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Public debt and post-crisis fiscal policy in South Africa

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Public Debt and Post-Crisis Fiscal Policy in South Africa

Research Report in support of a 50% research Master of Commerce in Development Theory and Policy

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Abstract:

Almost nine years after the onset of the global financial crisis, South Africa is still struggling to consolidate the public debt it accrued with countercyclical fiscal policy. Large deficit spending necessitated by the downturn in growth and upturn in unemployment-induced social spending caused South Africa's public debt level to escalate to 43.9% of its GDP by 2014. This rapid increase in South Africa's level of public debt has caused great concerns from many camps about the sustainability of South Africa's debt path.

This study identifies and analyses the key components of South Africa's debt sustainability and short-term fiscal policy effectiveness. It judges South Africa's countercyclical fiscal stance in response to the crisis against the major theoretical debates and empirical evidence in the literature. The risks of South Africa running large fiscal deficits are then evaluated with regard to both the level of public debt, and its associated interest payment burden. The study finds that South Africa's debt dynamics are a cause for concern, where a situation of debt which does not decrease, or even explodes, are possible outcomes unless serious fiscal consolidation is undertaken. Despite low post-crisis interest rates on public debt, the study also finds that the interest payment burden of South Africa's debt is crowding out other forms of government spending. The study ends by highlighting the need for fiscal consolidation in South Africa and briefly investigating the role fiscal policy rules can play in achieving consolidation goals.

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1. Introduction

Friday the 13th in June 2014 marked a gloomy day for South Africa when Standard & Poor's (S&P), one of the largest international credit rating agencies, downgraded South Africa's sovereign credit rating to BBB-, one notch above the "junk" status shunned by many investors. S&P cited lacklustre growth, labour unrest, and a sizable current account deficit as the cause of the downgrade, stating that "the fiscal stance may become exposed to lower-than-expected economic growth, pressure from a new round of public-sector wage negotiations, and increased spending needs". Two years earlier, the other major credit rating agencies, Moody's and Fitch, had downgraded South Africa's rating outlook from stable to negative. Moody's argued that there was a "...growing risk that the political commitment to low budget deficits and the ability to keep within current debt targets could be undermined by popular pressures". Fitch was concerned with South Africa's failure to create jobs and pick up the pace of economic growth, noting that "...this inability has not only constrained growth and kept the tax base narrow, but has also caused public finances to become increasingly redistributive... The resultant narrowing of fiscal space undermines a key support to South Africa's creditworthiness".

Much of this story has to do with South Africa's poor economic performance since the onset of the global financial crisis almost nine years ago. The downgrading of South Africa's sovereign risk ratings is representative of the lasting impact the global recession, and the fiscal response it prompted, has had on South Africa's economy and fiscus. Financial contagion, the drop in world commodity prices, and the severe recession in South Africa's traditional trading partners served to turn GDP growth negative, cause massive job losses, and put increasing strain on public finances. This story is told in more detail in Section 2.

Emerging from a period of prudent fiscal policy management before the crisis, South Africa was able to use the considerable fiscal space it had created from three years of running a budget surplus to execute a significant fiscal policy response. The operation of automatic stabilisers in the form of reduced tax revenue from lower national income was combined with a discretionary fiscal stimulus package that was designed to boost aggregate demand. This type of countercyclical fiscal policy response was controversial because much of the literature at that point questioned the effectiveness of fiscal policy for macroeconomic stabilisation, and because of the risks that large deficit spending carry regarding the solvency of public finances. The reasons for this controversy, and a discussion on the appropriateness of such a response to the crisis, are elaborated on in Section 3.

The result was for government spending to quickly outstrip revenue, causing the fiscal balance to turn to a deficit. This difference between spending and revenue was financed by the accumulation of public debt. From a public debt level of 26% of GDP in 2009, South Africa's debt/GDP ratio rapidly increased by almost 70% to a level of 43.9% of GDP by 2014[1]. However, South Africa was in good company with almost every major and emerging economy executing a similar fiscal response. The international trend of running large fiscal deficits and accumulating public debt as a result sparked intense debate about the sustainability of this type of response, and the correct time to transition to a contractionary fiscal position. The persistence and depth of the global recession polarised views on this matter. Deficit hawks were horrified at the escalating levels of public debt and had concern over the burden it would place on the economy in the future. On the other end of the spectrum, others cited persistent unemployment and the sluggish response of growth to stimulus as justification for further maintaining deficit spending. The credibility of rating agencies aside, the downgrading of South Africa's credit rating was representative of a growing view that South Africa's level of public debt is approaching, or has already surpassed, a level that is sustainable. In Section 4, this concern is tested. After constructing the theoretical framework for testing public debt sustainability, the section performs a scenario analysis based on a variation of the Domar sustainability analysis technique which maps out the various pathways for the evolution of South Africa's public debt.

Many in favour of maintaining deficit spending argue that a focus on debt/GDP ratios in sustainability analysis can be misleading. They press that high levels of debt can be financed in the low-interest-rate environment that often results in response to a recession. With such low interest rates, the interest-payment burden of public debt is reduced and servicing the debt stock is sufficient until the economy has recovered enough to pay back the capital. This argument is investigated in the South African context in Section 5. The relationship between public debt, deficits, and the interest rate, and the dynamic effect that the interaction between monetary and fiscal policy have on them, is investigated. The section traces the effects of the crisis on South Africa's interest rate and interest payment burden of public debt, and investigates whether interest expense is crowding out other forms of government spending.

South Africa's public debt and post-crisis fiscal policy story is concluded in Section 6. The results of this study are discussed and their implications for fiscal consolidation in South Africa explained. In particular, this section provides an introduction to the role of fiscal policy rules in contributing to fiscal consolidation in South Africa, and identifies areas where more research is needed. The section ends by

[1] Source: South African Reserve Bank 2014

noting the limitations of the scope of this study, and suggesting pertinent areas of further research that relate to the long-run impact of deficit spending on growth and employment.

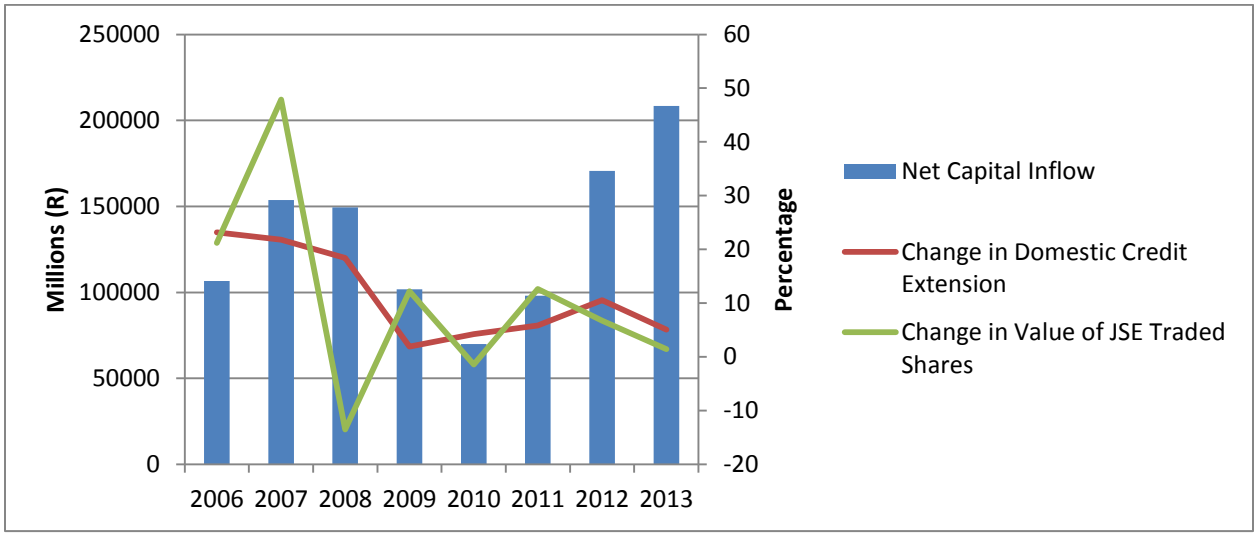
2. The Fiscal Impact of the Crisis on South Africa

The financial origin of the crisis provided many African countries with a degree of insulation at its onset due to the isolation of their financial markets. However, South Africa's sophisticated and integrated financial markets meant that financial contagion was the first avenue through which the economy was affected. While this contagion effect was somewhat mitigated by reforms in South Africa's banking regulations prior to the crisis (Devarajan & Kasekende: 2011, 423), cross-border financial linkages through capital flows, stock market investors, and the exchange rate still negatively affected the financial sector (IMF: 2009a, 3).

In particular, the global rise in risk caused investors to seek safe havens and, despite being the origin of the crisis, the United States (US) was viewed to be the safest investment destination through its treasury bills (Baxter: 2009, 108). In addition, as credit became more scarce, international banks in advanced economies pulled financial resources out of their emerging market locations, making external capital more scarce for South African banks and corporations (IMF: 2009a, 3). Furthermore, South Africa's stock market index plummeted at the onset of the crisis and suffered losses similar to other emerging market economies, and the capital outflow put downward pressure on the exchange rate (Devarajan & Kasekende: 2011, 425).

Figure 1 below shows the impact of the crisis on a selection of financial market indicators from 2006 to 2013. The graph shows that the Johannesburg Stock Exchange (JSE) was one of the first financial indicators to be affected by the onset of the crisis, with the change in value of traded shares (measured on the right axis) dropping dramatically in 2008. The decrease in net capital inflows (measured on the left axis) from 2008 to 2010 indicate that capital inflows were decreasing over the crisis period. This is supported by the change in domestic credit extension (measured on the right axis) which dropped substantially in 2009 from an already downward trend, indicating that the supply of credit had been constrained by the crisis.

Figure 1: Selected Financial Market Indicators

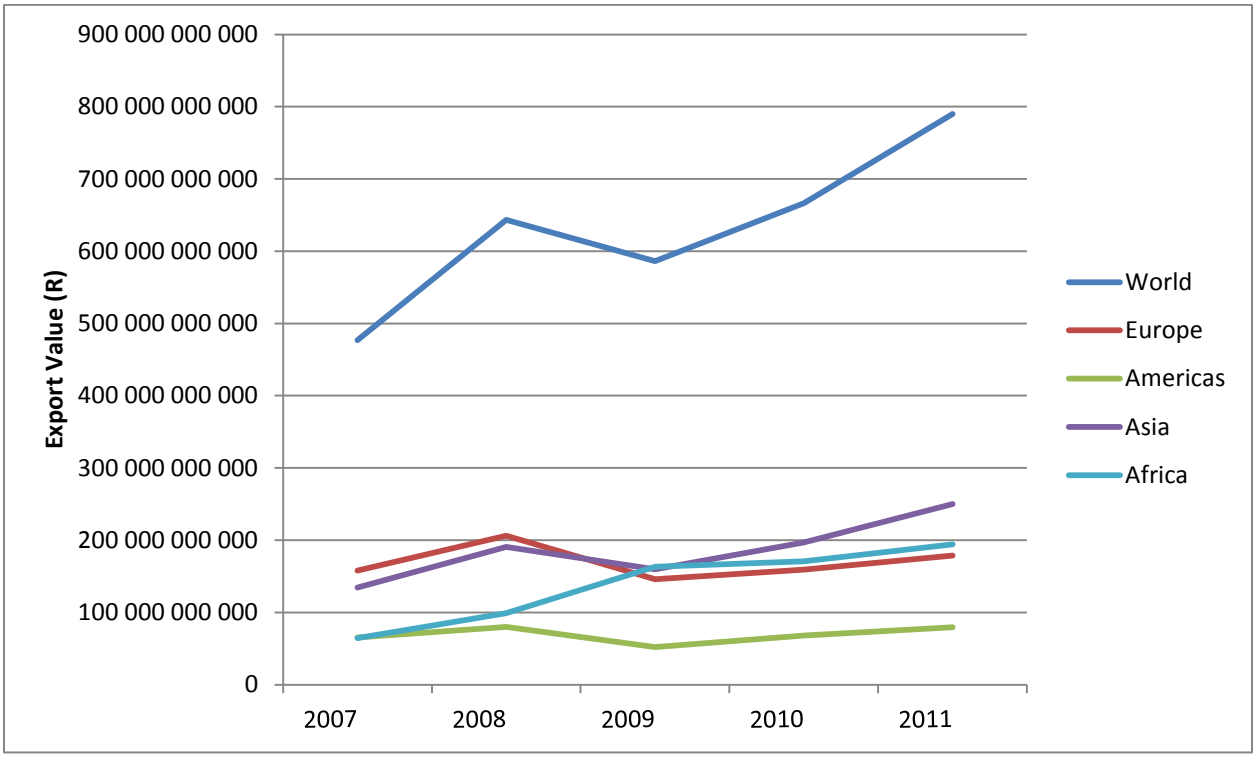


Data source: South African Reserve Bank 2014

The financial crisis soon spread to the real economy as the loss of financial wealth and income and gloomy investor confidence dampened global demand. South Africa's real sector was affected through two main channels. Firstly, after the commodity price boom of 2001-2007, the crisis served to depress global commodity prices (IMF: 2009a, 3). For many of the minerals South Africa produces, the drop in commodity prices was not sufficiently offset by a depreciation of the rand, meaning a loss in mineral revenue and concurrent decrease in mining production and employment. Mining is a crucial industry in South Africa with 20% of all corporate tax in 2007 raised by the sector (Baxter: 2009, 113).

Secondly, the severe recession in South Africa's traditional trading partners of Europe and North America meant that demand for South African exports to these regions significantly declined. While South Africa has seen an increase in trade with emerging market countries, such as India and China, traditional developed country trading partners are still a critical source of official financing (as well as remittance and investment flows), with the US and Europe continuing to account for almost half of sub-Saharan Africa's exports (Nene: 2011, 3). The effect of both of these channels is evidenced in Figure 2 below which shows South Africa's commodity exports to various regions. The sharp decline in total commodity exports in 2009 is clearly a result of the decreased exports to Europe and the Americas, with Asia and Africa accounting for the pickup in export volume from 2010 onwards.

