable domestic borrowing provided the funds are utilised in productive economic avenues.

Singh (1999) carried out a research on the relationship that exists between domestic debt and economic growth in India. An Engel-Granger test of cointegration and Granger causality test was used for the period 1959 to 1995. The author considered two theoretical views of domestic debt and economic growth. One is traditional view of long-run negative impacts of domestic debt on economic growth (Debt Overhang Hypothesis). The second is the Ricardian Equivalence or neutrality of domestic debt on economic growth. The results of the Engle-Granger cointegration test indicated that the domestic debt and economic growth are not cointegrated and that domestic debt does not affect economic growth in any way. The study supports the Ricardian equivalence.

3.2.3 Total Public Debt and Economic Growth
Elbadawi et.al (1997) investigated the impact of debt overhang on economic growth using a cross-sectional regression covering the period 1975 to 1995 for 99 developing countries. The sample covered sub-Saharan Africa (SSA), Latin America, Asia and the Middle East. The researchers identified the three direct channels in which indebtedness affected SSA only. The
channels include *current debt inflows* which enhance economic growth, *previous debt stock* which captures the debt overhang. The last channel involves *debt service payments* which leads to crowding out. According to Elbadawi *et al.* (1997), these debt burden indicators also depress growth indirectly through their effect on public sector expenditures. As economic conditions worsen, governments find themselves with scarce resources for public expenditure. Part of the expenditures destined for social programs were diverted to service the debt and have severely affected the very poor.

Cunningham (2003) studied the relationship between debt burden and economic growth for 16 heavily indebted nations in Latin America and sub-Saharan Africa during the period 1971 to 1987. He used cross sectional data with structural breaks to identify the impact of debt on economic growth during different time intervals. The empirical results confirmed that debt negatively affected economic growth in these countries during the period 1971 to 1979 because of its negative impact on the productivity of labour and capital. As debt burden becomes significant, so does the servicing requirements. This will affect how capital and labour will be used in production. On the other hand, the results for the 1980-1987 period found no evidence on the relationship between growth of debt burden and economic growth.

Similar findings to Cunningham (2003) were also obtained by Kumar and Woo (2010). Kumar and Woo (2010) confirmed a non-linear relationship between the initial level of public debt and subsequent GDP growth behaviour based on panel data of 38 advanced and emerging economics countries over the period 1970 to 2010. To examine the effects of debt on growth in the medium and long-term, the researchers took into account the problem of reverse causality that is, the potential impact of low economic growth on higher indebtedness and the problem of endogeneity. Large public debts were found to have detrimental effects on capital accumulation as well as productivity which potentially produced adverse effects on economic growth. The findings concur with the Debt Laffer Curve by (Cohen, 1993).

Using an augmented Cobb-Douglas model to determine the impact of public debt on economic growth in Nigeria, Obademi (2012) adapted a segregated approach for the period 1975-2005. Two models were developed, one with domestic debt and external debt as exogenous variables on the dependent variable real GDP whilst the second model had the total public debt stock. Total public debt was found to have impacted negatively the growth rate of the Nigerian economy. Another incidence channel was also observed, the incidence is felt as the rate of servicing draws away available domestic resources. Total debt stock was also found to have a
long-run relationship with real GDP thereby an Error Correction Model had to be used to capture short-run dynamics towards the long-run equilibrium.

Rabia and Malik (2012) investigated the impact of domestic debt and external debt on economic growth in Pakistan over the period 1980 to 2010. The researchers used the Ordinary Least Squares (OLS) approach. The findings showed an inverse relationship between domestic debt and economic growth though the effect was minor. The relationship between external debt and economic growth was also found to be negative and significant. The research findings concluded that a huge external debt amount slows down economic growth more as compared to domestic debt amount.

Bonga et.al (2015) examined the origins of the debt crisis and its consequences in Zimbabwe. The study used 1980-2013 data on an OLS model in an effort to explore the effect of public debt on economic growth. The regression results showed that public debt had a significant negative effect on economic growth in Zimbabwe. The study recommended the government not to borrow unnecessarily, and to use borrowed funds for investment projects rather than for consumption expenditure.

3.3 Summary and conclusion of literature review

There is wide spread debate and mixed opinions on how public debt affects economic growth. The Classicals viewed the creation of public debt as an impediment to growth, whilst in contrast, the Keynesians suggested that public debt is just transfer of resources in an economy which could increase economic growth if used wisely. Ricardian equivalence found neutral effect of public debt on economic growth. The Debt Overhang, Crowding Out and Laffer Curve both accept that minimum levels of public debt accelerate economic growth, but beyond a critical threshold, it retards economic growth. Most researchers who includes Rabia and Malik (2012), Cunningham (2003) and Kumar and Woo (2010) supported the Debt Overhang Hypothesis and Crowding Out hypothesis whilst very few studies like Singh (1999) observed the neutrality of public debt on economic growth, these studies goes in favour of Ricardian Equivalence.
CHAPTER FOUR
RESEARCH METHODOLOGY

4.0 Introduction
This chapter explores the econometric methodology to be used in investigating the impact of public debt on economic growth in Zimbabwe. The method of estimation is the Ordinary Least Squares (OLS). A cointegration approach to test for a long-run relationship between public debt (domestic and external) will be used. This chapter also justify the inclusion of variables used in the model and carry out model diagnostic tests then lastly provide the sources of data.

4.1 Model Specification
In order to empirically assess the impact of public debt on economic growth, there is need to build an econometric model containing all variables of interest. The choice of variables is confined to economic theory. Research work by Bonga et.al (2015) is considered to be arguably outstanding in tackling the debt crisis in Zimbabwe though their research did not have any quantitative flavour. This research aims at treating public debt stock as the sum of both domestic and external debt, the segregation is meant to establish which between the two forms of debt has a greater influence on the growth rate of Zimbabwe. Therefore, it is necessary to develop a model that encompasses both domestic debt, external debt and other influential variables of economic growth.

An econometric model developed by Obademi (2012) captures the impact of public debt on economic growth by disaggregating total debt stock into domestic and external debt. This model forms the backbone of the methodology used in this study. The reason being the inclusion of the key economic variables that suit the intended research for Zimbabwe. Obademi (2012) used an error-correction and cointegration techniques to investigate the impact of public debt on economic growth in Nigeria. The model is thus specified as follows:

\[ RGDP = f \left( \frac{ED}{DD}, \frac{BD}{EDS}, INV, \mu \right) \] .......................... (1)

where:

\( RGDP \) = Growth in Real Gross Domestic Product

\( ED \) = External Debt (% of GDP)
**DD** = Domestic Debt (% of GDP)

**BD** = Budget Deficit (% of GDP)

**EDS** = External Debt Service (% of GDP)

**INV** = Total Domestic Investment (% of GDP)

**μ** = Stochastic error term

The long-run econometric equation becomes:

**Equation 2: Long-run econometric model**

\[ RGDP = \alpha + \beta_1 ED + \beta_2 DD + \beta_3 BD + \beta_4 EDS + \beta_5 INV + \mu \] ................................. (2)

where \( \alpha, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5 \) are coefficients to be estimated

The long-run model was used to generate residuals used to develop a short-run model which includes an error-correction term. If a long-run relationship exist amongst the variables, then there must be an associated adjustment model. The short-run error correction model was applicable in Obademi (2012) study due to cointegrating variables in the model. The short-run error correction equation is specified as follows:

**Equation 3: Short-run econometric model**

\[ \Delta RGDP = \alpha + \beta_1 \Delta ED + \beta_2 \Delta DD + \beta_3 \Delta BD + \beta_4 \Delta EDS + \beta_5 \Delta INV + \pi \Delta EC_{t-1} + \varepsilon_t \] ............ (3)

where \( \Delta \) is the first difference operator, \( EC_{t-1} \) is the lagged error correction term and \( \pi \) is the adjustment parameter of the lagged error correction term.

