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Analyzing the Theoretical and Empirical Foundations of Public Debt Dynamics in Zimbabwe*

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Abstract

This paper provides an analysis of the theoretical and empirical foundations of public debt dynamics in Zimbabwe. The analysis was undertaken by applying the debt dynamics equation that enables estimating the required primary balance, building on the government inter-temporal budget constraint to infer the factors that influence public debt, as well as to ascertain specific policy issues required to ensure a sustainable public debt structure. The results from the simulation analysis show that debt dynamics in Zimbabwe are largely composed of huge stock flow adjustments to finance social and political related expenditures. This underscores the need for prudent debt management to guard against unexpected changes in public debt, which are not explained by fundamentals. The major policy implication from the study is the need to minimize the interest rate growth differential and to implement growth enhancing fiscal policies to ensure a sustainable long term public debt position.

Keywords: Automatic Debt Dynamics, Public Debt Dynamics, Snowballing Effect, Debt Stabilising Primary Balance

1 Introduction

The sharp increase in public debt ratios and the growing concern about the sustainability of public finances since the onset of the 2008-09 global financial and economic crisis and the peripheral euro-zone debt crisis have underscored the

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need for significant fiscal adjustment and credible public debt strategies in most countries. Sustained high public debt levels increase interest expenditure and supersede other growth enhancing expenditures such as government investment. In addition, a snowball effect, where higher public debt increases government interest expenditure, which is financed by additional issuance of debt, causes a vicious circle that may be detrimental to the sustainability of the public finances and overall economic conditions.

Empirical evidence suggests that high public debt levels hamper economic growth and discourages capital accumulation (Checherita & Rother 2010). The normal channels in this regard are possible rises in inflation, higher real long term interest rates, lower private investments, expected increases in distortionary taxation and lower growth-enhancing primary spending. In some cases, unsustainable increases in the public debt to GDP ratio may trigger an outflow of capital from a country and contribute to a banking crisis (Reinhart & Rogoff 2009). As such, an analysis of public debt dynamics is linked to answering questions related to a government's solvency and liquidity situation. A government is solvent when the discounted value of its current and future budget balance surpluses is higher than the sum of the initial stock of public debt and the discounted value of its future budget deficits (Barro 1989).

Accordingly, the objective of this paper is to provide a better understanding of the public debt dynamics in Zimbabwe over the period from 1980 to 2012. This is particularly important given that a vulnerable fiscal policy can be a cause of debt crisis, and can expose an economy to various risks that can endanger sustainability in the long run. Under the multicurrency regime introduced by the Zimbabwean government in 2009, the country has been issuing debt in foreign currency over which it has no control, thus exposing the country to further risk of debt distress.

The study will, therefore, specifically identify the key fiscal and macroeconomic variables that influence public debt dynamics in Zimbabwe. The study will also estimate the required primary balance adjustments in the fiscal sector to ensure a long term sustainable public debt position. The empirical strategy followed in this paper, therefore, involves decomposing and assessing the contribution of drivers of public debt accumulation into macroeconomic components attributable to primary balance, automatic debt dynamics and to the gains or losses on foreign currency denominated debt as a result of exchange rate movements. The paper contributes to the literature by directly exposing the theoretical and empirical foundations of Zimbabwe's public debt portfolio. No study has investigated the theoretical and empirical dynamics of the ratio of public debt to GDP in Zimbabwe. The paper is organised as follows: Section two provides the evolution of Zimbabwe's public debt; Section three presents the theoretical framework for public debt dynamics; Section four provides the methodological framework; and Section five presents the empirical analysis of the determinants of public debt dynamics in Zimbabwe. Finally, Section six draws some final conclusions and policy recommendations.

2 Evolution of Zimbabwe's Public Debt

Historically, from 1980 until 2012, the debt to GDP ratio for Zimbabwe averaged 80.1 percent reaching an all-time high of 105.9 percent in December of 2008, and a record low of 16 percent in December, 1980. The slowdown in the debt to GDP ratio from 2008 onwards, reflects an improvement in capacity to repay as opposed to debt service. The country has not been servicing its debt which has culminated in accumulation of external payment arrears estimated at over 60 percent of GDP in 2012. Generally, public debt as a percentage of GDP is used by investors to measure a country's ability to make future payments on its debt, thus affecting the country's borrowing costs and government bond yields. As highlighted by Reinhart *et al.* (2003), the country's historical fiscal performance helps inform the assessment of what constitutes an optimal public debt policy. The Reinhart argument was based on the fact that a country's record at meeting its public debt obligations and managing its macro economy in the past, is relevant to simulating its ability to sustain moderate to high levels of indebtedness in the medium to long-term. Figure 1 below shows the trend in Zimbabwe's public debt to GDP ratio.

From Figure 1, it can be shown that, Zimbabwe's public debt maintained an upward trajectory before stabilising somewhat between 1995 and 2000, when the economy was still recording fair growth rates. However, from 2000 onwards, the debt level spiraled due to more domestic borrowing in the absence of adequate external support. The growth in total debt was also a reflection of penalty charges for accumulating external payment arrears as well as new short-term loan facilities contracted by the central bank for Government in the absence of official development assistance.

The country also witnessed a general shift in the composition of public debt during the period 2000 up to 2007. This move was necessitated by the drying up of external sources of financing following the placement of Zimbabwe on restrictive measures by traditional creditors, notably the IMF and the World Bank. This trend has been consistent with developments in other developing and emerging market economies where domestic debt is increasingly becoming more pronounced (Panizza 2008). According to Panizza, developing economies traditionally used the domestic debt market as a residual only when they did not have access to external resources or to sterilise aid flows. Recent developments have, however, seen an increasing number of countries switching from external to domestic debts, thus, posing the risk of trading a currency mismatch for a maturity mismatch since few of them are able to issue long-term domestic debts at reasonable interest rates (Panizza 2008). Figure 2 below shows the evolution of Zimbabwe's public debt portfolio since 1980 up to 2010.