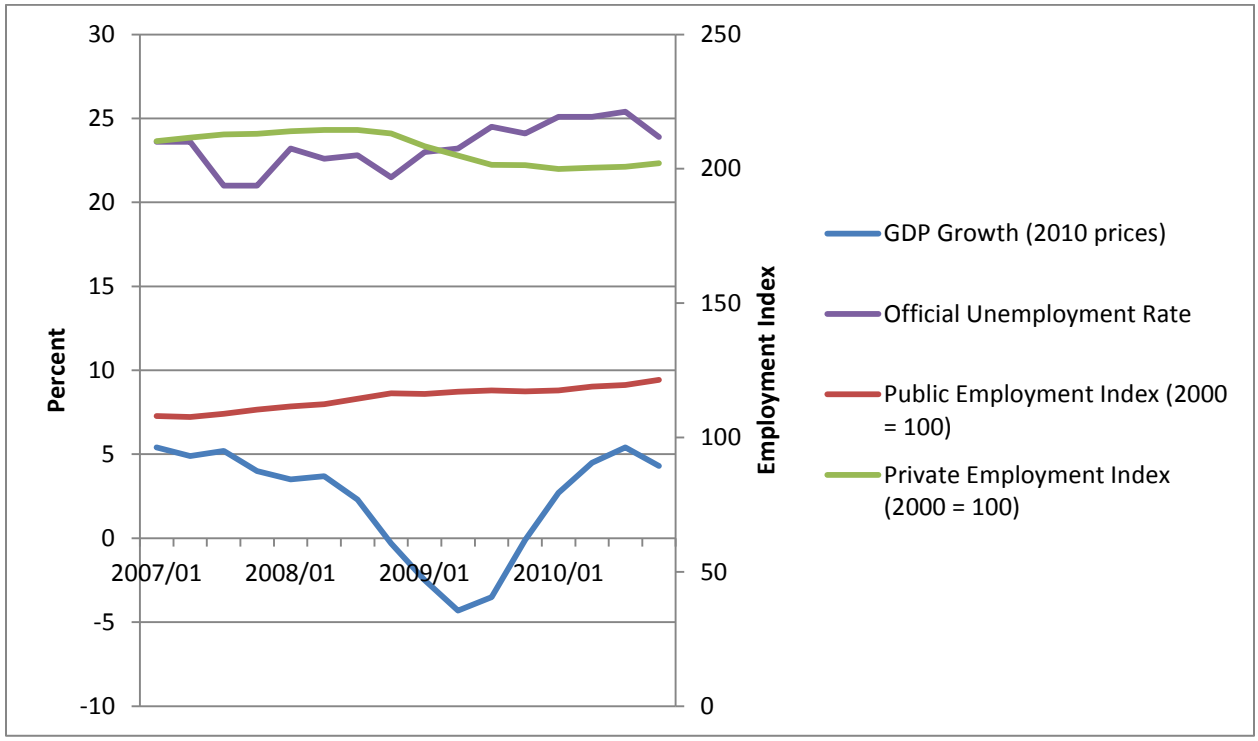
Figure 2: South African Commodity Exports by Region



Data Source: South African Department of Trade and Industry 2014.

As a result of the impact on South Africa's financial and real economy, the crisis severely affected the country's growth and employment trajectory. Figure 3 below plots quarterly data for South Africa's GDP growth and unemployment rates (measured on the left axis), and indices for total employment in the public and private sector (measured on the right axis). After surpassing a 6% GDP growth target in the beginning of 2006, the South African economy entered a recession in the last quarter of 2008. The recession lasted for five quarters, with the recovery occurring in the first quarter of 2010. As a result of the sharp contraction of the economy, the expected job shedding is evidenced by the climbing unemployment rate from the first quarter of 2009, from 23% to just over 25% by the third quarter of 2010. The employment indices published by the South African Reserve Bank (SARB) reveal that this increase in unemployment occurred solely due to job shedding in the private sector, with a steady decline in the index from the last quarter of 2008, while the public employment index rises from the second quarter of 2007 onwards.

Figure 3: Growth and Employment Effects of the Crisis

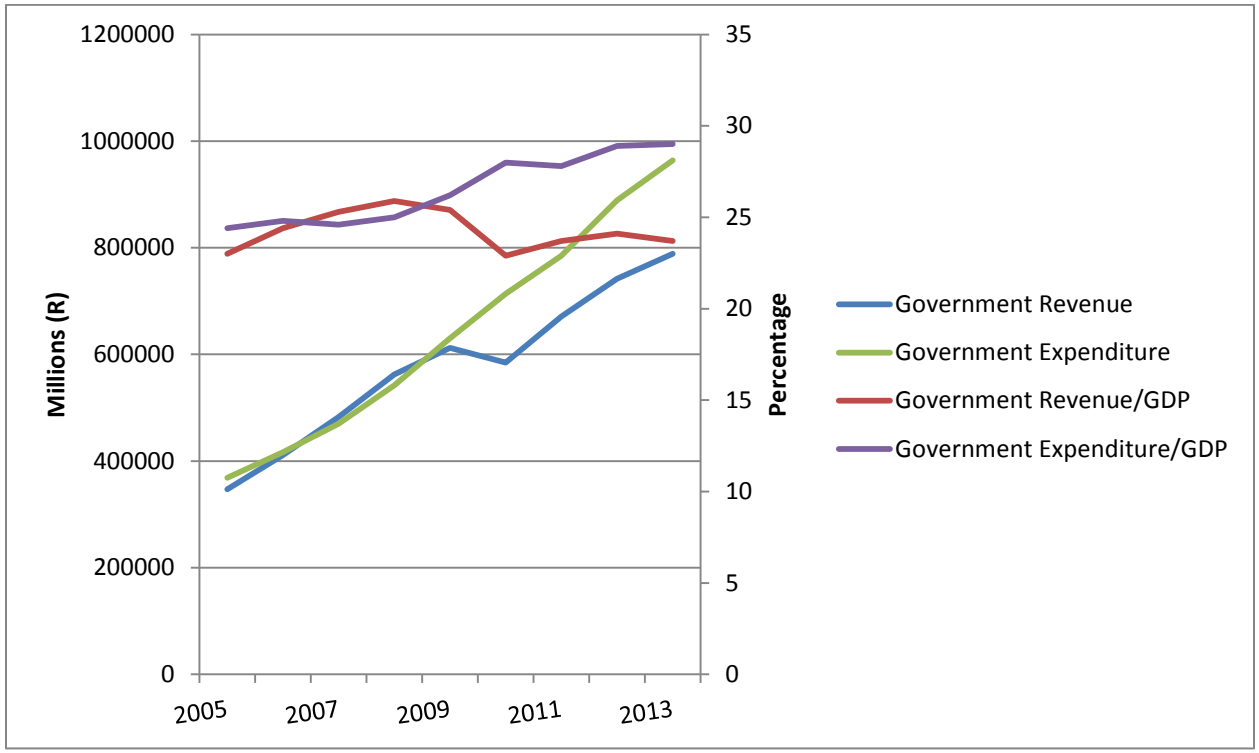


Data Source: StatsSA and the South African Reserve Bank 2014

The result of the recession and the concurrent downturn in growth and increase in unemployment was to place increased pressure on the South African fiscus. Immediately prior to the onset of the recession, the South African Treasury had managed to create fiscal space by keeping government spending below its revenue collection. However, the downturn in growth during the recession caused a sharp downturn in the collection of tax revenue, and necessitated an increase in discretionary government spending in the form of public investment and increased civil service employment.

Figure 4 below shows the actual value (measured on the left axis) and ratio to GDP (measured on the right axis) of fiscal revenue and expenditure in the run-up to and aftermath of the crisis. The graph shows how South Africa enjoyed a surplus of revenue over expenditure in 2007 and 2008, but the sharp decline in revenue in 2009 coupled with the continued rise in expenditure causes the revenue- and expenditure-to-GDP ratios to diverge from 2009 onwards. Despite the pickup in revenue collection from 2011 onwards, the continuous increase in expenditure necessitated by the severity of the crisis has meant that there has been a deficit of government revenue over expenditure since the onset of the recession to present day.

Figure 4: Impact of the Crisis on Fiscal Revenue and Expenditure

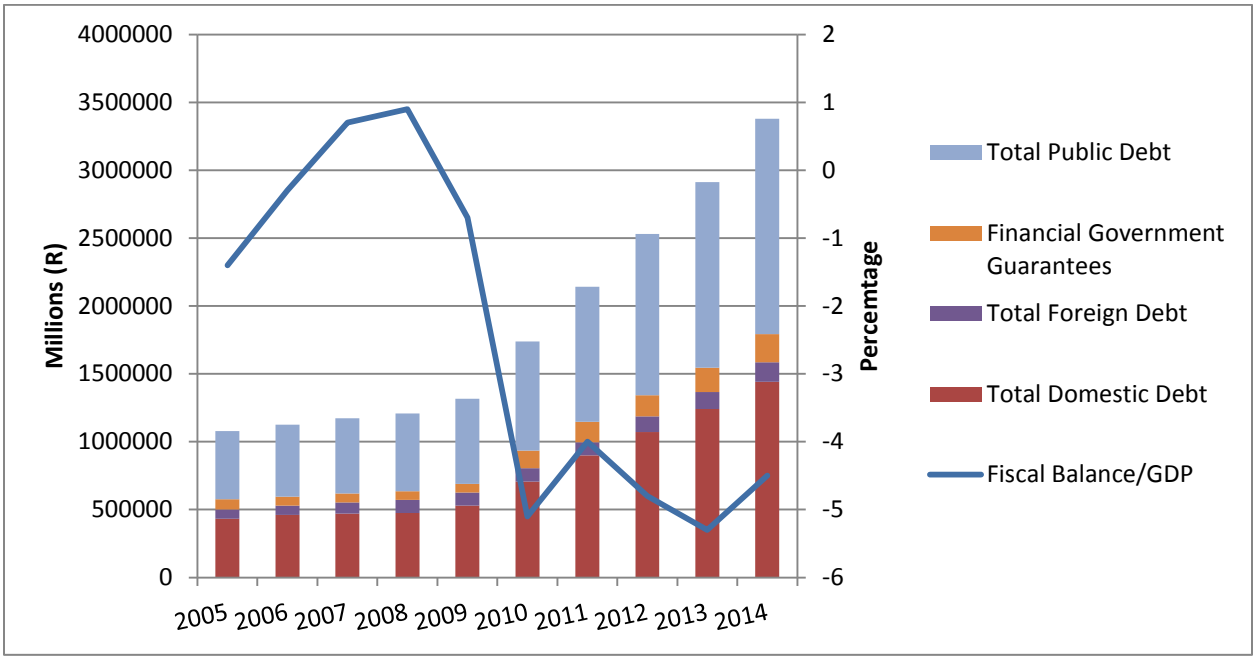


Data Source: South African Reserve Bank 2014.

This deficit has been financed by the accumulation of public debt. Figure 5 below shows the level of total public debt (measured on the left axis) broken down by domestic and foreign debt, as well as government guarantees, and the fiscal-balance-to-GDP ratio (measured on the right axis). The fiscal balance moves from surplus to deficit in 2009, where it remains in deficit to the present day. The movement from surplus to deficit corresponds with a sharp increase in the level of public debt from 2010 onwards. The result has been the sharp and continuous increase in South Africa's debt/GDP ratio from a low of 26% in 2009 to 43.9% in 2014[2], with Treasury estimating the ratio to increase to 48.3% by the 2016/2017 fiscal year (National Treasury: 2014, 71).

[2] Source: South African Reserve Bank 2014.

Figure 5: Public Debt and the Fiscal Balance



Data Source: South African Reserve Bank 2014

South Africa clearly responded to the crisis with a strong countercyclical fiscal response. In combination with the operation of automatic stabilisers, a fiscal stimulus package was implemented in the form of discretionary spending to try and boost aggregate demand. While South Africa was in good company executing such a response, the orthodox view prior to the crisis questioned the value of discretionary fiscal policy in boosting growth in much of the literature[3]. Furthermore, given the alarming rise in the level of public debt as a result of the response, many questioned whether the debt servicing obligations it induced was worth the positive effect it may have had on stabilising the economy. The many debates regarding whether a countercyclical response to the crisis was justified are the focus of the next section.

[3] See for example: Blinder, A. 2006. The Case Against the Case Against Discretionary Fiscal Policy in *The Macroeconomics of Fiscal Policy* ed. R.W. Kopcke, G.M.B. Tootell, and R.K. Triest, 25-61. Cambridge: MIT Press; Hemming et al. 2002;
Saregent, T. 1993. *Bounded Rationality in Microeceonomics*. Oxford: Oxford University Press; Seater, J. 1993.Ricardian Equivalence. *Journal of Economic Literature* 31 (1) pp. 142-90;
Smets, F. and Wouter, R. 2007. Shocks and Frictions in U Business Cycles: A Bayseian DSGE Approach. *American Economic Review* 97 (3) pp. 587-606;
Woodford, M. 2009. Convergence in Macroeconomics: Elements of the New Synthesis. *American Journal of Economic*s 1 (1) pp. 267-79.

3. Countercyclical Fiscal Policy: Debates and Evidence

The global financial crisis caused many economists to question and revise what they thought they knew about the role and effectiveness of fiscal policy in macroeconomic stabilisation. The magnitude and coordination of the fiscal response from almost all major and emerging economies was unprecedented. The use of countercyclical fiscal policy and the magnitude of discretionary fiscal spending was controversial and has questioned whether a new standard has been set for the fiscal response to crises in the future. This section investigates the major theoretical debates and empirical evidence on the appropriateness of countercyclical fiscal policy in the face of a crisis, and applies them to the South African context.

3.1. Theoretical Debates

Prior to the most recent crisis, economic orthodoxy questioned whether fiscal policy should play much of a role as a tool for short-term macroeconomic stabilisation. This view held that monetary policy was a more effective stabilisation tool for a variety of reasons and, therefore, fiscal policy should be used as an exception rather than the rule. Automatic stabilisers should be allowed to operate within the context of a balanced budget over the business cycle, and the interest rate was seen as the main stabilisation tool with fiscal policy playing a downgraded and passive role (Angeriz & Arestis: 2009, 568).

This view represented the culmination of a number of arguments against the short-term effectiveness of fiscal policy. The first relates to the difficulty of fine-tuning fiscal policy due to the time lags involved: recognition lags resulting from collecting and interpreting business cycle information, decision lags, implementation lags, and the time taken for the economy to respond to the policy changes (Sawyer: 2009, 554). Cumulatively lasting many quarters and sometimes even surpassing the recession, these lags can destabilise the economy if policy aimed at addressing a slowdown takes effect once the economy has already moved into the next phase of the business cycle (Caldantey & Vernengo 2010: 9). While this can also be true for monetary policy, its main policy instrument – the interest rate – and its decision-making and implementation process, is generally quicker than that of fiscal policy (Sawyer: 2009, 554).

The second and most common argument relates to crowding out. An increase in government spending is argued to create direct and induced crowding out. In the former case, the provision of goods and services by the government substitutes for the goods and services the private sector provides. In the latter, government spending financed through debt drives up the interest rate, reducing investment and

private consumption. If the increased government spending is financed through increased taxes, the loss of disposable income will have the same effect on private consumption (Caldentey & Vernego: 2009, 9). Furthermore, an increase in public employment may reduce the private sector labour supply, driving up wages and decreasing the present discounted value of future profits, which may also reduce investment (Angeriz & Arestis: 2009, 572). The increase in aggregate demand from government spending is, therefore, offset by the decrease in private consumption and investment.