The variables are defined as below:

**RGDP** = Growth in Real Gross Domestic Product

**ED** = External Debt (% of GDP)

**DD** = Domestic Debt (% of GDP)

**BD** = Budget Deficit (% of GDP)

**EDS** = External Debt Service (% of GDP)

**INV** = Total Domestic Investment (% of GDP)
\( \mu \) = Stochastic error term

Basing on the research work by Obademi (2012), the empirical analysis of this study is going to closely follow the same model and employs the OLS technique in carrying out econometric estimations. The same cointegration technique and error-correction method (ECM) used by Obademi (2012) will also be employed. The purpose of the ECM is to establish the dynamics and speed of adjustment of public debt towards the long-run in Zimbabwe. The main advantages of using this model for Zimbabwe is that it distinguishes the short-run and long-run response of the dependent variable to the changes in its explanatory variables. It can be used to directly estimate the speed of adjustment towards the equilibrium.

The stationarity of variables is the pre-requisite for estimating a short-run model. This approach is based on the fact that there is no time available for the manifestation of any alteration in the mean and variance of variables in the short-run. The implication being that all variables are stationary in the short-run. In contrast, all variables are non-stationary in the long-run attributable to the occurrence of changes in mean and variance of variables in the long-run. This implies the suitability of estimating a long-run model which includes non-stationary variables (Engle and Granger, 1987).

4.2 Description and Justification of Variables

Growth in Real Gross Domestic Product (RGDP)

Growth in real GDP is used as a proxy for economic growth. Real gross domestic product (GDP) refers to national output that has been adjusted to base year using the GDP deflator. GDP measures the total value of final goods and services produced by the residents of a country. Growth in real GDP reveals how an economy is performing over a given period of time, implying the growth rate of the economy.

External debt (ED)

This is the proportion of outstanding external debt to GDP. External debt is the portion of debt borrowed from non-residents or foreign lenders repayable in foreign currency, goods or services. The county’s external debt is vital as it shows how much the government is borrowing externally each year. Clements et.al (2003) found evidence supporting the view that higher external debts are associated with negative effects on the growth rate of an economy. Thus, the expected sign is negative.
Domestic Debt (DD)
Extensive domestic borrowing results in a rapid accumulation of domestic debt which has a negative effect on the economy through increased interest payments or higher interest rates. However, a recent study by Putunoi and Mutuku (2013) showed that moderate levels of domestic debt could have a positive effect on the economy, more so if the debt is marketable. The estimated coefficient of the percentage of domestic public debt to real GDP is expected to be either positive or negative depending on the level of domestic debt distress.

Budget Deficit (BD)
Measures the difference in which government expenditures exceeds its revenues. The sources of government revenue are taxes (direct and indirect), profits and interest earned from state owned assets and enterprises. Government incurs expenditures by paying for public sector workers, expenditures on infrastructure development, transfer payments and debt servicing cost. In the absence of Ricardian equivalence, fiscal deficits can either crowd-out or crowd-in private investment (Singh, 1999). In the neoclassical sense, crowding-out results in a decrease in desired national savings which could deter investment and hence compromise growth (Bonga et.al, 2015). In the Keynesian view, fiscal deficits can increase national savings and investment thus stimulating growth. The expected sign can either be positive or negative.

External Debt Service (EDS)
Is the percentage of principal repayments plus interest actually paid in foreign currency, goods or services to real GDP. Debt servicing diverts funds away from essential areas like investment that could enhance economic growth. Higher total debt service indicates a liquidity constraint as explained by Faraji and Makame (2013), therefore, the expected sign is negative.

Total Domestic Investment (INV)
Measures the rate at which capital formation is growing as a proportion of GDP. A positive relationship is assumed as supported by the multiplier concept of national income (Keynes, 1936). Investment is a dominant component of GDP thus, an increase in investment will also increase real income. The more the inflow of capital into the economy, the more national income will also increase (Sulaiman and Azeez, 2012)
4.3 Method of Estimation

The econometric methodology to be employed in this study to investigate the impact of public debt on economic growth in Zimbabwe is the Ordinary Least Squares (OLS) technique. The choice of this technique is attributed to its simplicity, convenience and has been used successfully by other similar studies like Clements et al. (2003) and Sheikh et al. (2010). Moreover, the parameter estimates obtained by using this technique are (BLUE). Gujarati (2004) has shown that the OLS estimators of the coefficients have a desirable property known as super-consistency provided the OLS assumptions are not violated. A cointegration and error correction model is also employed to establish the short-run and long-run dynamics and speed of adjustment towards the long-run.

It is also necessary to begin by analysing the time series properties of the data. The idea of cointegration entails that a set of variables be integrated of the same order and their linear combination must be stationary, that is, \( I(0) \). If the series do not follow the same order of integration, then there can be no meaningful relationship among variables. We therefore proceed to test for cointegration if series have the same order of integration. Cointegration merely means looking for a long-run equilibrium relationship among non-stationary variables. Therefore, the performance of cointegration method requires the prior check for stationarity of data (Gujarati, 2004).

4.3.1 Stationarity and Unit Root Tests

Since the validity of the error correction specification necessitate the existence of a long-run relationship or cointegration between the variables concerned, the modelling strategy begins with the test for unit root involving the variables of interest. Several tests are usually employed to test whether time series variables are stationary or non-stationary; the Dickey-Fuller (DF), the Augmented Dickey-Fuller (ADF) test, Auto-Correlation Function (ACF) and Phillips-Perron test. If a model has two or more non-stationary time series, regression analysis involving such time series may lead to the phenomenon of spurious or nonsense regression. That is, if you regress a non-stationary time series on one or more non-stationary time series, you may obtain a high \( R^2 \) value. The regression coefficients may be statistically significant on the basis of the usual \( t \)-test and \( F \)-test but they will not be reliable.
This study is going to use the ADF test to determine the existence of a unit root basing on its consistency, accuracy and resourcefulness. The study will run the ADF test with an intercept and trend in level as follows:

**Equation 4: ADF unit root equation**

\[ \Delta y_t = \alpha y_{t-1} + \delta + y_t + \varepsilon_t \]

where, \( y_t \) is any variable in the model to be tested for stationarity, \( \varepsilon_t \) is an error term and \( \Delta \) is the first difference operator. The null hypothesis of ADF is \( \delta = 0 \) against alternative hypothesis that \( \delta < 0 \) where \( \delta = \gamma - 1 \). A rejection of this hypothesis means that the time series is stationary or it does not contain a unit root while failing to reject means that the time series is non-stationary (Greene, 2003).

A time series is integrated of order zero, \( I(0) \) if it is stationary in levels. Some series need to be differenced several times before becoming stationary. The number of times a series needs to be differenced before being stationary is the order of integration. If a time series is said to be integrated of order \( d \), \( I(d) \), it means that it has to be differenced \( d \) times before the series become stationary. If the series are stationary, running a regression avoids spurious regressions (Ngurah, 2009).