Figure 2 shows that the composition of public debt increased sharply in 2000 as the government tried to steer the economy through more domestic borrowing against the imposition of economic sanctions on the country. Domestic debt however, declined progressively due to erosion of the value of the Zimbabwean dollar as a result of spiraling inflation. Inflation reached the 231 million percent level in July 2008 with the result that investors resisted long term Government

paper and gave preference to short term, but high rewarding, treasury bills. Steadily, the debt portfolio structure began to move towards the shorter end of the market, exposing Government to refinancing risk. By 2006, the portfolio was 99 percent short term and 1 percent long term, compared to 96 percent long term recorded in 1990 (Government of Zimbabwe 2009).

3 Theoretical Framework for Public Debt Dynamics

3.1 Debt dynamics

Theoretically, the starting point to analyze public debt dynamics is the dynamic budget constraint, explained with the help of the inter-temporal budget constraint. The inter-temporal budget constraint states that public debt at a point in time is equal to the outstanding public debt at any point in time plus interest payment on outstanding debt minus the primary deficit. Public debt is thus, a stock variable which captures the flow of previous government deficits. However, there are also some additional transactions, over and above these components, which do not alter the budget deficit, but do affect the public debt. These additional transactions are commonly known as the deficit debt adjustment (DDA) or, as generally known, the stock-flow adjustment (SFA). Accordingly, following the approach taken by Escolano (2010), the public debt dynamics is illustrated recursively by the following equation:

$$D_t = (1 + i_t)D_{t-1} - PB_t + SF_t \quad (1)$$

Where D_t is the outstanding debt at time t, PB_t is the primary balance at time t, i_t is the implicit real interest rate at time t, calculated as debt interest payments expressed as a percentage of the debt stock in the preceding period and SF_t is the stock-flow adjustment that ensures consistency between net indebtedness and variation in the observed public debt stock. The stock-flow adjustment includes a number of variables, such as the variations in the public debt due to exchange-rate fluctuations in the local currency, and between the currencies in which the public debt is denominated, the effect on the public debt ratio from the accumulation of financial assets and remaining statistical adjustments and other statistical discrepancies.

The implicit interest rate is desirable as an approximation to the real interest rate paid by the country, compared to the spread between the interest rates on sovereign bonds issued by countries over and above the United States treasury bonds. The spread over the US treasury bonds may be misleading, because it only expresses the interest rate paid at a given moment, whereas what is being analyzed is a balance which includes all the debt generated in the past. Dividing equation 1 by nominal GDP gives the following:

$$\frac{D_t}{P_t Y_t} = \frac{(1 + i_t)}{(1 + \pi_t)(1 + g_t)} * \frac{D_{t-1}}{P_{t-1} Y_{t-1}} - \frac{PB_t}{P_t Y_t} + \frac{SF}{P_t Y_t} \quad (2)$$

Where the nominal GDP is algebraically defined as: $P_t Y_t = (1 + \pi_t)(1 + r_t)P_{t-1}Y_{t-1}$, where Y_t is the real GDP at time t , P_t is the real GDP deflator at time t , π_t is the inflation rate at time t , r_t is the real interest rate at time t and g_t is the real growth rate of the economy at time t .

Defining equation 2 in lower cases result in the following equation:

$$d_t = \phi_t d_{t-1} - pb_t + sf \quad (3)$$

Where $\phi_t = \frac{(1+i_t)}{(1+\pi_t)(1+g_t)} = \frac{1+r}{1+g}$, $d_t = \frac{D_t}{P_t Y_t}$, $pb_t = \frac{PB_t}{P_t Y_t}$ and $sf = \frac{SF}{P_t Y_t}$

The parameter ϕ in equation 3 is known as the automatic debt dynamics, and it can result in the accumulation of public debt without the government contracting any new debt. As shown in the equation, changes to the automatic public debt dynamics are explained by the rate of inflation, the real interest rate and the growth rate of the economy. The other determinants of the change in the public debt ratio as shown in equation 3 are the underlying cyclically adjusted primary balance and the stock flow adjustment, which is a residual. The primary balance is controlled by fiscal policy makers, while interest rates depend on actions of monetary authorities. A priori, the impact of these variables on the automatic debt dynamics and the debt to GDP ratio is shown in Table 1.

3.2 Establishing whether public debt is stable or explosive

The key reason for understanding the public debt dynamics is to determine whether public debt is stable or explosive. Accordingly, from equation 3 it can be seen that for the ratio of the debt to GDP (d_t) to converge to a predetermined optimal level, $\phi_t < 1$ or $r_t < g_t$. However, if $\phi_t > 1$ or $r_t > g_t$, the public debt portfolio would explode from the predetermined optimal path.

This implies that if the interest rate being paid on debt is greater than the growth rate of the economy, the interest burden on existing debt increases, while the debt to GDP ratio also increases. At the same time, if a government borrows for servicing debt, it further increases the debt. This analysis, therefore, shows that for public debt to remain stable, the primary balance needs to at least cover the interest payments due. However, if past debts are very large or if interest rates are very high, the government would either be required to raise the primary balance or the public debt will increase every year in a snowballing effect because the portion of the payments that cannot be covered by the primary balance will be covered by issuing new loans, thereby increasing the debt stock. Kannan and Singh (2007) argued that even if the growth rate of the economy exceeds the interest rate, persistent primary fiscal deficits may result in a steady growth in the debt to GDP ratio toward a limit where investors may be unwilling to hold the debt instruments.