Thirdly, Ricardian Equivalence argues that expansionary government spending financed through public debt is self defeating. Consumers realise that the boosted government spending must eventually be paid off in the future, either through a reduction in future spending or increased taxation. The perceived future welfare loss causes consumers to save more in the current period in anticipation. This argument is based on the assumption of rational expectation: that forward-looking agents have full information and that markets clear efficiently. This implies that economic agents engage in consumption smoothing over their lifetimes, taking into account the government's budget constraint (Caldentey & Vernego: 2009, 8). If these assumptions hold, the increase in aggregate demand from government spending is offset by the decrease in private consumption. Furthermore, labour supply as well as production would decrease since the distortionary effects of higher taxation induce expectations of lower output in the future (Angeriz & Arestis: 2009, 571).

Fiscal deficits are also argued to lead to external instability. The orthodox view draws a causal relationship between fiscal deficits and the current account. If there is dissaving in the public sector, the level of aggregate national saving will fall and the increased government borrowing to cover the rising deficits will increase the interest rate. Without strict capital controls and a flexible exchange rate regime, the higher interest rate will attract foreign capital, causing an exchange rate appreciation and a current account deficit (Vera: 2009, 615).

In contrast, the orthodox view maintains that monetary policy is a more effective stabilisation tool because it is more flexible, is more easily insulated from political pressure, more easily placed in the hands of experts, and the zero lower bound typically occurs only infrequently and not sharply (Romer: 2012, 58). However, this position is not uncontested.

Pollin argues that the Ricardian equivalence assumption is unrealistic as it assumes that agents operate with perfect foresight and within perfectly functioning markets. It also assumes that these agents always prefer to save more now to cover their decreased wealth in the future, rather than spending more now

and worrying about the future later (2011, 9). In recognition of this, some economists have tried to relax the assumption by introducing a distinction between Ricardian consumers and "rule-of-thumb" consumers – i.e. credit-constrained consumers unable to borrow and lend freely and who consume all their income in each period. In this framework, an increase in government spending causes firms to increase their production and demand for labour, increasing the real wage rate which is spent by "rule-of-thumb" consumers. In this model, increased public consumption can lead to an increase in private consumption if there are enough "rule of thumb" consumers in the economy (Fontana: 2009, 592). In addition, Parguez argues that an expansionary fiscal policy can act as anchor for profit expectations among firms (2007, 8). The increase in government spending as well as the increase in public employment leads to an increased expectation of profit among firms, inducing investment and further employment creation.

With regards to external stability, Vera argues that applied macroeconomic work in developing countries undermine the assumptions that support the causal relationship between fiscal and current account deficits (2009, 617-618). Underutilised productive capacity and supply-side constraints are not considered, and the assumption of perfect asset substitution is not supported by empirical evidence in the developing world. Without the assumptions of full employment and perfect asset substitution, money demand is no longer a given and the determinism from the fiscal deficit to changes in international reserves suffers many problems. Moreover, drawing from the Latin American context, structuralist economists have argued that fiscal deficits may be a response to, rather than the cause of, external deficits. For example, a fall in exogenous demand for mineral exports would cause the external account to deteriorate which, in a country that is heavily reliant on company tax from mineral exporters, would cause the fiscal balance to worsen. Similarly, unexpected changes in export earnings, import prices, foreign borrowing, and the availability of foreign credit may all affect a country's fiscal variables as well as their national income (Vera: 2009, 619).

In addition to these abstract theoretical debates, it is important to consider the context in which short term fiscal policy effectiveness is being evaluated. Hemming et al (2002a) provide a theoretical framework for evaluating whether fiscal policy has a positive and substantial fiscal multiplier (or in other words, effective fiscal policy) at a particular point in time. They determine five criteria which must be met in order for a government to generate a relatively large fiscal multiplier:

- significant excess capacity,

- liquidity constrained households,
- government spending not substituting for private spending,
- government not facing financing constraints, and
- accompanying fiscal expansion with monetary expansion.

In applying these criteria to the South African scenario during the crisis, it is clear that South Africa was operating well below capacity with a very high unemployment rate of 23.7% and a manufacturing rate of capacity utilisation of 78.1% in 2009[4]. Due to falling incomes and high unemployment in the wake of the crisis, as well as an existing heavy private debt obligation, South African households could be considered to be credit constrained during the crisis. Jooste et al (2013, 12) confirm this assumption with a dynamic stochastic general equilibrium model (DSGE) which indicates that South Africa has a large share of credit-constrained consumers that are unable or unwilling to save, given extra income. The financial crisis caused a large amount of risk aversion among private investors and a resultant drop in private investment, meaning that the rise in government spending was not substituting for private spending on the investment front (Pollin: 2011, 10). Furthermore, on the consumption spending front, the rise in government consumption of 11.86% from 2009-2013 did not crowd out household consumption, which grew by a larger 16.65% over the same period[5]. Relatively low bond yields during the crisis meant a less harsh debt servicing obligation, and South Africa's well developed and integrated financial markets meant that the government did not face a financing constraint. Lastly, South Africa's expansionary fiscal stance was accompanied by expansionary monetary policy as the SARB attempted to keep interest rates low to stimulate investment and prevent a spike in inflation.

By Hemming et al's criteria, South Africa's position during the crisis was indeed one that was conducive to a relatively large fiscal multiplier. The effect of South Africa's fiscal expansion (and accumulation of public debt) during and after the crisis struck should be to positively stimulate growth, at least on a theoretical basis.

3.2. Empirical Evidence

Beyond this rich theoretical debate, those in favour of actively using fiscal policy as a stabilisation tool point towards the empirical evidence to support its effectiveness. Romer reviews the large body of empirical evidence for the short-term effects of fiscal policy and concludes that conventional fiscal

[4] Data Source: South African Reserve Bank 2014.
[5] Calculated from 2014 South African Reserve Bank data.

stimulus is effective at raising output (2012, 59-60). He also points to historical evidence, in particular the major increases in US government spending during the two world wars and the Korean War leading to booms in economic activity.

Angeriz and Arestis surveyed the results of empirical estimates of fiscal policy in the European Union (EU), US, and United Kingdom undertaken by each region's respective central bank (2009, 580). They find that there is a positive effect of fiscal policy on output, which is quite substantial up to and around the third year after the policy is implemented. However, by the 12^{th} quarter, the positive effects evaporate in the case of the Bank of England and in one case for the Fed. They argue that the results suggests that fiscal policy should not be used for short-term stabilisation.

Wren-Lewis uses a complex macroeconomic model to conclude that changes in government spending, income transfers, and indirect taxes can still have an impact on demand in the short run (2000, 104). Hemming et al find that there is little evidence of direct crowding out through interest or exchange rates, or for full or partial Ricardian equivalence offset (2002a, 36), while Briotti argues that although many empirical studies strongly reject the full Ricardian equivalence effect, observed private consumption behaviour may still be consistent with a partial Ricardian equivalence effect (2005, 21). However, the empirical evidence is somewhat mixed and no clear conclusion can be reaches about the effect's magnitude. Hemming et al find that estimates of fiscal multipliers are small, but overwhelmingly positive (2002b, 4). They find hardly any instances of negative fiscal multipliers, except in some macroeconomic models with strong credibility effects.

In the South African context, two studies which have estimated the size of the fiscal multiplier in South Africa are worth noting. The first study, undertaken by Ocran (2010), examines the effects of fiscal policy associated with government expenditure, tax revenue, and budget deficits on the South African economy using the structural vector autoregression (VAR) estimation technique.

Ocran finds that the effect on output from changes in government investment is quite small in intensity and negative, with a relatively high standard error making the result less reliable. As such, government investment expenditure does not seem to have a significant impact on output (2010, 611). While he finds that positive tax revenue shocks stimulate marginal output responses, the standard error of the estimated response to the stimulus increases over time. The response in output observed from a one unit shock in tax revenues can therefore be deemed weak (2010, 612). Changes in government consumption expenditure, however, do not attract an immediate response from output. There is a lag of

almost one and a half years, after which the response becomes negative (2010, 613). Using the budget deficit as the fiscal variable, Ocran finds that output responds positively to budget deficit changes, but only slightly as a one unit change in the budget deficit generates just 0.003 units response in output, while the response has a high level of uncertainty due to the associated standard error values (2010, 615). Lastly, changes in tax revenue are observed to attract a positive but weak response from output, up until quarter 6, after which the response turns negative.

Ocran concludes that despite the mixed results, a common strand is that changes in fiscal policy through government investment or consumption expenditure, tax revenue, or the budget deficit have modest but persistent effects on output. However, the direction of the effect was positive for changes in tax revenue and budget deficit, but negative for government investment and consumption expenditure (2010, 616).

The second study, undertaken by Jooste et al (2013), analyses the effect of government spending and taxes on output in South Africa using three types of DSGE models, as well as a structural vector error correction model (SVECM) and a time-varying parameter vector autoregression (TVP-VAR).

Using the DSGE model, the authors make the distinction between Ricardian and rule-of-thumb households that was discussed in Section 3.1. With a small share of Ricardian households, increases in government spending leads to an increase in aggregate consumption due to the large response of rule-of-thumb consumers. The response from output is close to unity, implying that fiscal policy has the potential to stimulate demand, but as the share of Ricardian households increases, the output response declines (2013, 12).

Turning to the SVECM, the study finds that a 1% increase in government expenditure increases GDP per capita by more than one percent, with the maximum impact reached over three quarters. However, in the long run, the effect disappears to virtually zero. The study also finds that an opening up of the economy effectively reduces the size of the fiscal multiplier (2013, 13).

With the TVP-VAR model, the study notes that pre-2000 multipliers (when South Africa has a mostly procyclical fiscal stance) were slightly less than one and took five quarters to have a maximum impact on the economy. The periods where the multiplier was the strongest was the run-up to the crisis, 2007 and 2008, during which South Africa was running budget surpluses not seen since 1990. An expansionary fiscal shock during this countercyclical fiscal policy period had longer and more far-reaching effects (2013, 14).

Jooste et al draw three main conclusions from the study. Using the different methodologies, they argue that fiscal policy in South Africa has been effective in stimulating both output and consumption. A closed economy yields larger multipliers, whereas an open economy reduces the multiplier. For South Africa, the multiplier is larger than one in periods of countercyclical policy, but the multiplier becomes less effective when fiscal policy is procyclical (2013, 15).

The empirical evidence on fiscal multipliers in South Africa seems to more strongly suggest that the fiscal multiplier is positive and greater than one than the alternative. However, this generalised conclusion must be taken in cognisance that the result is highly dependent on particular circumstances and conditions. For example, South Africa is a generally open economy with a trade/GDP ratio of 62% for 2011-2013[6], indicating that the size of the multiplier will be reduced by this high level of openness. However, the fact that South Africa's rapid fiscal expansion took place in a countercyclical fashion indicates that the multiplier at the time of the crisis would have been larger. On balance, the empirical evidence does not provide the strong link between fiscal expansion or deficit spending and a positive effect on growth that we may hope for, although it also does not disprove it.

3.3. Concluding Remarks

Mainstream economists concede that there are extraordinary or abnormal circumstances where monetary policy tools fail to stabilise the business cycle and fiscal policy is needed for stabilisation through deficit spending or tax cuts (Caldentey & Vernego: 2010, 11). A historical example is the Japanese recession in the 1990s, lasting for fourteen years, where interest rates hit the zero lower bound, crowding out effects were negligible, and the recession endured longer than fiscal policy lags. (Caldentey & Vernego: 2010, 12).

Undoubtedly, the recent crisis has provided the most severe challenge to the orthodox view and has caused mainstream economists to seriously reconsider the role of fiscal policy in times of recession. During this crisis, shocks were much larger than expected, the zero lower bound constraint turned out to be binding and quite permanent, and central banks did not make enough use of other monetary policy tools to compensate for the loss of stimulus caused by the zero lower bound. As such, almost every major country employed discretionary fiscal policy tools in addition to the traditional monetary policy tools (Romer: 2012, 58).

[6] Data source: World Trade Organisation 2014

As no exception, South Africa's use of countercyclical policy was in line with the global trend. While there is a rich theoretical debate on the merits of fiscal policy as a tool for macroeconomic stabilisation, South Africa seems to fit well with the theoretical criteria for having a positive fiscal multiplier at the onset of the crisis. Furthermore, despite the fact the empirical evidence on the matter is not conclusive, the evidence in the South African context does not disprove the presence of a positive fiscal multiplier. As such, given the magnitude of the impact of the crisis on the South African economy, South Africa was justified in taking a large fiscal response to the crisis.

However, the use of countercyclical fiscal policy and the employment of large discretionary spending comes with large risks. The escalation of the level of public debt that results presents serious sustainability concerns that need to be addressed. This will be the focus of the next section.

4. Debt Sustainability

The unprecedented use of discretionary fiscal policy in the face of the crisis has reinvigorated debate about the long term consequences of maintaining fiscal deficits and growing levels of public debt. In the US and European Union (EU) in particular, deficit hawks have argued that maintaining fiscal deficits after the economy shows signs of recovery will lead to an unsustainable build up of public debt which will constrain future fiscal options and place a burden on future generations. Others discard sustainability concerns in favour of maintaining fiscal deficits to achieve employment and growth targets which, they argue, will generate enough revenue in the future to offset the debt accrued now.

4.1. Theoretical Framework

The concept of debt sustainability relates to a government's ability to employ the same set of fiscal policies indefinitely without going bankrupt or defaulting on its debt. Traditionally, sustainability is viewed in terms of expressing a fiscal variable – be it debt, debt repayments, or the primary balance – as a ratio of some underlying macroeconomic variable, usually GDP. A public debt path is considered sustainable, for example, for any path of the primary balance which keeps the debt/GDP ratio constant (Vera: 2009, 633).