**4.4 Diagnostic Tests**

**4.4.1 Normality test**

Normality of error term assumption is a prerequisite which the Classical Linear Regression Model (CLRM) must satisfy. The test is used to check whether the errors obtained are well-modelled by normal distribution or not. Normality in statistics is measured using the Jarque-Bera test though it is most convenient for large samples not small samples (Gujarati, 2004). If the Jarque-Bera statistic is greater than the level of significance it implies that the errors are normally distributed. If the error term is not normally distributed, it can be specified that the OLS estimators are still best linear unbiased estimators (BLUE), that is, they are unbiased and in the class of linear estimators they have minimum variance. Hence, if the errors are not normally distributed, estimations can still be carried since normality is a convenient assumption hence it does not affect the results (Greene, 2003).
4.4.2 Multicollinearity test
Multicollinearity is when the explanatory variables are moving in a systematic way. This means that there is an exact linear association amongst variables. The consequence of this problem is obtaining inefficient estimators which have large variances and covariances making precise estimation difficult. Confidence intervals will be very wide and t-ratios of most coefficients will be statistically insignificant. A pair-wise Correlations matrix shall be employed in testing for the existence of multicolinearity. If the correlation between two explanatory variables is greater than 0.8 in absolute values, it means there is collinearity hence one variable should be dropped (Gujarati, 2004).

4.4.3 Autocorrelation test
Autocorrelation means that the errors of the current period are related to the errors of the previous period. The consequences of autocorrelation are obtaining large standard errors and incorrect t-statistics. In most cases OLS standard errors are underestimated, which means the estimated t-values will be inflated, giving the appearance that a coefficient is more significant than it actually may be. To test whether there exists dependence among the error terms at different time periods, the Durbin-Watson (DW) test is preferred because it is convenient in detecting serial correlation. The decision criteria are shown below:

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>Decision</th>
<th>If</th>
</tr>
</thead>
<tbody>
<tr>
<td>No positive autocorrelation</td>
<td>Reject</td>
<td>$d &lt; d_L$</td>
</tr>
<tr>
<td>No positive autocorrelation</td>
<td>Do not reject</td>
<td>$d &gt; d_U$</td>
</tr>
<tr>
<td>No positive/negative correlation</td>
<td>No decision</td>
<td>$d_L &lt; d &lt; d_U$</td>
</tr>
<tr>
<td>No positive/negative correlation</td>
<td>Do not reject</td>
<td>$d_U &lt; d &lt; 4 - d_U$</td>
</tr>
<tr>
<td>No negative correlation</td>
<td>No decision</td>
<td>$4 - d_U &lt; d &lt; 4 - d_L$</td>
</tr>
<tr>
<td>No negative correlation</td>
<td>Reject</td>
<td>$4 - d_L &lt; d &lt; 4$</td>
</tr>
</tbody>
</table>

Source: Gujarati (2004)

4.4.4 Heteroscedasticity test
Heteroscedasticity means that the error terms does not have a constant variance or are not equally spread. If the variance of the error term is not constant, it means each variable will not be equally reliable. Heteroscedasticity does not alter the unbiasedness and consistency properties of OLS estimators but the estimators are no longer of minimum variance or efficient.
That is, they are not the best linear unbiased estimators (BLUE) meaning that, they are simply linear unbiased estimators (LUE). If there is heteroscedasticity it means that the standard errors, $t$-statistics and F-statistic will be not reliable. This will result in erroneous conclusions regarding the statistical significance of the estimated regression coefficients. Homoscedasticity is tested using the ARCH test and if the probability value is greater than 0.05 it means there is homoscedasticity.

4.5 Cointegration Tests

Cointegration is when two non-stationary time series integrated of the same order have a long-run relationship. If two series $Y_t$ and $X_t$ are non-stationary and integrated of the same order, then they are cointegrated if their linear combination is of order zero. Thus, cointegration means that, despite being individually non-stationary, a linear combination of two or more series can be stationary. Intuitively, cointegration among a set of variables implies that there exist fundamental economic forces, which make variables move stochastically together over time (Greene, 2003). Cointegration allows for the existence of an equilibrium relationship among two or more series, it also implies that economic variables may drift apart from each other in the short-run but do not diverge in the long-run.

Cointegration can be tested using Engle-Granger two-step procedure, Autoregressive distributed lag, Maximum Likelihood procedure and the Johansen approach. Among these various different approaches, the Engle-Granger type of static long-run regression has become a widely applied method since it was introduced by Engle and Granger in 1987 (Gujarati, 2004). Engle-Granger cointegration involves two steps; first all dynamics are ignored and the cointegrating regression is estimated by the OLS and fitted residuals are stored. In order for $Y_t$ and $X_t$ to be cointegrated, the necessary condition is that the estimated residuals from the long-run regression should be stationary i.e. $e_t \sim I(0)$. Thus, variables $Y_t$ and $X_t$ may be individually nonstationary but if the estimate of their residual errors is stationary they are cointegrated.

The cointegrated series has an error correction representation. If the residual error of the estimate is stationary the error correction model can be estimated which shows the short-run dynamics of the model.
4.6 Error Correction Model (ECM)

The particular relevance of the error correction model is to model cointegrating series. According to Engle and Granger (1987), when variables are cointegrated, there exists a valid error correction model describing their relationship, with the implication that cointegration between variables involved is a prerequisite for the error correction model. ECM corrects for any disequilibrium between variables that are cointegrated because the sequence of the discrepancy between the observed equilibrium states tends to decay to its mean, which is zero.

The ECM specification thus provides the means by which the short-run observed behaviour of variables is associated with their long-run equilibrium growth paths. If the null hypothesis of cointegration is not rejected, formulating an error correction model will involve taking the following steps: The model will be estimated through OLS (cointegrating regression) in levels and the fitted residuals will be stored and renamed. The stored residuals from the cointegrating equation will be lagged once. The model will be estimated in its differences (stationary form of variables) and the lagged residuals are included as one of the explanatory variables representing the error correction term. The new re-parameterised model represents the short-run equation (error correction model). The coefficient of error correction term (which should be negative) shows the speed of adjustment from short-run disequilibrium to the long-run equilibrium. The error correction model is of the form:

\[
\Delta \text{RGDP} = \alpha \Delta + \beta_1 \Delta ED + \beta_2 \Delta DD + \beta_3 \Delta BD + \beta_4 \Delta EDS + \beta_5 \Delta INV + \pi \Delta EC_{t-1} + \epsilon_t \quad \ldots \ldots (5)
\]

where \(\Delta\) is the difference operator, \(\pi\) is the coefficient of the error correction term. It represents the speed of adjustment to long-run equilibrium following shocks to the system. Hence, it captures the transitional dynamics of the system to the long-run equilibrium and \(EC_{t-1}\) is the lagged error correction term, which indicates that if any disequilibrium occurs in the long-run growth rate, it will be corrected in the upcoming year.

4.7 Stability Test

Consistency of parameters is examined with the help of a stability test. For inspection of structural stability of model, Brown et al. (1975) introduced cumulative sum (CUSUM) and cumulative sum of square (CUSUM) tests. For a model to be stable, the CUSUM statistic and the CUSUM of square (CUSUMSQ) should fall inside the critical bounds of the 5 percent confidence interval of parameter stability, that is, fall within the two parallel red lines.
4.8 Granger Causality tests
Causality exists when lagged values of a variable, have explanatory power on another variable. The idea of causality is that the cause precedes the effect, that is, if public debt is the cause of economic growth, then economic growth should precede public debt. Therefore, public debt Granger causes economic growth, the prediction error of current growth rate declines when lagged values of public debt are used. If both variables, that is public debt and economic growth cause one another, then there is feedback mechanism in the system (Greene, 2003).