In addition, when the real interest rate exceeds the real growth rate of the economy, even with a zero primary deficit, the interest burden on existing public debt would be translated into secular growth in the debt to GDP ratio. In this respect, Buiter *et al.* (1985) claim that an explosive debt-deficit spiral is a policy choice rather than a deep structural property of the economy, since there are

many alternative debt-stabilising tax-transfer options that can be used as public debt-stabilising instruments. However, Davig and Leeper (2010) showed that as public debt levels and tax rates rise in the era of fiscal stress, the population's tolerance of taxation declines and the probability of reaching the fiscal limit increases.

4 Model Derivation and Empirical Methodology

The methodology followed in this paper involves decomposing the changes in the public debt to GDP ratio into its macroeconomic components attributable to primary fiscal balance, real interest rates, and real GDP growth, and ascertaining the relative contributions of these factors to the public debt dynamics. After that, an empirical analysis of the relationship between a broad set of fundamental determinants of public debt accumulation and the behaviour of the debt to GDP ratio from 1980 to 2012 was undertaken. The primary balance is usually regarded as a target for policy intervention to secure fiscal sustainability. As such, solvency requires that a government must run a series of primary fiscal surpluses on average to ensure that it has a positive or zero net wealth.

According to Blanchard (1990), the primary balance required to stabilize the debt to GDP ratio at its current value is equal to the interest rate growth differential ($r_t - g_t$) times the initial debt to GDP ratio (d_t). As such, to estimate the primary balance required to stabilize Zimbabwe's public debt for a given level of interest and growth rate, the inter-temporal budget constraint was applied. From the debt dynamics equation in 1, subtracting d_{t-1} from both sides, results in the following debt dynamics equation:

$$\Delta d_t = (\phi_t - 1)d_{t-1} - pb_t + sf_t \quad (4)$$

The debt dynamics equation (Δd_t) illustrated in equation 4 can be separated into three components, namely the primary balance to GDP ratio (pb_t), the snowball effect $(\phi_t - 1)d_{t-1}$, and the stock-flow adjustment (sf_t). Accordingly, to stabilize Zimbabwe's public debt at the current level $\Delta d_t = 0$ for a given level of interest rate and growth rate of the economy is calculated as follows:

$$pb_t = (\phi_t - 1)d_{t-1} + sf_t, \text{ where } (\phi_t - 1) = \frac{r_t - g_t}{1 + g_t} \quad (5)$$

From equation 5, it can be deduced that a large primary balance is needed if the gap between real interest rates and growth rate is large. By implication the relationship between real interest rates and the growth rate of the economy has important implications on debt stabilising primary balance and optimal public debt management policies.

According to Bohn (1998) the primary fiscal balance responds positively to increases in debt, hence it ensures that the inter-temporal government budget constraint holds. Any large increase in public debt due to a large negative shock

is eventually reversed through primary surpluses. A positive response shows that the government is taking actions in reducing mainly mandatory expenditure or raising revenue that counteract the changes in public debt. Croce and Ramon (2003), however, ruled out the case when $r_t < g_t$, because this would lead, in a steady state, to inefficient capital over accumulation. Under this state of affairs, the government can run a Ponzi scheme by issuing debt and roll it over perpetually.

4.1 Simulating the debt stabilising primary balance

In Zimbabwe, similar to any other low income countries, the ultimate goal is to reduce the public debt levels to a sustainable position. In the context of the regional integration agenda under the Southern African Development Community (SADC), countries are expected to achieve a public debt to GDP ratio of at most 60 percent in nominal value terms (SADC 2001). As such, for Zimbabwe to reduce its public debt level to 60 percent, the quantum of the primary balance required was algebraically simulated as follows:

$$d_{t+k}^* = \gamma * d_t \quad \text{with } \gamma^* < 1 \quad (6)$$

Where, d_t is the initial debt stock and d_{t+k}^* is the target debt stock. Assuming a constant interest rate, GDP growth rate, and government primary balance (pb^*), the solvency equation can be expressed as follows:

$$d_t = \left[\frac{1}{\phi} \right]^k \gamma^* d_t + pb_t^* \sum_{j=1}^k \left[\frac{1}{\phi} \right]^j \quad (7)$$

The primary balance pb^* required to reduce the public debt for Zimbabwe from the current level d_t to d_{t+k}^* in k periods was computed as follows:

$$pb_t^* = \left[\frac{(\phi_t - 1)(\gamma^* - \phi^*)}{1 - \phi^k} \right] d_t \quad (8)$$

The derivation was done by making use of the following geometric series:

$$\sum_{j=1}^k ar^j = a \left[\frac{r - r^{k+1}}{1 - r} \right] \quad (9)$$

Equation 8, therefore, implies that the lower γ^* and or k , the larger the pb_t^* will be needed to reach the optimal or preferred public debt target in the desired time. Furthermore, if the government can achieve a primary balance which is sufficient to meet the interest cost under a given growth rate, then the debt to GDP ratio will be stabilised at the existing level, since there is no need for new borrowings.

4.2 Assessing the role of monetary financing

Prior to the introduction of the multicurrency regime in 2009, Zimbabwe used to finance its budget deficits and public debt service through seigniorage revenue or monetisation of public deficits. Although the introduction of the multicurrency regime has temporarily closed this source of financing, it is likely to resurface in the future given that the multicurrency regime is only a short term measure to Zimbabwe's macroeconomic stabilisation efforts (Government of Zimbabwe, 2009). As such, in the presence of monetary financing, the government budget constraint facing the government of Zimbabwe will be as follows:

$$D_t = (1 + i_t)D_{t-1} - (PB_t - \Delta M_t) \quad (10)$$

Applying the law of motion by dividing the above equation by nominal GDP yield the following:

$$\frac{D_t}{P_t Y_t} = \frac{(1 + i_t)}{(1 + \pi_t)(1 + g_t)} \frac{D_{t-1}}{P_{t-1} Y_{t-1}} - \left[\frac{PB_t}{P_t Y_t} + \frac{\Delta M_t}{P_t Y_t} \right] \quad (11)$$

This equation (11) expressed in lower case and applying the Iving Fisher's equation of exchange to transform $\Delta M_t : MV = PY, V = \frac{PY}{M}$ results in the following debt dynamics equation in lower cases:

$$d_t = \phi_t d_{t-1} - (pb_t + \mu m_t) \quad (12)$$

Where, m_t is the inverse of the velocity of money, μ is the growth rate of money and $\phi_t = \frac{(1+i_t)}{(1+\pi_t)(1+g_t)} = \frac{1+r_t}{1+g_t}$, is the automatic debt dynamics.