There are two main approaches to assessing the sustainability of a government's debt path: the Domar method, and the Present Value Constraint (PVC) approach[7]. The Domar method makes projections of future interest rates (payable on debt) and growth rates in order to determine what primary balance is required to keep the debt/GDP ratio stable, while the PVC method takes the present value of all future fiscal revenue and expenditures, and debt and debt repayments, to assess the 'affordability' of the government's current fiscal position (Vera: 2009. 634-635). The Domar or traditional method, as taken from Cassimon et al (2008, 26), draws on the theoretical decomposition of public debt into its various components:

[7] Cassimon et al (2008, 44) also consider an alternative debt sustainability assessment, termed the human development perspective, which measures a country's debt obligations against its ability to achieve its Millennium Development Goals. However, this method applies to external debt and considers debt forgiveness as one of its prescriptions, making its applicability limited to low-income countries with a history of debt defaulting.

$$D_t = D_{t-1} + iD_{t-1} + \left(I_g + C_g - T\right) - \Delta M = (1+i)D_{t-1} + (B - \Delta M)$$

where D_t is the stock of public debt, i is the average nominal interest rate on public debt, I_g is government spending on infrastructure, C_g is recurrent government spending, T is domestic government revenue, ΔM is monetary financing, and B is the primary (non-interest) government balance. Sustainability requires an investigation of the changes of debt indicators over time, normalised by the government's ability to service debt, such as GDP. With a few assumptions and simple algebra, the equation above can be rewritten :

$$\Delta d_t = b_t + (r - g)d_{t-1}$$

where d_t is the ratio of debt to GDP, r_t is the average real interest rate on debt, g_t is the real growth rate of GDP, and b_t is the ratio of the primary balance to GDP.

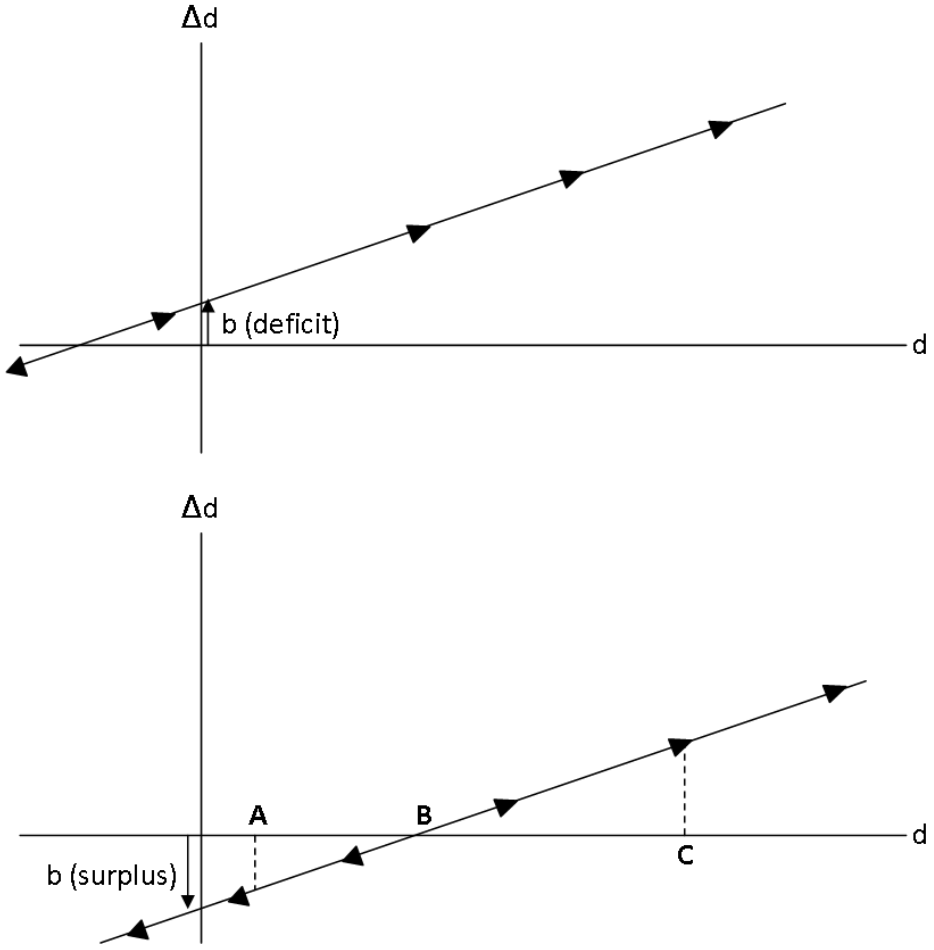
This equation reveals that two key factors affect the debt-to-GDP ratio over time: the difference between the average real interest rate on debt and the real growth rate of GDP (the interest-growth rate differential), and the primary balance. If the interest rate is higher than the GDP growth rate, the interest payments on existing debt are rising faster than GDP and the government will have to run a primary surplus to keep the debt-to-GDP ratio constant, and run a sufficiently large surplus to reduce it. If, however, GDP growth exceeds the interest rate, keeping the debt-to-GDP ratio constant, or even reducing it, is compatible with a primary deficit (Carlin & Soskice: 2006, 183). Essential to both of these methods is, therefore, an evaluation of the evolution of the rates of economic growth and interest on debt.

It is useful to show the different scenarios that can occur using a phase-line diagram which clarifies how the debt/GDP ratio evolves based on assumptions about the interest-growth rate differential and the primary balance. The diagrams plot the debt/GDP ratio (d) on the horizontal axis and the growth in the debt/GDP ratio (Δd) on the vertical axis. Depending on the level of debt in the economy, the phase line shows whether the change in the debt level in the next period will be positive or negative. The slope of the line is determined by the interest-growth rate differential, and the intercept of the line with the vertical axis represents the magnitude of the primary balance. If the line intercepts the vertical axis above the horizontal axis, the primary balance is in deficit, and vice versa.

Figure 6 below shows the phase line diagram for an economy with a positive interest-growth rate differential (the interest rate exceeds the growth rate). In the top diagram, the phase line cuts the

vertical axis above the horizontal axis, representing a primary deficit. Because the interest-growth rate differential is positive, at any positive level of the debt/GDP ratio, the corresponding change in the debt/GDP ratio will be positive. As such, assuming the macroeconomic conditions do not change, the debt/GDP ratio will continue to increase over time as the economy moves North-East along the phase line.

Figure 6: Phase Line Diagram with Positive Interest-Growth Rate Differential



Sourced from Carlin & Soskice: 2006, 184

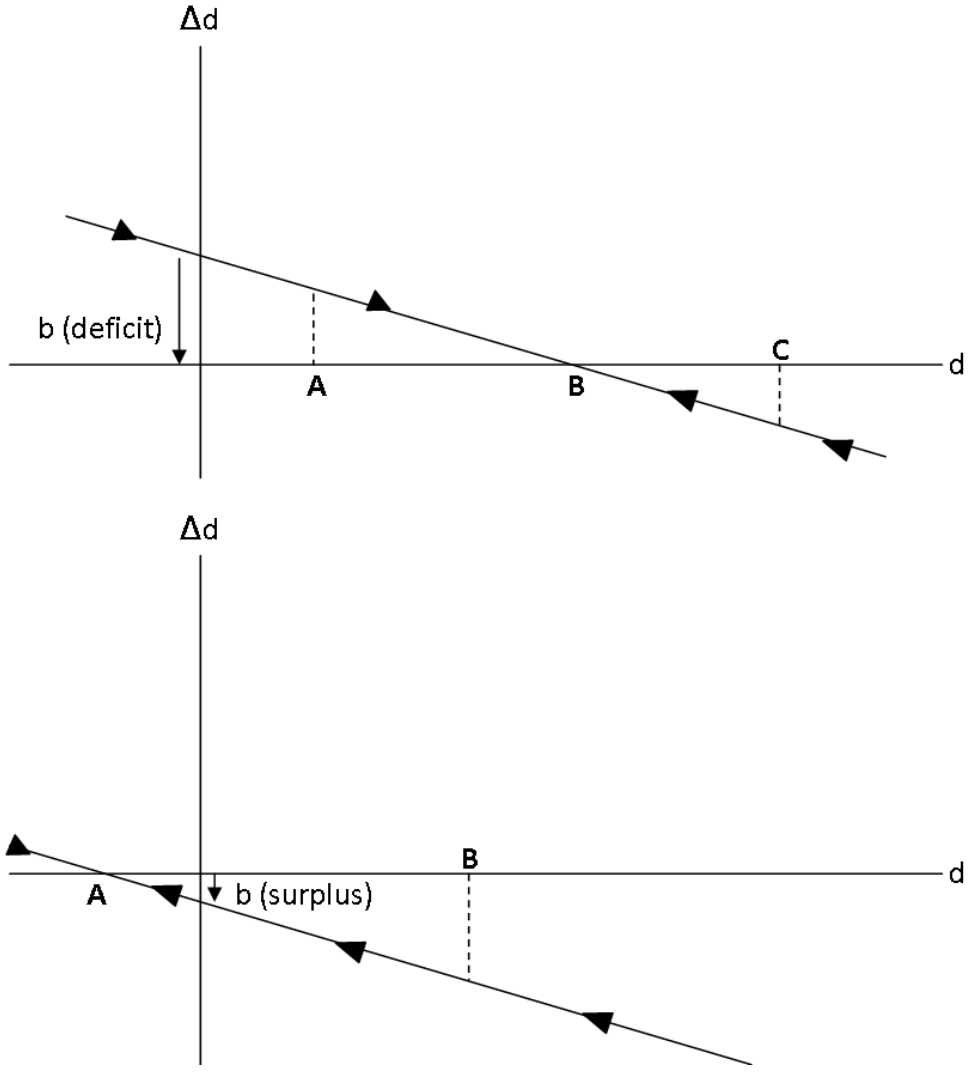
In the bottom diagram, the phase line has the same slope but cuts the vertical axis below the horizontal axis, representing a primary surplus with the same interest and growth rates. In this case, the progression of the debt/GDP ratio depends on its initial level. If the debt/GDP ratio is initially at point A, the primary surplus is sufficiently large to offset the positive interest-growth rate differential and the debt/GDP ratio will shrink as the economy progresses South-West along the phase line. If the debt/GDP

ratio is at point B, the primary surplus effect is exactly offsetting the positive interest-growth rate differential effect and the debt/GDP ratio will remain constant. However, this does not mean that the debt/GDP ratio is stable – a slight increase in the ratio would cause it to increase continuously, and a slight decrease would cause it to decrease continuously. Running a primary surplus can keep the debt/GDP ratio constant, but it does not change the underlying dynamics of the debt as determined by the interest and growth rate. At point C, the positive interest-growth rate differential effect outweighs the primary surplus effect, and the debt/GDP ratio will rise without limit.

Figure 7 below shows the phase line diagrams for an economy with a negative interest-growth rate differential (growth rate exceeds the interest rate). In the top diagram, the primary balance is in deficit. At point A, the debt/GDP ratio will rise as the negative interest-growth differential effect is more than offset by the primary deficit effect, and the economy will move South-East along the phase line. However, when the economy arrives at point B, provided the primary deficit and interest and growth rates remain unchanged, it will remain at point B. Moreover, point B represents a *stable* debt scenario – a small increase in the debt ratio from point B means that the negative interest-growth differential effect will more than offset the primary deficit effect and the economy will move North-West back to point B. Similarly, a small decrease in the debt/GDP ratio from point B means that the economy will move South-East along the phase line back to point B. The opposite case to point A is represented by point C where the debt/GDP ratio will decrease until it reaches point B.

In the lower diagram, the primary balance is in surplus but with the same growth and interest rates as in the top diagram. As the arrows on the phase line show, the combination of the negative interest-growth rate differential and the primary surplus mean that the economy would converge to a negative debt/GDP ratio, where the government will be a net holder of private sector financial assets.

Figure 7: Phase Line Diagrams with Negative Interest-Growth Rate Differential



Sourced from Carlin & Soskice: 2006, 184

In performing a debt sustainability analysis, Vera (2009: 635-636) provides a number of criticisms of the conventional methods which are important to keep in mind. Firstly, by assigning an active role to fiscal deficits, policy changes implemented to prevent high or exploding debt are often self defeating. For example, reducing expenditure to aid in reducing a fiscal deficit could lead to a reduction in national income, and therefore tax revenue, worsening the debt situation. Secondly, the assumption that GDP and interest growth rates are unaffected by fiscal policy decisions is unrealistic. There could be many different combinations of macroeconomic variables resulting in sustainable debt paths, and the focus on maintaining a stable debt/GDP ratio can be misleading. Vera advises that a major improvement in conventional sustainability analysis must be the tracking and analysis of the long-run effects of fiscal

policy on the economy, in particular growth and the interest rate. Lastly, the conventional approach also needs to take into account the impact of public investment spending, particularly infrastructure spending, on future revenue. This is particularly so in developing countries where public investment can act as a tool to stimulate private investment – a type of 'crowding in' effect. Given the consensus that infrastructure is a priority for the developing world to unlock economic potential in the private sector, the accumulation of debt to fund public investment can be justified if its returns exceed the cost of debt.

Furthermore, Delong and Summers (2012) have argued that running a fiscal deficit in a depressed economy, such as the current post-crisis case, can be self-financing if a number of conditions are satisfied. They base this argument on the principle of hysteresis, the idea that a downward turn in economic activity can pick up momentum and create damaging long-term effects if fiscal policy interventions do not prevent it. Delong and Summers cite reduced labour force attachment among the long-term unemployed, scarring effects on young workers having trouble beginning their careers, reductions in public investment in physical and human capital as greater expenditure demands are made on social security, reduced investment in research and development and in physical capital, reduced experimentation with business models and informational spillovers, and changes in management attitudes during a depression as arguments for the presence of hysteresis (2012: 254).

Within their model, they assume output well below its potential, increased cyclical unemployment, no supply-side constraints on short-run demand, conventional monetary policy constrained by the zero lower bound, and that the central bank is either unwilling or unable to provide additional stimulus (such as through quantitative easing or other means). If these conditions are satisfied, Delong and Summers find that real government borrowing rates in the historical range, a modestly positive fiscal multiplier, and a small hysteresis effects are together sufficient to make a fiscal expansion self-financing (2012: 245-246). They argue that the point is made stronger if there is underlying economic growth so that the fiscal balance requirement is one of a stable debt/GDP ratio, rather than a stable debt level, if increases in the future price level as a result of the fiscal expansion reduced the real interest rate on the newly accumulated debt, and if the additional government spending raises future productivity, and therefore output, by increasing the productive stocks of public infrastructure and private human capital.

4.2. Debt Stock Projections: Scenario Analysis

The accumulation of South Africa's public debt during and after the crisis has caused concern that the magnitude of the debt stock has reached, or will continue to grow, to unsustainable levels. To test this

concern, this section will perform a variation of the Domar sustainability analysis in order to make projections about the future progression of South Africa's public debt stock. While traditional debt sustainability analysis projections are based on the assumption that the conditions prevailing in the base year remain unchanged over the forecast period [thereby answering the question of what would happen to the debt ratio if the underlying budgetary situation and economic fundamentals are constant (Luiis: 2012)], this study takes Vera's (2009) advise and makes projections based on differing assumptions about the possible future value of these variables.