4.9 Data type and sources
This study uses annual time series data covering 1980-2014 period. The period has been chosen because of the availability of data during the period under consideration. Furthermore, the period chosen is long enough to trace the evolution of public debt in Zimbabwe and assess its impact on the growth performance of the country. The data is secondary in nature and is expressed in US dollar to capture transitions from Zimbabwean dollar to multi-currency system. Data for real GDP is obtained from Zimbabwe Statistical Agency (ZIMSTATS). Data for the remaining variables which are external debt, domestic debt, budget deficit, external debt service and investment is tapped from World Development Indicators (WDI) World Bank.

4.10 Conclusion
In this chapter, the econometric methodology to be employed by the study in modelling the impact of public debt on economic growth has been specified. The model is built basing on the work of Obademi (2012). The following variables, external debt, domestic debt, budget deficit, external debt service and investment are explanatory variables for the real growth rate of Zimbabwe. Given that economic time series often exhibit non-stationary stochastic process, the econometric specification has been conducted in a framework that allows for non-stationarity but potentially cointegrated variables. Tests for unit root will be conducted using the Augmented Dickey-Fuller Tests at the same time a formal cointegration will be carried out following the residual-based approach proposed by Engle-Granger (1987). Using the outlined econometric methodology, the following chapter presents econometric estimations and diagnostic tests on the impact of public debt on economic growth in Zimbabwe.
CHAPTER FIVE

ESTIMATION AND INTERPRETATION OF RESULTS

5.0 Introduction

This chapter presents the results of the empirical estimations and gives an economic interpretation of the results. We start by presenting the descriptive statistics, stationarity tests, model diagnostic tests, stability test, causality test then the regression results follow thereafter. The long-run model is first estimated in order to generate a residual to be used in the short-run error correction model. All econometric procedures are done using E-views 8.

5.1 Descriptive statistics summary

Table 3 provides a descriptive summary for all the variables used in the econometric model.

Table 3: Statistical summary

<table>
<thead>
<tr>
<th></th>
<th>RGDP</th>
<th>DD</th>
<th>ED</th>
<th>BD</th>
<th>EDS</th>
<th>INV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.210295</td>
<td>21.74616</td>
<td>41.26203</td>
<td>-5.780785</td>
<td>7.257204</td>
<td>12.19164</td>
</tr>
<tr>
<td>Maximum</td>
<td>13.48445</td>
<td>77.09750</td>
<td>69.99068</td>
<td>-0.254892</td>
<td>29.55136</td>
<td>25.49195</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>6.540859</td>
<td>18.73320</td>
<td>13.88419</td>
<td>2.834193</td>
<td>6.433846</td>
<td>7.747907</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.111052</td>
<td>1.331139</td>
<td>0.067024</td>
<td>0.221462</td>
<td>2.201175</td>
<td>-0.339807</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>2.053288</td>
<td>3.820577</td>
<td>2.678449</td>
<td>1.865031</td>
<td>8.199430</td>
<td>2.257701</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>1.378989</td>
<td>11.31822</td>
<td>0.176989</td>
<td>2.164656</td>
<td>67.68819</td>
<td>1.477122</td>
</tr>
<tr>
<td>Probability</td>
<td>0.501830</td>
<td>0.003486</td>
<td>0.915308</td>
<td>0.338806</td>
<td>0.000000</td>
<td>0.477801</td>
</tr>
<tr>
<td>Observations</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 3 above shows the descriptive statistics of variables used in the study for the period 1980 to 2014. There are 35 observations for each variable. The standard deviation shows variability of the variable whilst the minimum and maximum helps to check for outliers in the data. The variables are closer to their expected mean as shown by smaller standard deviations with domestic debt having the highest of 18.7. Almost all the variables are positively skewed except for real gross domestic product and investment which are negatively skewed. Most variables passed the normality assumption except for domestic debt and external debt which have \( p \)-values less than 0.5. Estimations can still be carried out since normality is a convenient assumption hence it does not affect the outcome of results (Greene, 2003).
5.2 Unit root test

The Augmented Dickey-Fuller (ADF) test was used to test for stationarity of variables in order to avoid spurious regression. If the estimated Augmented Dickey-Fuller statistic is greater than the critical value, we reject the null hypothesis that the series is non-stationary in favour of stationarity. The results of the ADF are shown in table 4 below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>t-ADF Statistic</th>
<th>Critical level</th>
<th>Probability</th>
<th>Order of integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGDP</td>
<td>-3.561393</td>
<td>-3.548490**</td>
<td>0.0486</td>
<td>I (0)</td>
</tr>
<tr>
<td>ED</td>
<td>-3.567037</td>
<td>-3.552973**</td>
<td>0.0485</td>
<td>I (0)</td>
</tr>
<tr>
<td>DDD</td>
<td>-4.944818</td>
<td>-4.262735*</td>
<td>0.0018</td>
<td>I (1)</td>
</tr>
<tr>
<td>BD</td>
<td>-5.426837</td>
<td>-4.252879*</td>
<td>0.0005</td>
<td>I (0)</td>
</tr>
<tr>
<td>DEDS</td>
<td>-6.885132</td>
<td>-4.262735*</td>
<td>0.0000</td>
<td>I (1)</td>
</tr>
<tr>
<td>DINV</td>
<td>-5.223139</td>
<td>-4.262735*</td>
<td>0.0009</td>
<td>I (1)</td>
</tr>
</tbody>
</table>

* and ** implies stationarity at 1% and 5% respectively. D means first difference.

From table 4 above, real gross domestic product (RGDP), external debt (ED) and budget deficit (BD) are stationary in their levels, meaning they are integrated of order zero hence, they do not have a unit root. The variables domestic debt (DD), investment (INV) and external debt service (EDS) are not stationary in levels, meaning they have a unit root. These variables had to be differenced once to make them stationary. After being differenced once, DD, BD, INV and EDS became stationary at 1% critical level which means they are integrated of order one. Given that two or more variables are integrated of the same order after first differencing, there is high possibility of cointegration. Stationarity test is a necessary but not a sufficient condition for cointegration, testing for the existence of cointegration is still necessary.

5.3 Diagnostic Tests

5.3.1 Multicollinearity test

A pairwise correlation test was carried out using a correlation matrix to check for correlations between the variables used in the model. Multicollinearity may result in wrong signs for the estimated parameters. The correlation test is also important as it helps us to see which variables to include or drop from the model depending on their correlation statistic. A correlation static
An empirical investigation into the impact of public debt on economic growth: The case of Zimbabwe (1980-2014)

that is greater than 0.80 reflects high correlation among the variables (Gujarati, 2004). Table 5 below gives the output of the correlation matrix on stationary variables.

Table 5: Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>RGDP</th>
<th>ED</th>
<th>DDD</th>
<th>BD</th>
<th>DEDS</th>
<th>DINV</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGDP</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>-0.466934</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDD</td>
<td>-0.279645</td>
<td>0.346070</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BD</td>
<td>-0.025710</td>
<td>0.499635</td>
<td>0.007411</td>
<td>1.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEDS</td>
<td>0.141489</td>
<td>0.010750</td>
<td>0.025066</td>
<td>0.203793</td>
<td>1.000000</td>
<td></td>
</tr>
<tr>
<td>DINV</td>
<td>0.299919</td>
<td>0.169905</td>
<td>0.010738</td>
<td>0.277625</td>
<td>0.093474</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

From the results, all the partial correlation coefficients are less than absolute 0.8 implying that there is no serious multicollinearity. Hence, all the variables are linearly independent.