Similarly, equation 12, implies that for d_t to converge to a predetermined optimal portfolio, $\phi_t < 1$ or $r_t < g_t$. However, if $\phi_t > 1$ or $r_t > g_t$, the public debt portfolio explodes from the predetermined optimal portfolio. It can, therefore, be concluded that money creation plays a similar role to primary balance in influencing debt dynamics. However, under the multicurrency system, the government has ceased money printing and as such the money creation no longer directly influences public debt dynamics.

4.3 Assessing the role of external financing

In an open economy, the debt dynamics are affected by the portion of tradable and non-tradable goods sector, while inflation depends on domestic price formations, foreign prices and exchange rate movements. In addition, interest rate on public debt in an open economy also comprises domestic interest rate and foreign interest rate, where the impact of foreign interest rate is in turn affected by exchange rate movements. Accordingly, to ascertain the impact of external factors on the country's debt dynamics, the inter-temporary budget constraint was extended to take into consideration external debt, which is a common feature in most low income countries. The inter-temporary budget constraint in the presence of external financing can be specified as follows:

$$D_t = (1 + i_t^D) \times D_{t-1}^D + (1 + i_t^F) \times D_{t-1}^F \times E_t - PB_t + \Delta M_t \quad (13)$$

Where, D_t is the total outstanding public debt stock in local currency, i_t^D is the applicable interest rate on domestic debt, i_t^F is the relevant interest rate on foreign debt, E_t is the ruling exchange rate, D_{t-1}^D is the previous outstanding domestic debt in local currency, D_{t-1}^F is the previous outstanding external debt, PB_t is the primary balance and ΔM_t is the change in the monetary base.

Equation (14), therefore, states that the variation of total public debt denominated in local currency (D_t) depends on the current primary balance PB_t , previous public debt position, including the interest payments on government borrowing, and on changes of the monetary base ΔM_t . In Zimbabwe, the United States dollar has become the principal currency and the numeric currency for all transactions. As such, the impact of exchange rate movements on public debt merely reflects movements in the cross rates constituting the currency composition of Zimbabwe's public debt portfolio. In this regard, the exchange rate impact analyzed in this paper mainly relates to the Euro against the United States Dollar. Generally, the Euro is the most dominant currency after the USD in Zimbabwe's public debt stock (IMF 2009). Similarly, applying the law of motion and dividing equation 14 by nominal GDP ($P_t Y_t$), results in the following debt dynamics:

$$d_t = (1 + i_t^d)(1 + \alpha_{t-1})d_{t-1} + (1 + i_t^f)\alpha_{t-1}(1 + \varepsilon_t)d_{t-1} - (pb_t + \mu m_t) \quad (14)$$

Where α is the share of domestic debt portfolio in total public debt and $(1 - \alpha_t)$, is the proportion of external debt in the total public debt portfolio. This equation can then be summarised as follows after collecting like terms:

$$d_t = \frac{[1 + i_t^w \alpha_{t-1} \varepsilon_t (1 + i_t^f)]}{(1 + g_t)(1 + \pi_t)} d_{t-1} - pb_t - \mu m_t \quad (15)$$

Where d_t is the debt outstanding at period t, in local currency, ε_t is the exchange rate for respective currency composition of the external debt, i_t^w is the weighted implicit interest rate between domestic debt and external debt and the other terms are as previously defined. In this paper external debt is defined as debt issued abroad in foreign currency and debt issued domestically in foreign currency and domestic currency debt linked to the exchange rate, while domestic-currency debt is defined as debt issued domestically in domestic currency and debt issued abroad in domestic currency.

5 Data and Estimation Techniques

Annual data on key variables that affect the debt dynamics discussed above, namely growth rate, debt to GDP ratio, interest rate, inflation rate and cross exchange rates between the United States Dollar and the Euro were taken from the IMF's World Economic Outlook database. The empirical model was derived from the public debt dynamics equation in 15 above, which imply that the public debt to GDP ratio changes as a result of the primary balance, the automatic debt dynamics, which is determined by the real interest rates paid on public

debt and the GDP growth rate and the stockflow valuations. The specification is as follows:

$$\Delta d_t = \beta_0 + \beta_1 SNOW_t + \beta_2 PB_t + \beta_4 CRIS_t + \beta_5 EUR_t + \beta_6 ELEC_t + \beta_7 X_t + \varepsilon_t \quad (16)$$

Where Δd_t is the change in the total public debt as a percentage of GDP at time t ; $SNOW_t$ is the automatic debt dynamics capturing the snowball effect on public debt dynamics, PB_t is the primary fiscal balance as a percentage of GDP, EUR_t is the USD/EURO exchange rate, $CRIS_t$ is the crisis dummy to account for the structural breaks, following the financial liberalisation in 1990 crisis induced by economic and political sanctions in 2000 and the introduction of the multicurrency regime in 2009. The crisis dummy takes the value of (1) for the period after 2000 and (0) for the prior periods. The chow breakpoint test: 2000 confirms the existence of a structural break in 1990, 2000 and 2008. $ELEC_t$ is the electoral dummy, which took a value of 1 if there is a parliamentary election in election year, and (0) otherwise. X_t is a vector of other control variables and ε_t is the error. The vector of other control variables includes the non-interest current account balance and the output gap, included to capture the effects of unemployment on government expenditure and public debt.