Three different scenarios will be outlined based on assumptions about the future evolution of key macroeconomic variables: a best case, worst case, and more of the same scenario. For all scenarios, actual 2014 values for the debt/GDP ratio (d) and primary deficit/GDP ratio (b) are used as the base year. Values for the average GDP growth rate (g) and bond yield (r), and level of the primary deficit/GDP ratio over the projection period are chosen to project the progression of the debt/GDP ratio into the future, according to the following formuli:

$$d_n = d_{n-1} \times (1 + \Delta d_{n-1})$$

$$\Delta d_n = [b_n + (r_n - g_n) \times d_n] \div 100$$

4.2.1. Scenario 1: More of the Same

In the first scenario, the current macroeconomic climate is extended into the future. An average real GDP growth rate of 3.8% and real bond yield of 5% is assumed, and the primary deficit/GDP ratio remains at a deficit of 1.7% of GDP. These assumptions and the results are displayed in Table 1[8] below:

Table 1: Debt Stock Projections for Scenario 1

Base Year (2014)		**Projection Period**					
Debt/GDP Ratio (d)	Primary Balance/ GDP Ratio (b)	Average GDP Growth (g)	Average Bond Yield (r)	Primary Balance/GDP Ratio (b)	**2020 Debt/GDP Ratio (d)**	**2025 Debt/GDP Ratio (d)**	**2030 Debt/GDP Ratio (d)**
43.9%	-1.7%	3.8%	5%	-1.7%	**50.19%**	**56.32%**	**63.43%**

Data Source: South African Reserve Bank 2014 and author's own calculations

This scenario projects an increase in South Africa's debt/GDP ratio of 20 percentage points by 2030 to 63.43%. The modest GDP growth is unable to generate a sufficient increase in fiscal revenue to offset

[8] See Appendix A for details of the calculations.

the cost of servicing the debt stock with an interest-growth rate differential of 1.2%. Added to this is the accumulation of more debt through running a primary deficit of 1.7% of GDP throughout the forecast period. The result is an almost 50% increase in the debt/GDP ratio over a 16 year period, with the trend continuing into the future if growth remains below the interest rate and the primary deficit persists.

4.2.2. Scenario 2: Best Case

In the second scenario, the macroeconomic climate improves from its current state. An average real GDP growth rate of 5.1% and real bond yield of 4% is assumed, and the fiscal position tends to improve over time. The assumption is made that the primary deficit decreases by 0.15% of GDP per year, turning to a primary surplus in 2026 where the surplus continues to increase by 0.15% of GDP per year until the end of the projection period. These assumptions and the results are displayed in Table 2[9] below:

Table 2: Debt Stock Projections for Scenario 2

Base Year (2014)		Projection Period					
Debt/GDP Ratio (d)	Primary Balance/GDP Ratio (b)	Average GDP Growth (g)	Average Bond Yield (r)	Primary Balance/GDP Ratio (b)	**2020 Debt/GDP Ratio (d)**	**2025 Debt/GDP Ratio (d)**	**2030 Debt/GDP Ratio (d)**
43.9%	-1.7%	5.1%	4%	-1.7% - 0.7%	**46.14%**	**46.11%**	**44.40%**

Data Source: South African Reserve Bank 2014 and author's own calculations

This scenario projects a stable debt/GDP ratio over the forecast period which initially rises, and then decreases to almost the original value of approximately 44% of GDP. The strong GDP growth and low bond yields create an interest-growth rate differential of -1.1%, allowing the government to generate more tax revenue from debt creation than the debt servicing obligations. The debt/GDP ratio therefore rises only modestly to a maximum of 46.33% due to the running of a primary deficit until 2025, at which point the running of a primary surplus allows the ratio to decrease for the remainder of the forecast period. If the interest-growth differential remains negative, and the government is able to continue running a primary surplus, the debt/GDP ratio would continue to shrink into the future.

[9] See Appendix B for details of the calculations.

4.2.3. Scenario 3: Worst Case

In the third scenario, the macroeconomic climate worsens from its current state. An average real GDP growth rate of 2.3% and real bond yield of 11% is assumed, and the fiscal position tends to worsen over time. The assumption is made that the primary deficit increases by 0.05% of GDP every two years until the end of the projection period. These assumptions and the results are represented in Table 3[10] below:

Table 3: Debt Stock Predictions for Scenario 3

Base Year (2014)		Projection Period					
Debt/GDP Ratio (d)	Primary Balance/GDP Ratio (b)	Average GDP Growth (g)	Average bond yield (r)	Primary Balance/GDP Ratio (b)	**2020 Debt/GDP Ratio (d)**	**2025 Debt/GDP Ratio (d)**	**2030 Debt/GDP Ratio (d)**
43.9%	-1.7%	2.3%	11%	-1.7% - -3%	**62.89%**	**93.60%**	**167.51%**

Data Source: South African Reserve Bank 2014 and author's own calculations

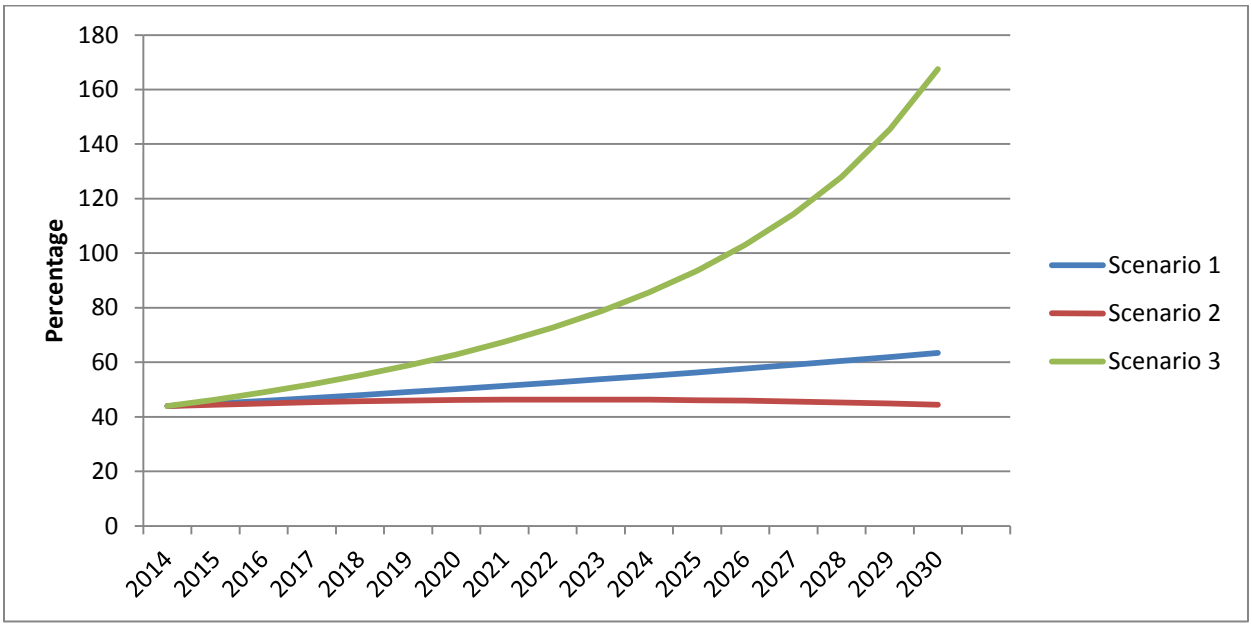
This scenario represents a situation of exploding debt. The very low growth, combined with high bond yields, results in an interest-growth rate differential of 8.7%. Combined with the increasing primary deficit, the debt/GDP ratio escalates by over 400% to 167.51% of GDP by 2030. This clearly represents an unsustainable debt trap scenario where the level of debt exceeds the country's gross income and debt servicing obligations crowd out an increasing portion of government spending.

4.3. Concluding Remarks

The public debt/GDP ratio progression of the three different scenarios is represented by Figure 8 below. The graph clearly spells out the implications of the combination of macroeconomic conditions and fiscal policy responses of each of the three scenarios outlined. The conventional wisdom of the Domar sustainability analysis is reemphasised by this study as the interest-growth rate differential and direction of the primary balance are the key determinants of the debt/GDP ratio's forecast path. In Scenario 1, the slightly positive differential in combination with a stable primary deficit results in a debt/GDP ratio which increases consistently, while in Scenario 2 the negative differential and improving primary balance allows the debt/GDP ratio to stabilise and start to improve. However, in Scenario 3, the largely positive differential in combination with an increasing primary deficit causes the debt/GDP ratio to escalate exponentially.

[10] See Appendix C for details of the calculations.

Figure 8: Public Debt/GDP Ratio Paths for each Scenario



Data Source: South African Reserve Bank 2014 and author's own calculations

These forecasts provide an important warning for South African policy-makers, if one is to believe that very high levels of debt can be dangerous. Even in the best case scenario of strong growth and prudent fiscal policy management, using 2014 values as the base year (where the effects of the crisis are still strongly felt) means that the debt/GDP ratio only stabilises in the medium term (up to 2030) and will only start to decrease in the long term if the same conditions remain. On the opposite end of the spectrum, the worst case scenario of poor growth and fiscal policy management spells a disastrous outcome of exploding debt. This scenario emphasises how negative prevailing macroeconomic conditions in combination with poor fiscal policy can reinforce one another to result in a debt trap, from which escape is unlikely or extremely difficult. Picking up the momentum of debt accumulation in such scenarios is made worse by external factors, such as credit rating downgrades, which serve to dampen investment further and push up the risk premium that investors demand on emerging market bonds.

It is clear that growth is one of the most important aspects to guaranteeing a sustainable debt path into South Africa's future. Fiscal policy is, therefore, heavily affected by other types of economic policy which influence this preeminent variable. However, the primary balance/GDP ratio is one policy variable that fiscal policy-makers do have control over. As such, conventional wisdom about the pertinence of forward planning and sticking to expenditure targets, as well as securing the revenue base and preventing phenomena such as tax base erosion and profit shifting, is very apt. However, there are

those who argue that the level of public debt is not important, so much as the government's ability to service that debt is. This will be the focus of the next section.

5. Interest Burden of Public Debt

While traditional sustainability concerns focus on the debt stock, in particular the debt/GDP ratio, others have argued that a more serious consideration relates to the interest burden on the public debt stock. Particularly within the heterodox paradigm where debt/GDP ratios (and indeed the very concept of GDP) are treated with suspicion, many argue that the level of the debt stock is not important as long as the government is able to service the debt and use the funding productively. Within this view, it is not helpful to consider projections of the debt stock alone, without considering the prevailing interest rates and associated interest burden of that debt stock (Pollin: 2011, 7).

In this vein of thought, a rising level of public debt is not dangerous in and of itself so much as the rising fiscal outlays on its interest payments which will contribute to rising budget deficits in the future (Luiis: 2012). Of particular concern is the possibility that rising interest payments will consume a larger portion of fiscal expenditure, creating a growing opportunity cost of spending on social services and public investment. Pollin (2012, 7) argues in the context of the US that if the focus is shifted from the debt/GDP ratio to interest payments, a very different picture of sustainability is painted. Despite sharply rising debt/GDP ratios, the average ratio of Federal interest payments to outlays between 1960 and 2010 was only 9.9%. He argues that despite the huge fiscal expansion in 2009, interest burdens on Federal debt will continue to be low due to suppressed borrowing rates from 2009 onwards.

However, suppressed interest rates are a natural feature of recessions and are not necessarily permanent. While it is true that interest rates in the US and EU have remained low in the post-crisis period, Pollin's argument fails to take into account that fluctuations in the interest rate can occur relatively easily due to a number of external factors. Low interest rate cannot always be guaranteed in the wake of a crisis, and this uncertainty does little to allay sustainability concerns.

5.1. Theoretical Framework

If it is the interest burden on public debt, rather than its level, which presents the greatest sustainability concern, this raises a number of additional questions. What is the relationship between high levels of public debt and the interest and inflation rate, and what is the interaction between fiscal and monetary policy on these two variables?

Theoretically, if rising levels of public debt contribute to perceptions that government bonds are risky, then a higher interest rate will be demanded by investors to compensate for this risk factor. This is often

aggravated by credit rating agencies which incorporate debt sustainability into their risk profiling. A downgrading of a country's credit rating due to a perceived increase in the risk of default on public debt can have a large impact on investor confidence and the risk premium demanded on government bonds (Luiis: 2012). However, this situation is not always borne by evidence. With regards to the US, Pollin (2012, 4) makes an interesting observation from the most recent crisis. From 2006 to 2010, sharply rising levels of public debt have corresponded with dropping Treasury bill rates. He attributes this to investors seeking safe havens for their investments in the face of the global crisis where US Treasury bills were perceived to be the safest, and the effect of the Fed's quantitative easing (QE) policy on suppressing interest rates.

With regards to the relationship between public debt and inflation, orthodox theory argues that fiscal deficits have inflationary consequences either through money-financed deficits increasing private savings and thus money over-and-above that needed for trade leading to inflation, or through agents spending excess money balances on foreign goods and assets which leads to a nominal depreciation of the currency and an importing of inflation (Vera: 2009, 623). Furthermore, if government spending leads to substantial increases in the utilisation of labour and capital, this could lead to demand-pull inflation (Pollin: 2012, 5).

However, the orthodox view suffers from a number of problems. Vera (2009, 623) argues that the inflationary finance story rests on the assumption that the growth rate in money is equal to the growth rate of prices, implying zero output variation, a constant velocity of money, and fully flexible prices. She points out that within the developing world context, analytic exercises based on these assumptions have been poorly specified and that larger budget deficits need not be inflationary if the long-run steady-state effects of fiscal policy on growth are positive, as is suggested by endogenous growth models in the developing world. Furthermore, the orthodox view assumes that causality runs from fiscal deficits to inflation without considering what caused the fiscal deficit in the first place.

Monetary policy has obvious implications for the direction of interest and inflation rate paths as the interest rate is a direct tool of monetary policy and, depending on the central bank regime, inflation targeting can also be a direct objective of monetary policy. As Pollin (2012, 4) argues, the Fed's policy of QE in the US artificially suppressed interest rates, making the interest payment burden on public debt manageable despite the large size of the debt stock. As Reinhart and Rogoff (2010, 6) argue, unexpectedly high inflation can reduce the real cost of servicing debt and, as such, monetary policy which targets a specific inflation rate limits this benefit. For these reasons, the orthodox view that fiscal

policy should be constrained so that governments cannot engage in excessive deficits by aligning fiscal policy with monetary policy to keep inflation under control has been challenged. Rather, Sawyer (2009, 564) argues that central banks should be prevented from setting interest rates that are too high to allow fiscal authorities to pursue what Sawyer terms "functional finance". He argues that the interest rate should be set in line with social objectives (Sawyer's proposal is in line with growth rates), the fiscal deficit should be set to maximise economic activity, and short-term fluctuations can be addressed by automatic stabilisers, discretionary fiscal policy, and to a lesser degree interest rate variations. However, it must be noted that while the Central Bank can set the short-term interest rate, the long-bond rate is set by market forces , the outcome of which determines the yield curve. Therefore, setting the short-term rate in line with social objectives would not guarantee that the long-bond rate is similarly determined.