5.3.2 Normality test

The Jacque-Bera statistic was found to be 0.2229 with a probability value of 0.8945. This probability value is greater than 0.05, therefore, we fail to reject the null hypothesis that the errors are normally distributed at 5% level of significance. We can safely say that the OLS estimators are the best linear unbiased estimators.

5.3.3 Heteroscedasticity test

Homoscedasticity is tested using the ARCH test and if the probability value is greater than 0.05 it means there is homoscedasticity or the error term has a constant mean and variance. Results of ARCH test of heteroscedasticity are given in table 6 below:

Table 6: Heteroscedasticity Test: ARCH test

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Obs*R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob. F(1,32)</td>
<td>0.065131</td>
<td>0.069188</td>
</tr>
<tr>
<td>Prob. Chi-Square(1)</td>
<td>0.8002</td>
<td>0.7925</td>
</tr>
</tbody>
</table>

From table 6 above, the ARCH test gives a chi-squared $p$-value of 0.7925 which is above the 5% critical value indicating that there is no problem of heteroscedasticity in our model. That is, the standard errors, $t$-statistics and F-statistic are reliable. They are the best linear unbiased estimators (BLUE).
5.3.4 Autocorrelation test
To test for autocorrelation, we make our inference basing on the value of the DW-Statistic. Considering the upper and lower values of the DW critical levels, it was found that the estimated DW (2.5912) lies in the zone of no autocorrelation. That is, we can safely conclude that autocorrelation does not exist.

5.4 Stability test
Stability of short-run and long-run models is tested using the critical bound of the CUSUM and CUSUMSQ recursive tests. The results of short-run and long-run stability are shown below:

**Table 7: Long-run stability test**

<table>
<thead>
<tr>
<th></th>
<th>CUSUM</th>
<th>CUSUMSQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>-16</td>
<td>-12</td>
<td>-8</td>
</tr>
<tr>
<td>-4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>20</td>
<td>24</td>
<td>28</td>
</tr>
</tbody>
</table>

Critical bound @ 5% level

**Table 8: Short-run stability test**

<table>
<thead>
<tr>
<th></th>
<th>CUSUM</th>
<th>CUSUMSQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>-16</td>
<td>-12</td>
<td>-8</td>
</tr>
<tr>
<td>-4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>20</td>
<td>24</td>
<td>28</td>
</tr>
</tbody>
</table>

Critical bound @ 5% level

The CUSUM and CUSUMSQ squared test for stability reveals that the models do not suffer from instability. The statistic falls inside the critical bound of the 5 percent confidence interval of parameter stability, that is, they fall within the two parallel red lines therefore, our models are stable.
5.5 Causality test

A pairwise causality between variables is done using Granger causality test to determine the direction of causality. The variables real gross domestic product, external debt and domestic debt are paired against each other and the results are depicted by table 9 below:

Table 9: Granger causality test

<table>
<thead>
<tr>
<th>Null Hypothesis:</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD does not Granger Cause RGDP</td>
<td>1.80005</td>
<td>0.1895</td>
</tr>
<tr>
<td>RGDP does not Granger Cause DD</td>
<td>2.63421</td>
<td>0.1147</td>
</tr>
<tr>
<td>ED does not Granger Cause RGDP</td>
<td>0.00797</td>
<td>0.9294</td>
</tr>
<tr>
<td>RGDP does not Granger Cause ED</td>
<td>0.00797</td>
<td>0.9294</td>
</tr>
<tr>
<td>ED does not Granger Cause DD</td>
<td>4.16205</td>
<td>0.0499**</td>
</tr>
<tr>
<td>DD does not Granger Cause ED</td>
<td>1.42358</td>
<td>0.2419</td>
</tr>
</tbody>
</table>

*significant at 1%, **significant at 5%, and ***significant at 10% level

Results from the Granger causality test show that we reject the hypotheses that RGDP does not Granger cause ED and ED does not Granger cause DD. The reason being that the p-values are less than the 5% significance level. This means that there is a unidirectional relationship from real gross domestic product to external debt and external debt to domestic debt. We therefore conclude that real GDP causes external debt and external debt causes domestic debt.

5.6 Cointegration test

The Engle-Granger two-step procedure requires that we generate the residual from the estimated model with variables in their levels. The next step is to test the residual for unit root, if the results reveal that the residual is stationary at level, then we conclude that there is a long-run relationship, thus cointegration exists. Table 10 below provides the results from cointegration test:

Table 10: Residuals unit root test

<table>
<thead>
<tr>
<th>t-ADF Statistic</th>
<th>Critical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>-7.681069*</td>
<td>-4.25289 1%</td>
</tr>
<tr>
<td></td>
<td>-3.54840 5%</td>
</tr>
<tr>
<td></td>
<td>-3.20704 10%</td>
</tr>
</tbody>
</table>

*Indicates significance @ 1%

The null hypothesis that there is no cointegration against the alternative that there is cointegration was tested. It can be observed from the results of the above table that the null hypothesis of no cointegration is rejected at 1% level of significance. This is so because the
ADF $t$-statistic is greater than the critical values in the table above. This confirms the presence of a stable long-run relationship amongst the variables in the model. The above results confirm the use of an error correction model (ECM) to represent the relationship between economic growth and its determinants.

5.7 Regression results

5.7.1 Long-run model

Regression of the variables in their level form is done for the period 1980 to 2014 to produce a long-run model. The main reason for the regression of the data in levels is to generate the residual to be used in formulating an error correction term to be used in constructing a short-run error correction model. The residuals from the estimation were tested for their order of integration. The results indicate that the residual term is integrated of order zero, indicating that a long-run relationship between real GDP and its explanatory variables, thus justifying the formulation of an error correction model. The long-run model is given by:

$$RGDP = \alpha_1 + \beta_1ED + \beta_2DD + \beta_3BD + \beta_4EDS + \beta_5INV + \mu$$

Table 11: Long-run model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>$t$-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>12.92515</td>
<td>3.888850</td>
<td>3.323643</td>
<td>0.0024*</td>
</tr>
<tr>
<td>DD</td>
<td>0.186913</td>
<td>0.055684</td>
<td>3.356657</td>
<td>0.0022*</td>
</tr>
<tr>
<td>ED</td>
<td>-0.446417</td>
<td>0.063627</td>
<td>-7.016167</td>
<td>0.0000*</td>
</tr>
<tr>
<td>BD</td>
<td>-0.008999</td>
<td>0.330990</td>
<td>-0.027188</td>
<td>0.9785</td>
</tr>
<tr>
<td>EDS</td>
<td>-0.331369</td>
<td>0.127277</td>
<td>-2.603526</td>
<td>0.0144**</td>
</tr>
<tr>
<td>INV</td>
<td>0.491597</td>
<td>0.105448</td>
<td>4.662006</td>
<td>0.0001*</td>
</tr>
</tbody>
</table>

*significant at 1%, **significant at 5% and ***significant 10% level

Adjusted R-squared=0.652168

F-statistic=13.74968(0.00001)

Durbin-Watson= 2.591172

From table 11 above, all significant variables have their expected signs. Domestic debt, external debt and investment are statistically significant at 1% level, external debt service is statistically significant at 5% level. The adjusted $R^2$ is 0.65 implying that the model is of good fit. This means that 65% of variations in real economic growth (RGDP) are explained by the
combined variations in the explanatory variables. Moreover, the F-statistic probability value is 0.000001 which is less than 0.01 implying that the whole model is statistically significant at 1% level.