The election dummy was specifically included to test the political budget cycles hypothesis which postulates that fiscal variables are manipulated for political purposes and the opportunistic hypothesis which states that incumbent governments boost the economy prior to elections, in order to maximise their probabilities of being re-elected, thereby producing political business cycles (Alesina & Roubini 1992; Rogoff 1990; and Shi & Stevenson 2006). The empirical literature on this hypothesis remains, however, rather inconclusive (Schneider 2010). The automatic debt dynamics variable was included to capture the snowball effect on public debt dynamics as well as the effect from international nominal growth and interest rates on their domestic counterparts. The automatic debt dynamics variable was computed as follows:

$$\text{Automatic Debt Dynamics} = \frac{r_t - g_t}{1 + g_t} d_{t-1} \quad (17)$$

Where r_t , g_t and d_{t-1} are as previously defined.

6 Empirical Results and Analysis

As a preliminary analysis, the properties of data and analyzing the role played by automatic debt stabilisers in explaining changes in Zimbabwe's public debt to GDP ratio was first considered. Then the debt stabilising primary balance from the debt dynamics equation was estimated, assuming alternative interest rate growth differentials. Figure 3 below shows the historical movement of the $(r_t - g_t)$ gap for Zimbabwe over the period 1980 to 2012.

The analysis in figure 3 shows that the interest rate growth differential for Zimbabwe became negative after the introduction of the multicurrency system

in 2009, reflecting the presence of concessional loans in the public debt portfolio and the absence of higher interest rates on domestic debt borrowing. The positive interest rate growth gap before the introduction of the multicurrency system reflects the presence of higher interest expenditure on domestic debt borrowing which raises the implicit interest rate on public debt. Prior to that, the higher implicit interest rate on public debt reflected the presence of a large domestic debt portfolio, which was issued at higher interest rates. The positive interest rate growth differential was instrumental in the explosion of the public debt to GDP ratio since 1980.

6.1 Debt stabilising primary balance

Applying the debt dynamics equation discussed in the methodology, the simulated debt stabilizing primary balance required to attain the debt to GDP ratio of 20 percent by 2030 and 50 percent by 2030 under alternative scenarios for interest rates and growth is shown in table 2 below:

The results shows that Zimbabwe would require a large primary balance if the gap between interest rates and growth rates are low as shown in scenario 4, where a gap between interest rates and growth rate of 2 percentage points is assumed. However, based on 2012 public debt and macroeconomic conditions, Zimbabwe would require a primary surplus of 6.03 percent of GDP to achieve an optimal debt portfolio of 20 percent by 2030 or 4.98 percent to reach a target of 50 percent, which is within the desired debt to GDP ratio of 60 percent by 2030. The year 2030 was chosen from the IMF 2009, debt sustainability analysis for Zimbabwe, which shows that the country will only become sustainable after 2029 under the baseline macroeconomic assumptions¹. The immediate policy implication is, therefore, the need for the country to ensure a robust economic growth rate and to minimise the real interest rate growth differential when contracting new loans.

6.2 Decomposition of public debt dynamics

The estimated public debt decomposition to establish the contribution of the factors affecting public debt to changes in the public debt to GDP ratio are shown in figure 4.

The public debt decomposition in figure 4 shows that the stock flow adjustment or the unexplained public debt dynamics contributed more to changes in the public debt to GDP ratio since 1980. The contributions from real GDP growth rate, primary balance and real interest rate on public debt were marginal, reflecting the presence of concessional loans in the debt portfolio. The scenario has not changed much after the introduction of the multicurrency regime in 2009, reflecting the limited importance of the automatic debt stabilisers in Zimbabwe's public debt portfolio. The primary balance was unstable showing positive or negative impact on public debt, indicating changes in the fiscal policy

¹See Zimbabwe Debt Sustainability Analysis 2009, available on the IMF website.

stance throughout the review period. The non-debt creating flow foreign direct investment (FDI) was also significant, particularly following the introduction of the multicurrency system, reflecting the fundamental role played by explaining the reduction in the debt to GDP ratio in the multicurrency era.

Interestingly, the residual or stock-flow valuation which captures other factors like political decisions and cross exchange rates on principal revaluations expressed in different currencies was a significant contributor to changes in the public debt dynamics in selected years under the review period. For instance in 1990, public debt significantly increased through new public debt issuances to support the structural adjustment programmes and in response to the devastating drought in 1992. Considerable changes during 1997 and 1998 also reflect government expenditure specifically related to compensation of war veterans and involvement in diplomatic regional peace building missions in the DRC war (Jones 2011). These changes are not explained by debt dynamics fundamentals, thus, appearing as residuals to the debt dynamics equation.

The huge unexplained part since 2000 also reflects unbudgeted expenditure to cushion the economy from the impact of sanctions imposed on the country in 2000 and measures taken to stimulate the economy. Under the multicurrency environment, the stock flow valuation has also been large reflecting significant adjustment to the domestic debt stock which was substantially reduced by the severe hyperinflationary environment experienced in 2008. The huge stock-flow adjustment particularly in 2011 also reflects adjustments emanating from external debt data reconciliation that was undertaken by the government to establish the exact amount of the country's indebtedness.

The influence of these unexplained parts of the debt dynamics in Zimbabwe was further empirically analyzed to assess their impact on debt dynamics. Table 3 below presents the regression results on the determinants of public debt dynamics in Zimbabwe, with the change in the public debt to GDP ratio as the dependent variable.