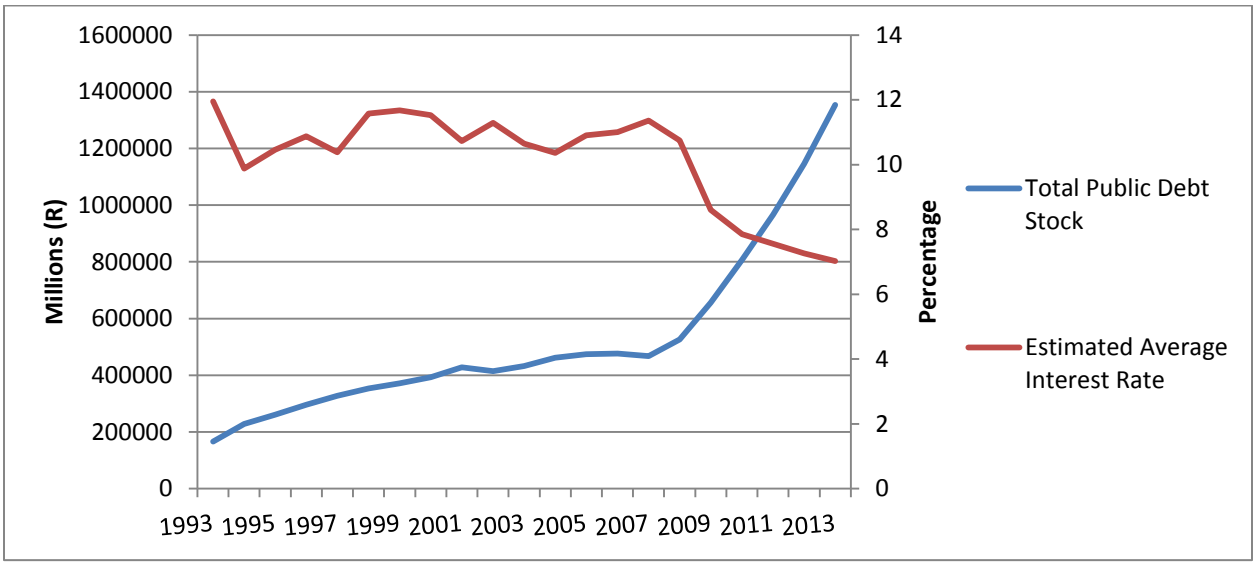
5.2. Debt, Deficits and the Interest Rate

To assess the danger of the interest payment burden in South Africa, this section begins by investigating the relationship between the level of public debt and its corresponding interest rate. Figure 9 below shows the stock of national debt (measured on the left axis) and a rough estimate of its average interest rate[11] (measured on the right axis) from 1993 to 2013. Figure 10 below shows the stock and yield on marketable domestic government bonds for three different maturities: 0-3 years, 3-10 years[12], and 10 years and over from 1986 to 2013.

[11] Calculated by dividing the interest expenditure by total public debt for each year.

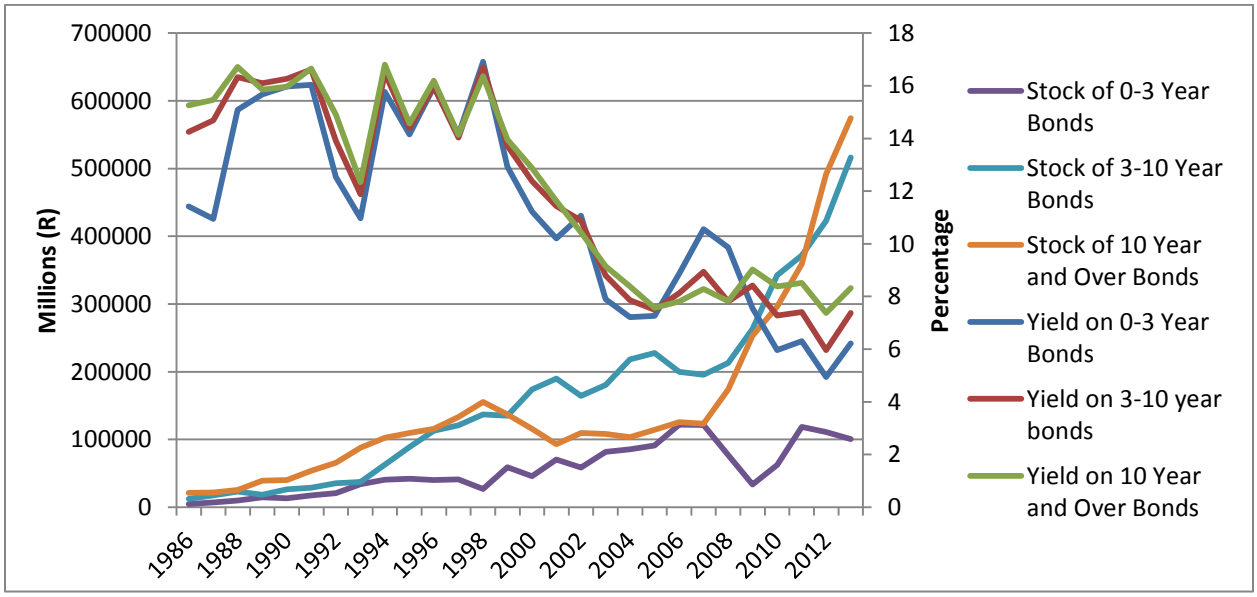
[12] Due to data availability, the yield on 3-10 year bonds was estimated as the simple average between 3-5 year and 5-10 year bonds.

Figure 9: Public Debt Stock and Estimated Average Interest Rate



Data Source: South African Reserve Bank 2014 and author's own calculations

Figure 10: Government Bond Stock and Yields



Data Source: South African Reserve Bank 2014 and author's own calculations

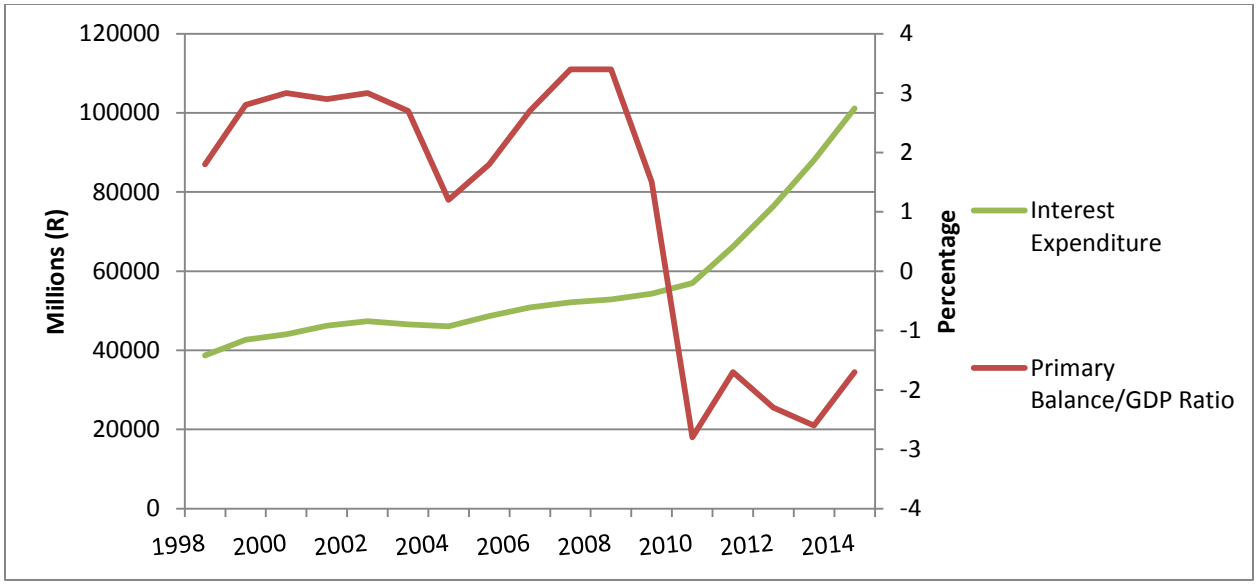
Both graphs above show a clear trend of a sharply increasing stock of public debt (with the exception of 0-3 year bonds) and a decrease in the corresponding interest rate since the onset of the crisis in 2008.

It is therefore not the case, in post-crisis South Africa, that accumulating high levels of debt exerts an upward pressure on the interest rate. Rather, as the data reveals, the sharp increase in public debt after the crisis is associated with a decrease in the interest rate on that debt.

5.3. Interest Expenditure

However, it is true that the accumulation of public debt through the running of a primary deficit during and after the crisis had a positive impact on the level of interest expenditure. Figure 11 below shows the relationship between interest expenditure (measured on the left axis) and the primary balance/GDP ratio (measured on the right axis) from 1998 – 2014.

Figure 11: Primary Balance/GDP Ratio and Interest Expenditure

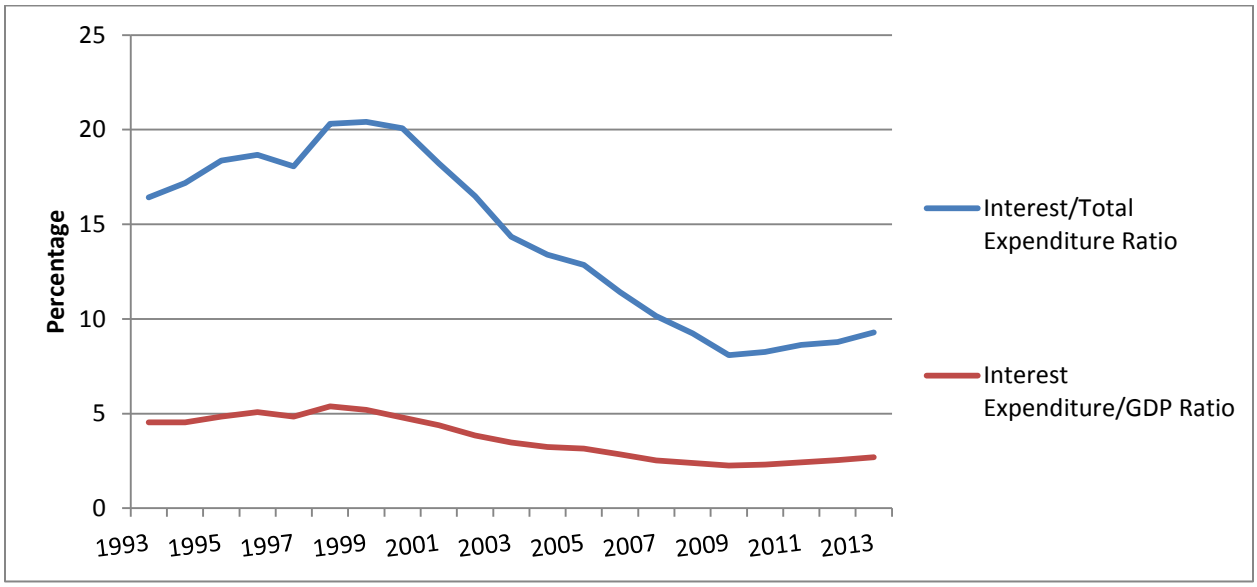


Data Source: South African Reserve Bank 2014

As is to be expected, the sharp decline in the primary balance/GDP ratio in 2009 to a deficit in 2010 causes the level of interest expenditure to increase substantially as the primary deficit adds to the debt stock, incurring larger interest payments.

Furthermore, this substantial increase in interest expenditure has crowded out other forms of government spending in the post-crisis period. Figure 12 below shows the evolution of South Africa's interest/total expenditure ratio and interest expenditure/GDP ratio from 1993 to 2013.

Figure 12: Interest/Total Expenditure and Interest Expenditure/GDP Ratios



Data Source: South African Reserve Bank 2014

The ratio of interest to total expenditure has declined quite rapidly since 2000, until levelling out in 2010 after which there was a mild increase to 2013. Similarly, the ratio of interest expenditure to GDP has declined since 1998, levelling out in 2009 and increasing slightly thereafter. This is evidence that rising interest expenditure in the wake of the crisis has only moderately crowded out other forms of government spending.

However, the rising level of the public debt stock fuelled by the increasing primary deficit does not cause the ratio of interest to total expenditure to increase as substantially as may be expected. Furthermore, the relatively low GDP growth in the aftermath of the crisis does not cause the ratio of interest expense to GDP to escalate as much as may have been expected. This is due to two factors. The first is that the level of total government expenditure since 2009 expanded at a far more rapid pace than interest expenditure. From 1990-2014, total government expenditure increased to an amount 14.15 times larger than the original amount, while interest expenditure only increased to an amount 9.69 times larger than the original amount[13]. The running of a primary surplus since 2009 has allowed the government to increase its spending significantly in the post-crisis period. This does not necessarily mean that the interest payments from the resultant debt is sustainable, but perhaps rather than the ratio of interest to total expenditure can be a misleading variable in this regard.

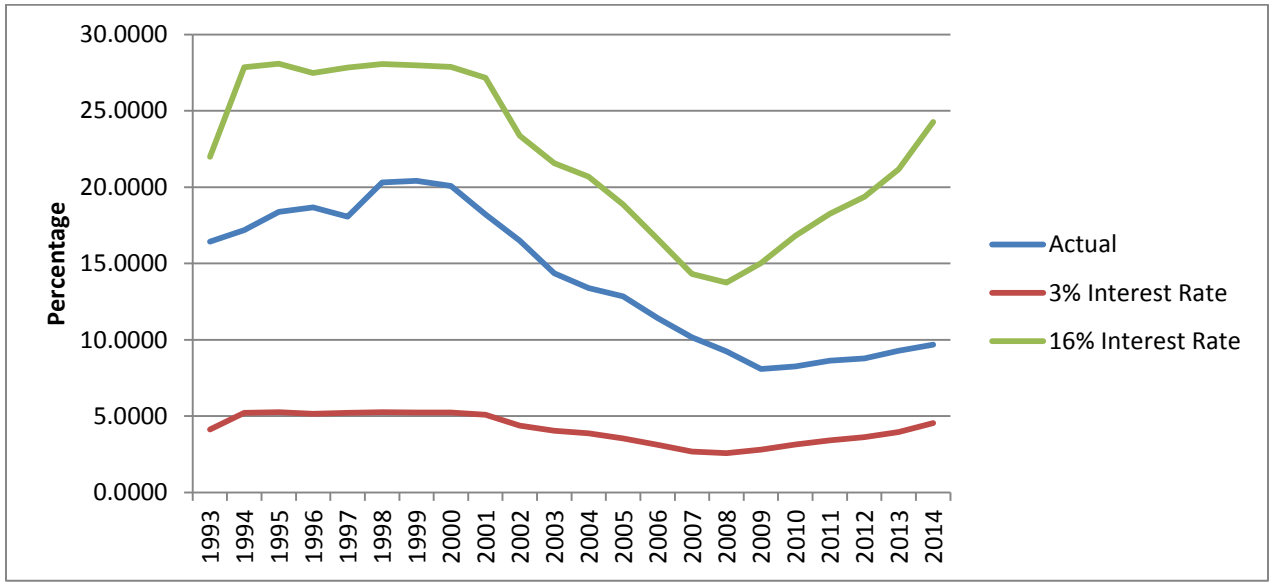
[13] Calculated using data from the South African Reserve Bank 2014.