The coefficient of domestic debt is found to be positive with a value of 0.1869 which is statistically significant at 1% level. The results obtained indicate that a 100% increase in domestic debt results in an increase in real economic growth by approximately 18.69%. Therefore, domestic debt contributes positively to economic growth. The possible economic meaning of this is that, when domestic debt increases, more expenditures will be carried out by the government. As a result, there will be a transfer of funds for production purposes from the government to the private sector which will in turn lead to an increase in economic growth as proposed by the Keynesian view of public debt. The results are in line with the findings of Putunoi and Mutuku (2013).

External Debt Stock (ED) has a negative relationship with real economic growth as denoted by a negative coefficient of 0.446417 which is statistically significant at the 1% level. This means that a 100% increase in external debt results in an approximately 45% decrease in real economic growth. This is a true reflection of the ‘debt overhang effect’. The results are consistent with the Debt Overhang theory which stipulates that when size of the debt stock grows so large, it can retard economic growth. In other words, a large debt overhang increases the uncertainty of the environment in which the country is operating in, it acts as an indirect tax on returns to investors. The findings in this research support Elbadawi et.al (1997)’s findings in which debt accumulation proved to have a negative effect for 99 developing countries from the Sub Saharan Africa (SSA), Latin America, Asia and the Middle East Countries hence, external debt accumulation deters economic growth.

The coefficient of external debt service (EDS) was found to be statistically significant at the 5% level with a negative value of 0.331369. This means that a 100% increase in external debt service results in an approximately 33% decrease in real economic growth. A possible explanation for the negative sign could be that the funds that could have been used for productive purposes may be diverted towards the repayment of the debt. This may result in crowding out of the private sector when the government draws away resources in the economy towards the servicing of the debt. The results support the Crowding Out hypothesis by Cohen (1993). Faraji and Makame (2013) also found the same results.
The investment (INV) coefficient was found to have a positive and significant relationship with real economic growth. A coefficient of 0.491597 means that a 100% increase in investment will in turn induce a 49% increase in real economic growth. Since investment is a dominant component of GDP, an increase in investment will also increase real income. The more the inflow of capital formation in an economy, the more national income will also increase. Sulaiman and Azeez (2012) came out with the same results.

5.7.2 Short-run error correction model

From the Engle-Granger residual test of cointegration, the results revealed the existence of the long-run behaviour among the variables, thus suggesting that there is cointegration. The ECM in this case would capture the long-run economic relationship between economic growth and its determinants. To explain the relationship between economic growth and its determinants in different time periods, both the long-run model and the short-run error correction mechanism (ECM) was employed.

Formulating the error correction model involved regressing the stationary values of explanatory variables with a lagged value of the error correction term (ECMt-1) on the stationary dependent variable from the cointegrating equation as given below:

$$\Delta RGDP = \alpha + \beta_1 \Delta ED + \beta_2 \Delta DDD + \beta_3 \Delta BD + \beta_4 \Delta EDS + \beta_5 \Delta INV + \pi \Delta EC_{t-1} + \epsilon_t$$

Given the equation above, the short-run error correction equation can be presented below:

Table 12: Short-run error correction model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>15.12980</td>
<td>5.594518</td>
<td>2.704397</td>
<td>0.0117**</td>
</tr>
<tr>
<td>ED</td>
<td>-0.277143</td>
<td>0.091279</td>
<td>-3.036209</td>
<td>0.0053*</td>
</tr>
<tr>
<td>DDD</td>
<td>-0.075279</td>
<td>0.135862</td>
<td>-0.554084</td>
<td>0.5841</td>
</tr>
<tr>
<td>BD</td>
<td>0.306813</td>
<td>0.443082</td>
<td>0.692453</td>
<td>0.4946</td>
</tr>
<tr>
<td>DEDS</td>
<td>0.114433</td>
<td>0.216670</td>
<td>0.528144</td>
<td>0.6017</td>
</tr>
<tr>
<td>DINV</td>
<td>0.442576</td>
<td>0.192290</td>
<td>2.301607</td>
<td>0.0293**</td>
</tr>
<tr>
<td>ECM_{t-1}</td>
<td>-0.620607</td>
<td>0.278760</td>
<td>-2.226313</td>
<td>0.0068*</td>
</tr>
</tbody>
</table>

*significant at 1%, **significant at 5% and ***significant at 10% level

Adjusted R-squared = 0.276386
F-statistic=3.100739  (0.019261)  
Durbin-Watson= 1.370943

In the short-run, most variables maintained their expected signs except for external debt service and domestic debt though they are insignificant in influencing real economic growth. A Durbin-Watson (DW) statistic of 1.370943 suggests that there is no decision on autocorrelation since it lies between 1.144 (dL) and 1.808 (du). The adjusted R² with a value of 0.2764 is very low due to the fact that some variables had to be differenced once to make them stationary, that resulted in the loss of some degrees of freedom. However, the model is still useful as depicted by the F-statistic probability of 0.023 which is less than the 5% critical value. The fact that Durbin Watson statistic is also greater than the coefficient of determination also rules out the possibility of spurious regression.

There is strong evidence of debt-overhang as shown by a statistically negative relationship between external debt and real economic growth. A 100% increase in external debt results in 28% decrease in real economic growth. This means that external debt accumulation retards economic growth both in the short and long-run. Clements et.al (2003) found similar results. However, domestic debt is found to have a negative impact on the real growth rate of Zimbabwe though the effect is insignificant in the short-run.

The coefficient of investment is 0.442576 which is positive and statistically significant at 5% level of significance. A 100% increase in investment will increase real economic growth by 44%. The relationship is supported by the multiplier effect of national income which states that initial injection of investment will produce multiple increase in national income thereby an increase in growth rate.

The error correction term (ECM_{t-1}) is stable and statistically significant at 1%. The significance of the ECM implies that a long-run relationship exists between real economic growth and its determinants. The coefficient of the error correction term (ECM_{t-1}) of -0.620607 implies that roughly 62% of the errors made in the previous period (period t-1) are corrected in the current period. This implies that the model converges towards equilibrium position though not necessarily at 100%.
5.8 Conclusion

This section presented all the econometric estimations and made interpretation of the research findings. External debt, domestic debt, budget deficit, external debt service and investment were found to be key explanatory variables of real economic growth basing on the model developed by Obademi (2012). Two models were considered, namely, the long-run and the short-run models. The regression results of the long-run model showed that most explanatory variables were statistically significant. External debt, budget deficit and external debt service were found to impact negatively the real growth rate of Zimbabwe. The long-run results confirmed the presence of both “debt overhang” and “crowding-out”. Domestic debt and investment both contribute positively to economic growth. The short-run model revealed that external debt acts as an impediment to the growth prospects of Zimbabwe, debt overhang prevails even in the short-run in Zimbabwe. However, domestic debt had an insignificant effect on economic growth in the short-run. Moreover, the short-run error correction term (ECM_{t-1}) is statistically significant and negative. The implication is that the short-run disequilibrium converges to its long-run steady state. The subsequent chapter will present the summary, conclusions and policy recommendations.
CHAPTER SIX
SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

6.0 Introduction
This chapter summarises the research and concludes on the basis of empirical findings. Policy recommendations will be provided on how best Zimbabwe can resolve the swelling public debt which is impeding economic growth. Furthermore, the study will identify the weaknesses of the study then suggest possible areas for further research in same area of study.

6.1 Summary and conclusion of the study
This study aimed at investigating empirically the impact of public debt on economic growth in Zimbabwe for the period 1980-2014. An econometric model was specified where economic growth was explained as a function of external debt, domestic debt, budget deficit, external debt service and investment. Two models were developed in order to capture the short-run and long-run relationships of economic growth and its determinants. In these two models, public debt was expressed as the sum of domestic debt and external debt to determine the effects of each independently on economic growth.