The regression is essentially significant and does not suffer from any serial correlation. All the variables were integrated of order 1 and the signs of the main explanatory variables are as expected. In model 1 (table 3), the results show a significant impact of the snowball effect, which is composed of implicit interest rates, growth rate of the economy and previous debt levels on debt. This confirms that Zimbabwe's public debt was explosive over the period 1980 to 2012, reflecting the impact of the positive interest rate growth differential on public debt dynamics during the greater part of this period. However, after allowing for a structural break in 1990, the results show the insignificant role played by the snowball effect, reflecting the limited role played by automatic debt dynamics in influencing changes in public debt in recent years. This shows the absence of huge interest payments on the domestic debt component which was significantly reduced in 2008.

The election dummy becomes significant after 1990, reflecting the need by government to increase its expenditure as a political expedience in light of mounting pressure from opposition forces. Since the end of the 1990s, dissatisfied war veterans and poor rural households suffering from increasing poverty

and inequality began occupying white owned farms, sometimes forcefully. In the face of increasing protest in Zimbabwe at the worsening situation in 1997 the government sought to maintain itself in power through unbudgeted spending increases for war veterans and joining the war in the Democratic Republic of Congo (Jones 2011). The unbudgeted spending increases and devaluation started a cycle of inflation and crisis. The significant variable of the electoral cycle during the period 1990 in model 2 (table 3) is consistent with the results from the public debt dynamics which shows huge stock flow adjustments in election and drought years, notably 1992, 1996 and 2008.

The results also confirm that the economic crisis witnessed in Zimbabwe from 2000 to 2008, was instrumental in increasing the public debt to GDP ratio as reflected by a significant crisis dummy in model 2. Concerning the exchange rate variations, the Euro exchange rate was insignificant, signifying the limited role played by cross exchange rates in influencing Zimbabwe's public debt dynamics.

7 Conclusion and Policy Recommendations

This paper provided an analysis of public debt dynamics in Zimbabwe utilizing annual time series data from 1980-2012 and the concept of the inter-temporal budget constraint. The objective of the paper was to analyze the factors that influence the public debt dynamics in Zimbabwe. Understanding the factors that influence public debt dynamics is crucial in the formulation of optimal public debt management policies. The evolution of the public debt to GDP ratio is the outcome of a complicated set of inter-related decisions involving governments' tax and spending ambitions and their need to satisfy their intertemporal budget constraint, the public's willingness to hold debt and the ability to pay based on economic growth. Accordingly, the variables examined as major drivers of public debt dynamics in Zimbabwe include GDP growth, effective interest rates on government debt, output gap, primary balance and the exchange rate. The results show that public debt in Zimbabwe has mainly been influenced by substantial stock flow adjustments, reflecting unbudgeted social and political expenditures. Automatic debt dynamics also influenced public debt dynamics prior to the introduction of the multicurrency regime, reflecting high interest payments on the domestic debt portfolio against subdued economic growth rates.

Results from the simulation analysis show that Zimbabwe would require a primary surplus of 4.98 percent. This is assuming an envisaged medium term growth rate of at least 7 percent to reach a sustainable public debt target of 50 percent by 2030 that falls within the internationally accepted desired public debt target of less than 60 percent. The significant contribution of the stock flow valuation in the debt portfolio underscored the need for prudent debt management to guard against unexpected changes in public debt, which is not explained by fundamentals. The study also confirmed that the excess of real interest rate on nominal GDP growth rates have had a deleterious impact on the public debt and can automatically increase public debt, even when the primary balance is in equilibrium. Finally, given the significant role of automatic debt dynamics in

the public debt stock, the government needs to be much clearer and more specific on the growth-facilitating policies and also on the interest rate structure of public debt to limit the snowball effect emanating from the interest rate growth differential on public debt.

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Table 1: Contributions to automatic debt dynamics

Variable	Impact on parameter ϕ_t	Impact on debt to GDP (d_t)
Interest rate (i_t)	Positive contribution	Increase
GDP growth rate (g_t)	Negative contribution	Reduction
Inflation (π_t)	Negative contribution	Reduction

Source: Researcher's own computations

Table 2: Simulated primary balance required to optimise public debt

Alternative Scenarios	2012 Position And Parameters				Automatic Debt Dynamics	Target / Actual $dt = 20\%$ by 2030		Target / Actual $dt = 50\%$ by 2030	
	dt	r	g	pb	Φ	γ	pb	γ	pb
Baseline	94.8	8.3	4.5	-2.4	1.04	0.21	6.03	0.53	4.98
Scenario 1	94.8	7.0	5.0	-2.4	1.02	0.21	4.92	0.53	3.67
Scenario 2	94.8	6.0	7.0	-2.4	0.99	0.21	3.20	0.53	1.56
Scenario 3	94.8	9.0	7.0	-2.4	1.02	0.21	4.89	0.53	3.64
Scenario 4	94.8	5.0	7.0	-2.4	0.98	0.21	2.68	0.53	0.89
Scenario 5	94.8	4.5	7.0	-2.4	0.98	0.21	2.43	0.53	0.56
Scenario 6	94.8	4.0	7.0	-2.4	0.97	0.21	2.18	0.53	0.24