The second factor concerns the fact that the interest rate charged on public debt decreased during and after the crisis. Returning to Figures 6 and 7 above, the general trend of decreasing interest rates (from 2000 onwards in the case of bond yields, and from 2009 onwards in the case of the estimated average interest rate on total debt) has meant that interest expenditure has not placed as large a burden on the fiscus as it would have had higher rates prevailed.

However, this does not necessarily mean that the interest burden of South Africa's rising public debt stock is sustainable. The suppression of interest rates during and after a recession is only temporary, and it is possible that a rise in interest rates will cause the interest burden on public debt to crowd out government spending even further. To emphasise this, a rough sensitivity analysis is carried out which investigates how the interest burden on public debt would have been different had different interest rates prevailed from 1993-2013.

This is done by calculating the ratio of interest to total expenditure with one fictional interest rate that is substantially lower than the actual range of 7-12%, and one that is substantially higher, while assuming that the total level of public debt and government expenditure in each situation remains the same. The chosen fictional average interest rates are 3% and 16% respectively. The results are displayed in Figure 13[14] below.

Figure 13: Ratio of Interest to Total Expenditure with different Interest Rates



Data Source: South African Reserve Bank 2014 and author's own calculations

[14] See Appendix D for details of the calculations.

With an average interest rate over the period of only 3%, the interest burden on the public debt stock would be substantially lower, dipping below 5% of total expenditure in 2002 and remaining below the 5% threshold even after the onset of the crisis. However, with an average interest rate over the period of 16%, the evolution of the interest/total expenditure ratio lies well above the actual amount and rises steadily after the onset of the crisis, exceeding 20% of total expenditure by 2013 and almost reaching the 25% of total expenditure threshold by 2014. It is interesting to note how the ratio of interest to total expenditure rises sharply from 2009 onwards in the 16% interest rate scenario, as might be expected with an escalating level of public debt. This strengthens the argument made that the relatively low interest rates on public debt after the crisis were a strong factor contributing to the actual ratio of interest to total expenditure ratio rising only modestly after 2009.

5.4. Scenario Analysis

Lastly, it is worthwhile considering what the various scenarios for the evolution of South Africa's public debt outlined in Section 4 would imply for the interest payment burden in each case. This is undertaken by multiplying the debt/GDP ratio for each year by the assumed interest rate for the forecast period, yielding the projected ratio of interest expense to GDP. Since the assumed interest rates for each scenario are real rates, an inflation rate of 5% is assumed for each scenario and added to the assumed real interest rates to arrive at the nominal interest rate. Table 4[15] below details the results:

Table 4: Interest Burden Projections

Scenario	Assumed Nominal Interest Rate	2020 Interest Expense/GDP Ratio	2025 Interest Expense/GDP Ratio	2030 Interest Expense/GDP Ratio
1: More of the Same	10%	**5.02%**	**5.63%**	**6.34%**
2: Best Case	9%	**4.15%**	**4.15%**	**4.00%**
3: Worst Case	16%	**10.06%**	**14.98%**	**26.80%**

Data Source: author's own calculations

In the 'more of the same' and best case scenarios, the relatively low nominal interest rates of 10 and 9% respectively ensure an interest burden which only rises modestly over time or, in fact, decreases. Scenario 1 sees an interest burden which grows continuously at a modest rate, growing to 6.34% of GDP by 2030 which will continue to rise into the future if the prevailing conditions remain. In Scenario 2, the interest burden levels out by 2022 and then begins to decrease, reaching 4% of GDP by 2030 and continuing to fall into the future if the prevailing conditions remain unchanged. In the worst case,

[15] See Appendix E for details of the calculations.

Scenario 3, the relatively high nominal interest rate of 16% causes the interest burden to rise exponentially, reaching a maximum for the forecast period of 26.8% of GDP which will continue to rise into the future should the same conditions persist.

5.5. Concluding Remarks

Orthodox theory may suggest that the accumulation of public debt among emerging markets places an upward pressure on interest rates and, therefore, on the interest payment burden as discussed in Section 5.1. This is particularly so in the context of the crisis where highly risk-averse investors switched to the perceived safest store of their wealth – US government bonds – which, in combination with QE and other accommodating monetary policies, kept US interest rates very low (Pollin: 2011, 4). The risk spread between US government bonds and emerging market bonds therefore increased as investors demanded higher interest rates in emerging markets to compensate for the perceived lack of safety. Contrary to this, and as displayed by this section, the interest rate on South Africa's public debt did not escalate with rising debt levels. In fact, it decreased during the onset of the crisis and into the post-crisis period.

The reason for this may be twofold. Firstly, while the risk spread between US and South African bonds may have increased, within the domestic financial market South African bonds were perceived to be less risky than other South African financial assets considering the Treasury's reputation for prudent fiscal policy management. As such, investment in the South African financial market may have shifted from other types of securities to bonds, pushing up their price and suppressing their yields. Secondly, South Africa engaged in its own accommodating monetary policy which served to suppress interest rates across the board.

As a result, while there is evidence that the interest burden on public debt has crowded out other types of government spending in the post-crisis period, the extent of this crowding out has not been as significant as expected, with the interest/total expenditure and interest expenditure/GDP ratios rising only modestly since 2009. While this is partly due to the aggravated rise in government expenditure, it is also due to the relatively low interest rates charged on the public debt stock during this period.

However, it is not clear that this means that the interest payment burden on the rising level of South Africa's public debt is sustainable, given that interest rates are subject to fluctuations and may not

remain suppressed for long after a recession. The sensitivity analysis carried out in this section emphasises this point by showing that had the prevailing interest rate for the period been 16%, instead of the actual range of 7-12%, interest expenditure would have severely crowded out other types of government spending, reaching almost one quarter of total government spending by 2014.

The danger of high interest rates creating an overly burdensome interest payment obligation was further highlighted by the continuation of the scenario analysis to the interest burden. With modest forecasted nominal interest rates of 10 and 9% in Scenarios 1 and 2 respectively, the interest burden as a percentage of GDP remains manageable at around the current 2014 level. With a relatively high forecasted interest rate of 17% in Scenario 3, however, the interest burden on debt explodes and consumes almost 27% of GDP by 2030. In a country with a large need for government expenditure on social services and public investment, particularly within the realm of infrastructure, a fiscal situation where debt servicing obligations consumes close to 30% of the national income is not at all advisable. This is particularly so considering the opportunity cost of crowding out these other aspects of government spending on long term growth and prosperity.

With dampened future growth due to an increasing share of government expenditure being consumed by debt servicing, the fiscal situation can only worsen in the future, creating larger interest obligations, further crowding out the necessary government spending and creating a cycle from which it is difficult to escape. However, if it is the case that the increasing interest burden is caused by a rising stock of debt that is being used to finance productive investments that have positive effects on long-term growth and prosperity, this would mitigate some of these sustainability concerns.

6. Conclusion

The 2008/2009 global crisis was a historical event, both because of its size and persistence, and because of the way it caused economists to re-evaluate what they think and know about fiscal policy. In particular, the orthodox view which placed fiscal policy on the back-burner of short-term macroeconomic stabilisation was challenged by the unprecedented use of discretionary fiscal policy. The result has been a global increase in deficit spending and the accumulation of public debt, sparking sustainability concerns and intense debates about the correct timing for austerity measures. South Africa is no exception with a sharply rising debt/GDP ratio since the onset of the crisis. The rising levels of South Africa's public debt stock, in conjunction with the downgrading of South Africa's credit risk rating by all three of the major international agencies in the post-crisis period, has cast doubt on the sustainability of South Africa's fiscal position and lent credence to the suggestion of implementing fiscal rules.

6.1. Summary of Results

This study provided insight into this issue by identifying and analysing the key components of South Africa's debt sustainability and short-term fiscal policy effectiveness. After surveying some of the major theoretical debates and empirical evidence in the literature about short-term fiscal policy effectiveness, the study finds that South Africa's countercyclical response to the crisis is, on balance, supported. South Africa fits well with the theoretical criteria for a positive fiscal multiplier at the onset of the crisis, and while the empirical evidence is inconclusive, it does not disprove that South Africa's fiscal multiplier is positive and greater than one.

The debt stock projections served to emphasise the conventional wisdom of the Domar sustainability analysis which identifies the interest-growth rate differential and the level of the primary balance as the key drivers of the future debt stock path. The scenario analysis performed provided a worrying picture of South Africa's future debt path, where a situation of debt which does not decrease, or even explodes, are possible outcomes unless serious fiscal consolidation is undertaken. This is especially so considering the effect that external factors, such as perceptions of sovereign risk garnered by credit rating agencies, can have in locking in negative cycles of interest rate and debt hikes. The analysis highlighted the importance of strong growth in guaranteeing a stable or decreasing debt path for South Africa, and the need for consolidating expenditure and securing the revenue base. To this end, South Africa's notable

representation on the G20 as the only African member is an important step towards achieving the international cooperation that is needed to prevent tax base erosion and profit shifting.

Despite the seriousness of South Africa's public debt level, escalating levels of debt in the post-crisis period have not caused interest rates on public debt to increase. In fact, these rates have decreased since 2009. Nevertheless, the accumulation of the debt stock has caused South Africa's interest payments in the post-crisis period to increase. These increasing interest payments have crowded out other types of government expenditure, although not in the magnitude that may be expected, partly because total expenditure has increase by more than interest spending, and partly because of the relatively low rates of interest on public debt discussed above. However, it was noted that suppressed interest rates are a natural feature of a recession and are often temporary. The sensitivity analysis and scenario forecasting undertaken in this study highlighted the importance of the future interest rate path in determining the sustainability of South Africa's interest burden, and concluded that if the prevailing low interest rates are not kept at their current levels, the interest burden would likely crowd out important government spending to an even greater degree in the future.

6.2. Fiscal Consolidation and Fiscal Policy Rules

As a result, there is a pertinent need for fiscal consolidation in South Africa. To this end, the international experience of implementing fiscal rules to achieve consolidation goals is encouraging. The IMF (2009b) describes fiscal rules as permanent fiscal policy constraints through numerical limits on budgetary aggregates. A fiscal indicator (such as debt, primary balance, expenditure – usually expressed in ratio to GDP) is used to create a rule that is relatively simple and which can be easily communicated to the public. Favero and Massimiliano (2005) identify adequate public finance management systems, accurate data availablility, and a National Treasury with a good track record of budget forecasting as a necessary prerequisite for the successful implementation of transparent fiscal rules. South Africa's well developed budgetary forecasting and data collection systems provide a firm basis for the implementation of legislative fiscal rules. Furthermore, there have been calls for the introduction of fiscal rules in South Africa by the Financial and Fiscal Commission and even by the National Treasury itself (Mabugu & Marinkov: 2012).

Fiscal policy rules can take many different forms depending on what policy outcome they are attempting to achieve. As an example, the prudent fiscal policy rule uses the government's inter-temporal budget

constraint to set a rule which focuses on solvency. Carlin and Soskice (2006, 194) show how the rule is derived beginning with the familiar equation that shows the change in the debt/GDP ratio:

$$\begin{aligned}\Delta d &= b + (r - g)d \\ &= (s - t) + (r - g)d \quad \ldots(1)\end{aligned}$$

where *s* is the ratio of government spending to GDP, and *t* is the ratio of tax to GDP. Prudent fiscal policy imposes the condition that $\Delta d \leq 0$ so that the debt/GDP ratio does not increase. This implies:

$$d \leq \frac{t^p - s^p}{r^p - g^p}$$

where the superscript *p* refers to the long-run or permanent value of each variable. If we assume that there is a public expenditure programme which implies a long-run ratio of government spending to GDP, s^p, then the financing of this programme which conforms with the rule can be determined by expressing the above equation in terms of the ratio of tax to GDP, t^p:

$$t^p \geq s^p + (r^p - g^p)d \quad \ldots(2)$$

The prudent fiscal policy rule therefore sets the level of tax revenue, as a ratio to GDP, at the level which satisfies the above constraint. The implications of this for the progression of the debt/GDP ratio within the ambit of the rule can be determined by substituting equation (2) into equation (1):

$$\Delta d \leq (s - s^p) + [(r - r^p) - (g - g^p)]d$$

The rule implies that borrowing can be used to finance a *temporary* rise in government spending above its permanent level, such as during a recession, and that the debt/GDP ratio can rise as a result. Discretionary spending during a recession, or a programme of infrastructure spending, would cause the current level of spending to rise above its permanent level ($s > s^p$) and the rule calls for a higher level of borrowing to finance this. Similarly, if the real interest rate is believed to be temporarily higher than its permanent value, or GDP growth is lower than its long-run value, the rule allows for the deficit to safely widen and the debt/GDP ratio to expand.

However, if there is an expected rise in *permanent* government spending, the rule requires this to be funded by an increase in taxation. For example, if the government has to pay pensions to a population which is increasingly aging, permanent spending will rise above the current level ($s^p > s$), and the rule

implies that the tax rate should be raised to a higher permanent level. If the government does not want to increase taxes, it would have to instead reduce the level of permanent spending by, for example, reducing employment benefits or raising the retirement age.

The rule, therefore, provides a clear method for analysing the financing of public investment or wealth transfers that have a structural, rather than cyclical time profile. The logic of a constant share of taxation is borrowed from the consumption smoothing behaviour of households: as a rational household consumes the same in each period and borrows and saves to achieve this consumption smoothing, so the rational government taxes a constant amount and borrows and saves in response to temporary shocks to expenditure (Carlin & Soskice: 2006, 197).

The great advantage of the prudent fiscal policy rule is that it allows for the use of discretionary spending for temporary shocks to the government's spending requirements, to the extent that financing this spending meets the rule's solvency requirements. As Jooste et al (2013, 3) argue, a fiscal rule with an exact numeric target implies either that discretionary fiscal policy is ineffective at stimulating demand and that only automatic stabilisers should be at work, or that the uncertainty of using discretionary policy cannot be priced in and, therefore, automatic stabilisers are relied on solely to smooth out shocks. This loss of policy space can be extremely dangerous in the face of severe external shocks which are not anticipated. The recent global crisis is the perfect example where the magnitude and severity of the shock was not anticipated by anyone, and as a result there was an unprecedented response of discretionary fiscal spending to compensate.