The data was subjected to diagnostic tests before the estimations. The cointegration results confirmed that there is a long-run relationship between economic growth and its determinants which are external debt, domestic debt, budget deficit, external debt service and investment. The study therefore had to make use of the error correction model (ECM) to capture the speed of adjustment of short-run disequilibrium towards the long-run equilibrium. Consistency of parameters was examined with the assistance of a stability test, the results indicated that the estimated parameters are stable. The Granger Causality test revealed that there is one-way causality effect flowing from economic growth to external debt and external debt causing domestic debt.

The findings of the study provide evidence that external debt retards economic growth. This is a clear indication that a higher level of external debt discourages economic growth both in the short and long-run. Therefore, there is strong evidence in support of debt overhang in Zimbabwe during 1980-2014 period. As explained by Krugman (1988); Sachs (1989) and Cohen (1993), when debt level is expected to exceed the country’s repayment ability with some
probability in future, the anticipated costs of debt service will discourage further domestic and foreign investment, which consequently result in sinking economic growth.

Domestic debt had a positive effect on real economic growth in the long-run. The positive influence concurs with the Keynesian view of public debt. If the domestically borrowed funds are put to productive use, a cycle of causation can further enhance economic growth through the multiplier effect. However, in the short-run, domestic debt slows down economic growth though the effect is insignificant as suggested by the Ricardian Equivalence. The reason might be the exhaustion of domestic savings and structural rigidities in developing countries like Zimbabwe which causes lags in policy response.

A significant error correction adjustment parameter obtained from the short-run equation confirmed the long-run relationship. An estimation of the adjustment parameter suggested that roughly 62 percent of any deviation in the short-run to the long-run equilibrium are corrected in the forthcoming year.

In conclusion, it has been established that external debt negatively affects economic growth, both in the short and long-run which corresponds with the second hypothesis of the study. Domestic debt had a positive impact on economic growth in the long-run though the impact was negative but insignificant in the short-run. The first hypothesis that domestic debt affects economic growth positively is therefore satisfied only in the long-run. Several policy implications emerge from the research findings:

**6.2 Policy recommendations**

A positive relationship between domestic debt and economic growth implies that it is worthwhile for the government of Zimbabwe to borrow domestically in the long-run. The government can therefore ensure that a properly functional bond market is put in place. Credible institutions should be established in order to send a positive signal to prospective bond holders that the government is fully committed to honour its debt obligations.

An effective debt management strategy is a pre-requisite in order to keep the public debt in particular external debt at sustainable thresholds. External funding should only be secured for productive purposes. Excessive reliance on foreign debt has resulted in an unsustainable public debt. The establishment of Zimbabwe Aid and Debt Management Office (ZADMO) is meant to manage public debts although very little has been done to reduce the escalating public debt. The legislative arm of government should also approve each loan before it is contracted and
ensure that the loan is within the established guidelines and laws of the country, and can be serviced within the national budget. Supporting statutory instruments that can also be used by the government to keep the public debt manageable include: the Public Finance Management (PFM) Act (Chapter 22:19), the Reserve Bank of Zimbabwe Act (Chapter 22:15), the International Bank Loans Assumption Act (Chapter 22:08) and the Former Administration (Liabilities) Act (Chapter 22:06).

The Government of Zimbabwe can offload underperforming public utility institutions that are causing unnecessary burden on its fiscal policy. Privatising these institutions through debt for equity swaps will be a stepping stone towards efficient operations of these institutions. Foreign investors can be requested to purchase the public debt then entitled to a stake in these utility institutions. The entry of foreign firms would also complement domestic investment and create employment for the local people. Furthermore, the country would be able to produce more goods and export the surplus. Earnings from exports will then be used to service the public debt.

The proceeds from natural resources can also be channelled towards servicing Zimbabwe’s public debt, both domestically and externally. Zimbabwe is richly endowed with natural resources but transparency is lacking in the exploitation of these resources. The Ministry of Finance and Economic Development should account for all revenues from natural resources and should regularly report to the public on all revenues attained. Value addition and beneficiation in the mineral sector is a key ingredient towards sustainable growth of Zimbabwe. Our local minerals are fetching lower returns because we export them unprocessed then import them as processed goods. Zimbabwe is losing lots of revenues by exporting raw mineral resources and at the same time these resources are becoming exhausted since they are non-renewable in nature.

Zimbabwe should also normalise its relations with bilateral and multilateral institutions to secure new lines of concessional funding. A bridge loan is therefore necessary in settling the existing arrears owed to these institutions. Settling this huge external debt is a formidable task for Zimbabwe but if successful, the country would unlock new loans on reasonable terms of payment which could boost economic growth. A bridge loan can be secured domestically from local firms since domestic debt is less harmful than external debt in the long-term.
6.3 Weaknesses of the study
The researcher could not access data for private debt due to limited time and resources needed to incorporate private debt. Therefore, the study had to concentrate on public debt solely.

6.4 Possible areas for further research
Future researches in the same area of the study can make use of the vacuum left by the researcher by incorporating private debt. There is thus need to consult alternative sources in order to access data for private debt.
REFERENCES


An empirical investigation into the impact of public debt on economic growth: The case of Zimbabwe (1980-2014)


Soludo, C. C. (2003). Debt, Poverty and Inequality. in Okonjo-Iweala, Soludo and Muhtar (Eds.), The Debt Trap In Nigeria, 23-74.