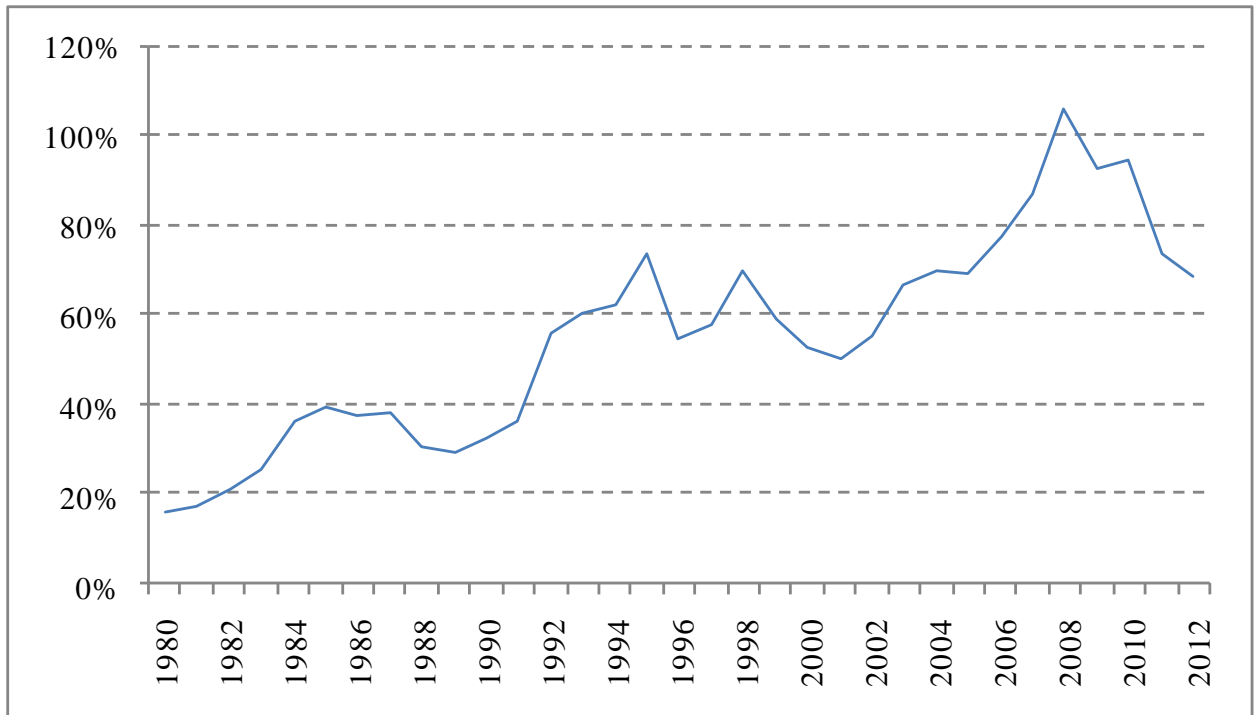
Source: Researcher's own calculations

Table 3: Determinants of public debt dynamics in Zimbabwe

Variable	Model 1 (1980-2012)	Model 2 (1990-2012)
β_0	0.067908*** (2.303913)	0.070990*** (2.636397)
$SNOW_t$	1.157724*** (2.826536)	0.292004 (0.646560)
PB_t	0.296733 (1.014127)	-0.213140 (-1.041605)
$CRIS_t$	-0.032287* (1.765927)	-0.058605** (-1.988743)
EUR_t	-0.051835 (-0.383926)	-0.321116** (-1.862041)
$ELEC_t$	0.038582 (0.168652)	0.067842** (2.140099)
$OGAP_t$	-0.34181*** (-2.389981)	-0.588386*** (-4.678521)
CA_t	0.050807 (0.219287)	-0.124084 (-0.533360)
Diagnostic Tests		
R-squared	0.574374	0.790255
S.E. of regression	0.071553	0.049080
Durbin-Watson stat	1.757481	2.281153

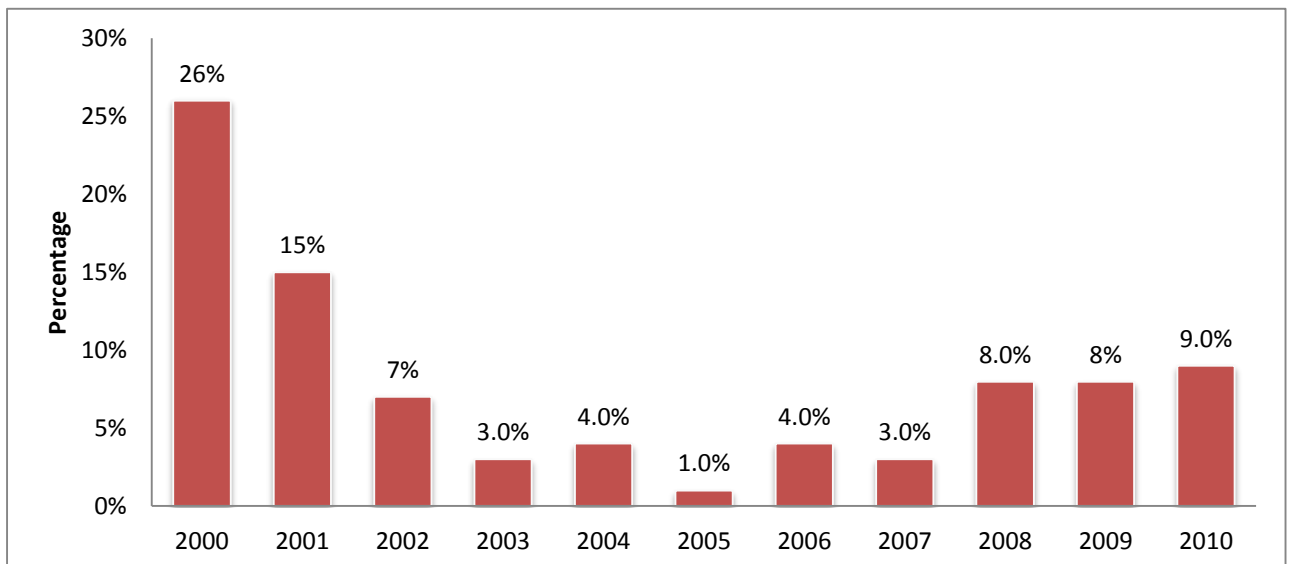
Note: ***, significance at 1%, **, significance at 5%, *, significance at 10% and figures in parenthesis are absolute t values