### APPENDICES

**Appendix A: Data**

<table>
<thead>
<tr>
<th>Year</th>
<th>RGDP</th>
<th>DD</th>
<th>ED</th>
<th>BD</th>
<th>EDS</th>
<th>INV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>-2.22603</td>
<td>8.78685</td>
<td>31.31427</td>
<td>-9.25695</td>
<td>7.46071</td>
<td>0.44760</td>
</tr>
<tr>
<td>1986</td>
<td>2.12875</td>
<td>5.63093</td>
<td>32.82497</td>
<td>-8.63939</td>
<td>7.64863</td>
<td>15.14235</td>
</tr>
<tr>
<td>1987</td>
<td>1.10957</td>
<td>4.30300</td>
<td>35.69954</td>
<td>-8.74854</td>
<td>7.89986</td>
<td>11.16763</td>
</tr>
<tr>
<td>1989</td>
<td>5.21306</td>
<td>5.52884</td>
<td>27.84905</td>
<td>-7.60812</td>
<td>5.30394</td>
<td>11.69849</td>
</tr>
<tr>
<td>1991</td>
<td>7.09274</td>
<td>5.95773</td>
<td>32.38130</td>
<td>-5.54586</td>
<td>5.63492</td>
<td>17.41304</td>
</tr>
<tr>
<td>1992</td>
<td>-8.40363</td>
<td>12.83872</td>
<td>43.09124</td>
<td>-6.76793</td>
<td>8.89925</td>
<td>15.41543</td>
</tr>
<tr>
<td>1993</td>
<td>2.09048</td>
<td>17.63741</td>
<td>46.72572</td>
<td>-6.14961</td>
<td>9.53905</td>
<td>13.62622</td>
</tr>
<tr>
<td>1995</td>
<td>0.16384</td>
<td>13.36548</td>
<td>48.40557</td>
<td>-10.03695</td>
<td>8.89149</td>
<td>20.79330</td>
</tr>
<tr>
<td>1997</td>
<td>1.38811</td>
<td>21.15034</td>
<td>34.10115</td>
<td>-7.12585</td>
<td>7.36146</td>
<td>17.75505</td>
</tr>
<tr>
<td>1998</td>
<td>0.26880</td>
<td>20.30492</td>
<td>50.99991</td>
<td>-2.23048</td>
<td>15.06107</td>
<td>22.09412</td>
</tr>
<tr>
<td>2001</td>
<td>-0.19354</td>
<td>17.32132</td>
<td>37.46938</td>
<td>-3.63788</td>
<td>2.38545</td>
<td>2.03462</td>
</tr>
<tr>
<td>2002</td>
<td>-5.93915</td>
<td>18.09932</td>
<td>45.12937</td>
<td>-2.53770</td>
<td>1.66581</td>
<td>-3.58799</td>
</tr>
<tr>
<td>2003</td>
<td>-7.46178</td>
<td>18.80742</td>
<td>55.35080</td>
<td>-0.25489</td>
<td>1.29548</td>
<td>7.92095</td>
</tr>
<tr>
<td>2006</td>
<td>-3.62392</td>
<td>24.64325</td>
<td>55.16222</td>
<td>-2.87215</td>
<td>1.74087</td>
<td>7.05038</td>
</tr>
<tr>
<td>2008</td>
<td>-10.64655</td>
<td>52.27006</td>
<td>69.99068</td>
<td>-2.40179</td>
<td>1.79068</td>
<td>6.17830</td>
</tr>
<tr>
<td>2009</td>
<td>7.26673</td>
<td>77.09750</td>
<td>68.62508</td>
<td>-3.13852</td>
<td>2.23169</td>
<td>15.44601</td>
</tr>
<tr>
<td>2010</td>
<td>11.37592</td>
<td>56.29935</td>
<td>47.84185</td>
<td>-1.44961</td>
<td>5.02964</td>
<td>20.94856</td>
</tr>
<tr>
<td>2012</td>
<td>10.56520</td>
<td>49.75812</td>
<td>39.57920</td>
<td>-1.63038</td>
<td>7.54172</td>
<td>21.47861</td>
</tr>
<tr>
<td>2013</td>
<td>4.48400</td>
<td>54.92854</td>
<td>42.45464</td>
<td>-2.87520</td>
<td>28.47759</td>
<td>21.02611</td>
</tr>
<tr>
<td>2014</td>
<td>3.62466</td>
<td>45.25512</td>
<td>44.15701</td>
<td>-2.81714</td>
<td>29.55136</td>
<td>20.17384</td>
</tr>
</tbody>
</table>

Sources: ZIMSTAT (2015), WDI (2015)
Appendix B: Stationarity results

Variable: Real Gross Domestic Product (RGDP)

Null Hypothesis: RGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-3.561393</td>
<td>0.0486</td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -4.252879
- 5% level: -3.548490
- 10% level: -3.207094


Variable: Domestic Debt (DD)

Null Hypothesis: DD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
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</tr>
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<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-2.234997</td>
<td>0.4562</td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -4.252879
- 5% level: -3.548490
- 10% level: -3.207094


Variable: Differenced Domestic Debt (DDD)

Null Hypothesis: D(DD) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
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</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-4.944818</td>
<td>0.0018</td>
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</table>

Test critical values:
- 1% level: -4.262735
- 5% level: -3.552973
- 10% level: -3.209642

**Variable: External Debt (ED)**

Null Hypothesis: ED has a unit root  
Exogenous: Constant, Linear Trend  
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

<table>
<thead>
<tr>
<th>t-Statistic</th>
<th>Prob.*</th>
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<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-3.567037</td>
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</tbody>
</table>

Test critical values:
- 1% level: -4.262735
- 5% level: -3.552973
- 10% level: -3.209642


**Variable: Budget Deficit (BD)**

Null Hypothesis: BD has a unit root  
Exogenous: Constant, Linear Trend  
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

<table>
<thead>
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<th>Prob.*</th>
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<td>-5.426837</td>
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</table>

Test critical values:
- 1% level: -4.252879
- 5% level: -3.548490
- 10% level: -3.207094


**Variable: External Debt Service (EDS)**

Null Hypothesis: EDS has a unit root  
Exogenous: Constant, Linear Trend  
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

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<td>-0.965610</td>
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Test critical values:
- 1% level: -4.252879
- 5% level: -3.548490
- 10% level: -3.207094

Variable: Differenced External Debt Service (DEDS)

Null Hypothesis: D(EDS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

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<td>-6.885132</td>
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Test critical values:
- 1% level: -4.262735
- 5% level: -3.552973
- 10% level: -3.209642


Variable: Investment (INV)

Null Hypothesis: INV has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

<table>
<thead>
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Test critical values:
- 1% level: -4.252879
- 5% level: -3.548490
- 10% level: -3.207094


Variable: Differenced Investment (DINV)

Null Hypothesis: D(INV) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

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Test critical values:
- 1% level: -4.262735
- 5% level: -3.552973
- 10% level: -3.209642

Variable: Error-Correction Term (ECT)

Null Hypothesis: U has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

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</thead>
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<td>Augmented Dickey-Fuller test statistic</td>
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Test critical values:
- 1% level: -4.252879
- 5% level: -3.548490
- 10% level: -3.207094


Appendix C: Diagnostic Tests

Normality test: JB statistic

![Histogram of Residuals]

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<thead>
<tr>
<th>Statistics</th>
<th>Value</th>
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</thead>
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<td>Mean</td>
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<tr>
<td>Median</td>
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</tr>
<tr>
<td>Maximum</td>
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</tr>
<tr>
<td>Minimum</td>
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</tr>
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<td>Std. Dev.</td>
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</tr>
<tr>
<td>Skewness</td>
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</tr>
<tr>
<td>Kurtosis</td>
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<tr>
<td>Jarque-Bera</td>
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<tr>
<td>Probability</td>
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Heteroscedasticity Test

Heteroscedasticity Test: ARCH

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Value</th>
<th>Prob. F(1,31)</th>
<th>Prob. Chi-Square(1)</th>
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<tr>
<td>F-statistic</td>
<td>0.065131</td>
<td>0.8002</td>
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<tr>
<td>Obs*R-squared</td>
<td>0.069188</td>
<td>0.7925</td>
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</table>
### Appendix D: Regression Results

#### Long-run Model

Dependent Variable: RGDP  
Method: Least Squares  
Date: 04/02/16  
Time: 12:15  
Sample: 1 35  
Included observations: 35

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
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<td>3.88885</td>
<td>3.323643</td>
<td>0.0024</td>
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<tr>
<td>DD</td>
<td>0.186913</td>
<td>0.055684</td>
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<td>ED</td>
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<tr>
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<td>-0.027188</td>
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<tr>
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#### Short-run Model

Dependent Variable: RGDP  
Method: Least Squares  
Date: 04/02/16  
Time: 12:38  
Sample (adjusted): 2 35  
Included observations: 34 after adjustments

<table>
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<th>t-Statistic</th>
<th>Prob.</th>
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<tbody>
<tr>
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<tr>
<td>DEDS</td>
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<td>0.216670</td>
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<td>0.6017</td>
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<tr>
<td>DINV</td>
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<td>ECM</td>
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R-squared 0.703320  
Adjusted R-squared 0.652168  
S.E. of regression 3.857620  
Sum squared resid 431.5558  
Log likelihood -93.62370  
F-statistic 13.74968  
Prob(F-statistic) 0.000001  
R-squared 0.407952  
Adjusted R-squared 0.276386  
S.E. of regression 5.497513  
Sum squared resid 816.0116  
Log likelihood -102.2711  
F-statistic 3.100739  
Prob(F-statistic) 0.019261