Figure 1: Trends in Zimbabwe's public debt to GDP ratio (1980-2012)



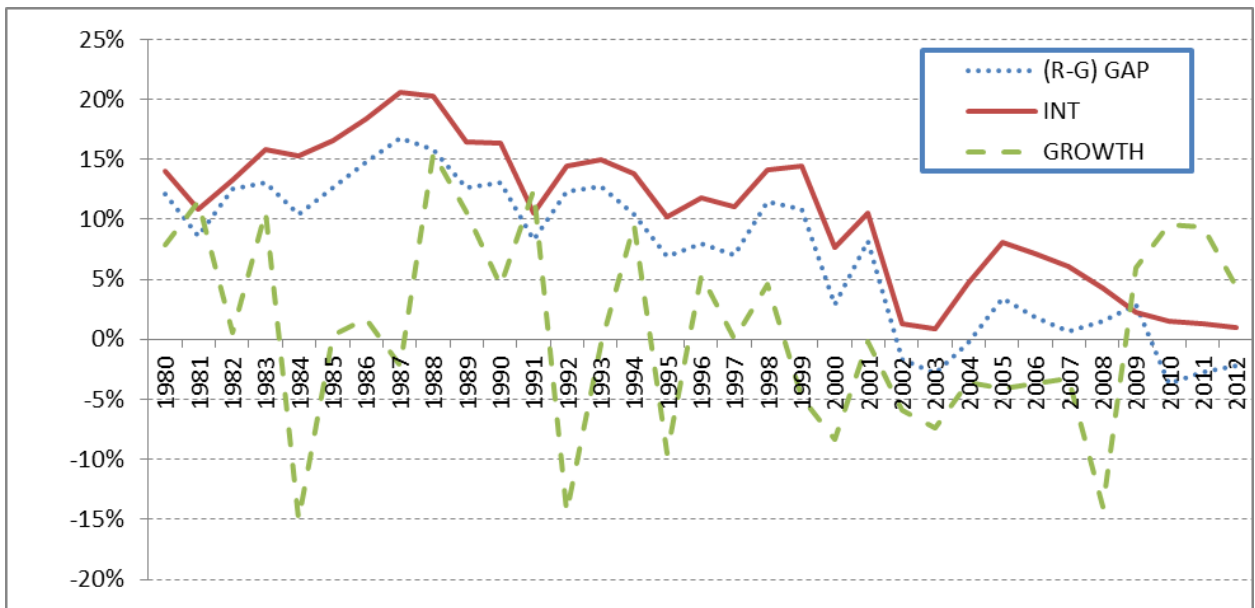
Source: IMF World Economic Outlook 2012

Figure 2: Domestic debt evolution as a % of GDP



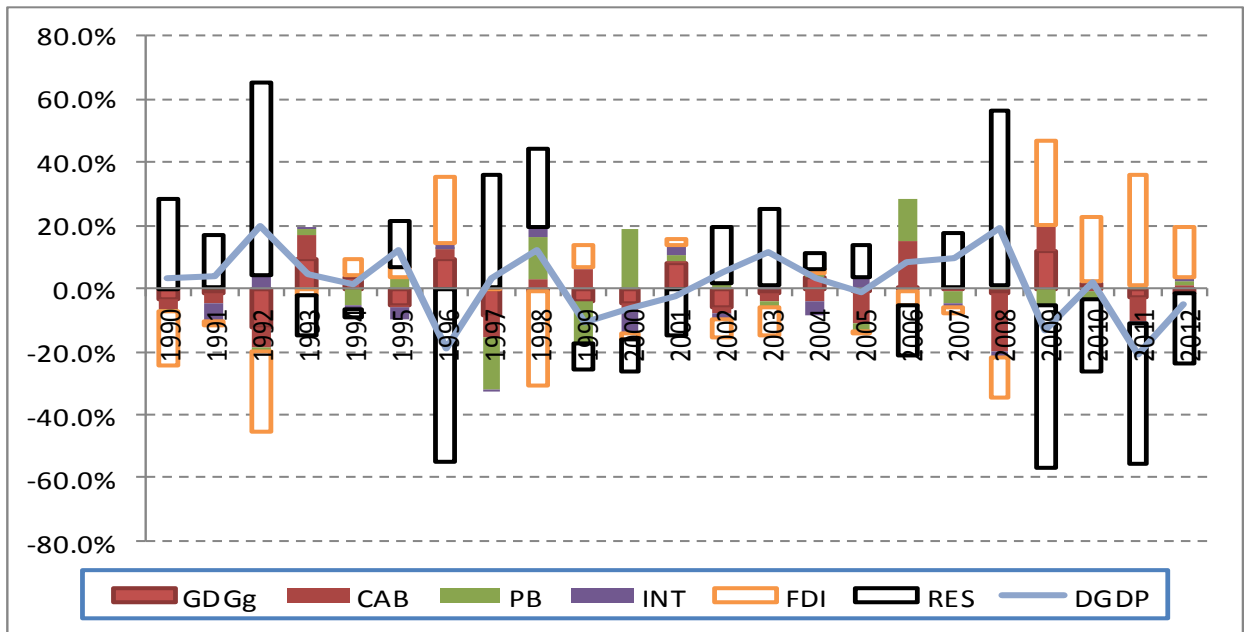
Source: Zimbabwe Debt sustainability Analysis (2012)

Figure 3: Historical movements in (r-g)



Source: Researcher's own calculations

Figure 4: Decomposition of Zimbabwe's public debt portfolio



Source: Researcher's own computations