Furthermore, the prudent fiscal policy rule sets no stock by requiring debt/GDP ratios to remain below targets or thresholds, such as the 3% debt/GDP ratio threshold contained in the EU's Stability and Growth Pact. This rule constrained the EU's fiscal policy options in the face of the crisis because it is very likely that the need to raise s above s^p during the deep recession would have been sufficient to raise the deficit/GDP ratio above 3%, while still being within the limits of the prudent fiscal policy rule. Other rules, like the Golden Rule applied in the United Kingdom, are more sophisticated because they distinguish between financing for government consumption spending and investment spending. The distinction is important for the Golden Rule because it implies that investment spending yields returns and therefore justifies financing. However, the Golden Rule fails to make the distinction within the realm of social returns on investment between cash and non-cash return to the government. From the perspective of the prudent fiscal policy rule, investment spending that does not yield cash returns

should be treated as consumption spending and, therefore, be financed through taxation (Carlin & Soskice: 2006, 198).

While South Africa's National Treasury has a reputation for prudent fiscal policy management and may make use of the prudent fiscal policy rule in making budgetary decisions anyway, there are distinct benefits to making such a rule official. Fiscal rules are designed to create a political cost of breaking past commitments and to foster credibility because the government makes clear rules known, sets targets, and then adheres to them (Mabugu & Marinkov: 2012, 23). Fiscal rules provide policy-makers with a legislative burden to practice prudent fiscal policy management, and indicate to investors and credit rating agencies that the government is committed to fiscal consolidation in a more meaningful way than speeches and budget plans do. These benefits are not outweighed by the potential restriction on discretionary fiscal policy if flexible fiscal rules with broad target ranges are implemented. To overcome the governance complications associated with fiscal rules, it is essential that South Africa institutes an independent fiscal agency which can allocate and adjudicate the implementation of fiscal rule targets, and provide a counterpoint to the National Treasury in terms generating research and policy advice in the fiscal space. The argument behind this move is to put fiscal policy on the same footing as monetary policy by having budgetary decisions outsourced to independent councils with the mandate to preserve fiscal stability (Daban: 2011).

6.3. Areas for Further Research

While this paper focused on the short-to-medium term aspects of countercyclical fiscal policy during a crisis, a far more long-run issue concerns the impact of the accumulation of public debt during a recession on growth and employment. Until recently, the orthodox consensus was that high levels of public debt negatively affect GDP growth in the long-run. The view was championed by Reinhart and Rogoff (2010) who produced a seminal paper in 2010 which provided empirical evidence for the idea of debt thresholds – that GDP growth decreases when the level of public debt surpasses a particular debt/GDP ratio. They found that growth is markedly lower when a country's debt/GDP ratio surpasses 90% for both advanced and emerging economies.

However, controversy was sparked when Herndon et al reproduced the paper in 2013, using the same dataset, and found markedly different results. Herndon et al found that coding errors, selective exclusion of available data, and unconventional weighting of summary statistics had lead Reinhart and Rogoff to serious errors that did not accurately represent the relationship between public debt and

growth (2013, 3). In fact, Herndon et al were able to show that the growth averages for the 30-60%, 60-90%, and 90-120% debt/GDP ratio categories were not highly dissimilar, invalidating the concept of debt thresholds (2013, 12-13).

In contrast to Reinhart and Rogoff, a number of heterodox economists have argued that high levels of public debt have been historically followed by upturns in growth and increases in employment. A prime example is the huge deficit spending during World War Two which led to the end of mass unemployment during the Great Depression (Bivens and Turner: 2010, 4). An interesting avenue of further research would be to analyse the nature of South Africa's current deficit spending and accumulation of public debt on future long-term growth. It is only in the very long term that the yields of large public infrastructure spending, for example, are realised. Furthermore, if Delong and Summers are correct, the negative effects of hysteresis on future growth could create a worse fiscal scenario in the future than if large deficit spending is employed to prevent it.

It is still too early to tell what the long-term effects of South Africa's significant deficit spending during the crisis will be. However, this study provides the groundwork upon which a more comprehensive evaluation of the sustainability of South Africa's post-crisis fiscal position can be conducted. Such research could aim to investigate whether there is evidence to support a relationship between deficit spending and long-term growth in South Africa's past, and to evaluate the composition of South Africa's discretionary spending in terms of its contribution to factors that are known to drive long-term growth.

Lastly, this study provided an argument for the need for fiscal consolidation in post-crisis South Africa, and made a brief case for the introduction of a prudent fiscal policy rule. There is great scope for more work to be done on the role of fiscal rules in achieving fiscal consolidation in South Africa. The Financial and Fiscal Commission has made significant contributions in this regard, but the field would benefit from more technical investigations into the effect that different fiscal policy rules would have on the South African economy.

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Appendices

Appendix A: Calculations for Debt Stock Projections for Scenario 1

Year	Debt/GDP ratio % (d)	GDP growth rate (g)	Bond yield (r)	Change in Debt/GDP ratio (Δd)	Primary deficit/GDP % (b)
2014	43.9000	0.038	0.05	0.0223	1.7
2015	44.8776	0.038	0.05	0.0224	1.7
2016	45.8822	0.038	0.05	0.0225	1.7
2017	46.9148	0.038	0.05	0.0226	1.7
2018	47.9765	0.038	0.05	0.0228	1.7
2019	49.0683	0.038	0.05	0.0229	1.7
2020	50.1913	0.038	0.05	0.0230	1.7
2021	51.3469	0.038	0.05	0.0232	1.7
2022	52.5362	0.038	0.05	0.0233	1.7
2023	53.7605	0.038	0.05	0.0235	1.7
2024	55.0212	0.038	0.05	0.0236	1.7
2025	56.3199	0.038	0.05	0.0238	1.7
2026	57.6580	0.038	0.05	0.0239	1.7
2027	59.0371	0.038	0.05	0.0241	1.7
2028	60.4590	0.038	0.05	0.0243	1.7
2029	61.9254	0.038	0.05	0.0244	1.7
2030	63.4383	0.038	0.05	0.0246	1.7

Notes:

1. Δd_n calculated as $[b_n + (r_n - g_n) \times d_n] \div 100$
2. d_n for forecast period calculated as $d_{n-1} \times (1 + \Delta d_{n-1})$

Appendix B: Calculations for Debt Stock Projections for Scenario 2

Year	Debt/GDP ratio % (d)	GDP growth rate (g)	Bond yield (r)	Change in Debt/GDP ratio (Δd)	Primary deficit/GDP % (b)
2014	43.9000	0.051	0.04	0.0122	1.7
2015	44.4343	0.051	0.04	0.0106	1.55
2016	44.9059	0.051	0.04	0.0091	1.4
2017	45.3127	0.051	0.04	0.0075	1.25
2018	45.6533	0.051	0.04	0.0060	1.1
2019	45.9262	0.051	0.04	0.0044	0.95
2020	46.1305	0.051	0.04	0.0029	0.8
2021	46.2654	0.051	0.04	0.0014	0.65
2022	46.3307	0.051	0.04	-0.0001	0.5
2023	46.3262	0.051	0.04	-0.0016	0.35
2024	46.2523	0.051	0.04	-0.0031	0.2
2025	46.1095	0.051	0.04	-0.0046	0.05
2026	45.8987	0.051	0.04	-0.0060	-0.1
2027	45.6210	0.051	0.04	-0.0075	-0.25
2028	45.2781	0.051	0.04	-0.0090	-0.4
2029	44.8714	0.051	0.04	-0.0104	-0.55
2030	44.4032	0.051	0.04	-0.0119	-0.7

Notes:

1. Δd_n calculated as $[b_n + (r_n - g_n) \times d_n] \div 100$
2. d_n for forecast period calculated as $d_{n-1} \times (1 + \Delta d_{n-1})$

Appendix C: Calculations for Debt Stock Projections for Scenario 3

Year	Debt/GDP ratio % (d)	GDP growth rate (g)	Bond yield (r)	Change in Debt/GDP ratio (Δd)	Primary deficit/GDP % (b)
2014	43.9000	0.023	0.11	0.0552	1.7
2015	46.3230	0.023	0.11	0.0573	1.7
2016	48.9773	0.023	0.11	0.0601	1.75
2017	51.9214	0.023	0.11	0.0627	1.75
2018	55.1754	0.023	0.11	0.0660	1.8
2019	58.8171	0.023	0.11	0.0692	1.8
2020	62.8855	0.023	0.11	0.0732	1.85
2021	67.4894	0.023	0.11	0.0772	1.85
2022	72.7006	0.023	0.11	0.0822	1.9
2023	78.6802	0.023	0.11	0.0875	1.9
2024	85.5609	0.023	0.11	0.0939	1.95
2025	93.5984	0.023	0.11	0.1009	1.95
2026	103.0453	0.023	0.11	0.1096	2
2027	114.3441	0.023	0.11	0.1195	2
2028	128.0059	0.023	0.11	0.1364	2.5
2029	145.4615	0.023	0.11	0.1516	2.5
2030	167.5064	0.023	0.11	0.1757	3

Notes:

1. Δd_n calculated as $[b_n + (r_n - g_n) \times d_n] \div 100$
2. d_n for forecast period calculated as $d_{n-1} \times (1 + \Delta d_{n-1})$

Appendix D: Calculations for Sensitivity Analysis of Interest/Total Expenditure Ratio to Interest Rates

Date	Total Public Debt (R Millions)	Interest Expenditure (R Millions)	Total Expenditure (R Millions)	Actual Interest/Total Expenditure Ratio (%)	Estimated Interest Expenditure 1 (R Millions)	Estimated Interest/Total Expenditure Ratio 1 (%)	Estimated Interest Expenditure 2 (R Millions)	Estimated Interest/Total Expenditure Ratio 2 (%)
1993	166704	19926	121301	16.4269	5001.12	4.1229	26672.64	21.9888
1994	228188	22536	131105	17.1893	6845.64	5.2215	36510.08	27.8480
1995	260800	27290	148564	18.3692	7824	5.2664	41728	28.0876
1996	296330	32236	172601	18.6766	8889.9	5.1505	47412.8	27.4696
1997	328048	34061	188592	18.0607	9841.44	5.2184	52487.68	27.8313
1998	353929	40972	201784	20.3049	10617.87	5.2620	56628.64	28.0640
1999	371099	43317	212264	20.4071	11132.97	5.2449	59375.84	27.9726
2000	392914	45271	225461	20.0793	11787.42	5.2281	62866.24	27.8834
2001	427655	45877	251987	18.2061	12829.65	5.0914	68424.8	27.1541
2002	414885	46853	284186	16.4867	12446.55	4.3797	66381.6	23.3585
2003	432020	45981	320469	14.3480	12960.6	4.0443	69123.2	21.5694
2004	461419	47821	357047	13.3935	13842.57	3.8770	73827.04	20.6771
2005	474499	51752	402579	12.8551	14234.97	3.5359	75919.84	18.8584
2006	476911	52456	459449	11.4172	14307.33	3.1140	76305.76	16.6081
2007	467450	53099	522829	10.1561	14023.5	2.6822	74792	14.3053
2008	525896	56499	611864	9.2339	15776.88	2.5785	84143.36	13.7520
2009	655794	56425	698287	8.0805	19673.82	2.8174	104927.04	15.0263
2010	806893	63402	767944	8.2561	24206.79	3.1522	129102.88	16.8115
2011	966873	73088	847152	8.6275	29006.19	3.4240	154699.68	18.2611
2012	1146250	83196	946949	8.7857	34387.5	3.6314	183400	19.3675
2013	1353342	95067	1023360	9.2897	40600.26	3.9673	216534.72	21.1592
2014	1584669	101090	1044629	9.6771	47540.07	4.5509	253547.04	24.2715

Notes:

1. $(estimated\ interest\ expenditure\ 1)_n$ is calculated as $(total\ public\ debt)_n \times 0.03$
2. $(estimated\ interest\ expenditure\ 2)_n$ is calculated as $(total\ public\ debt)_n \times 0.16$
3. All interest/total expense ratios are calculated as $\frac{interest\ expenditure_n}{total\ expenditure_n} \times 100$

Appendix E: Calculations for Interest Burden Projections

	Scenario 1			Scenario 2			Scenario 3		
Year	Debt/GDP Ratio (%)	Interest Rate	Interest Expense/GDP Ratio (%)	Debt/GDP Ratio (%)	Interest Rate	Interest Expense/GDP Ratio (%)	Debt/GDP Ratio	Interest Rate	Interest Expense/GDP Ratio (%)
2014	43.9000	0.1	4.3900	43.9000	0.09	3.9510	43.9000	0.16	7.0240
2015	44.8776	0.1	4.4878	44.4343	0.09	3.9991	46.3230	0.16	7.4117
2016	45.8822	0.1	4.5882	44.9059	0.09	4.0415	48.9773	0.16	7.8364
2017	46.9148	0.1	4.6915	45.3127	0.09	4.0781	51.9214	0.16	8.3074
2018	47.9765	0.1	4.7976	45.6533	0.09	4.1088	55.1754	0.16	8.8281
2019	49.0683	0.1	4.9068	45.9262	0.09	4.1334	58.8171	0.16	9.4107
2020	50.1913	0.1	5.0191	46.1305	0.09	4.1517	62.8855	0.16	10.0617
2021	51.3469	0.1	5.1347	46.2654	0.09	4.1639	67.4894	0.16	10.7983
2022	52.5362	0.1	5.2536	46.3307	0.09	4.1698	72.7006	0.16	11.6321
2023	53.7605	0.1	5.3760	46.3262	0.09	4.1694	78.6802	0.16	12.5888
2024	55.0212	0.1	5.5021	46.2523	0.09	4.1627	85.5609	0.16	13.6897
2025	56.3199	0.1	5.6320	46.1095	0.09	4.1499	93.5984	0.16	14.9757
2026	57.6580	0.1	5.7658	45.8987	0.09	4.1309	103.0453	0.16	16.4872
2027	59.0371	0.1	5.9037	45.6210	0.09	4.1059	114.3441	0.16	18.2951
2028	60.4590	0.1	6.0459	45.2781	0.09	4.0750	128.0059	0.16	20.4809
2029	61.9254	0.1	6.1925	44.8714	0.09	4.0384	145.4615	0.16	23.2738
2030	63.4383	0.1	6.3438	44.4032	0.09	3.9963	167.5064	0.16	26.8010

Notes:

1. All interest expense/GDP ratios are calculated by multiplying the debt/GDP ratio by the prevailing nominal interest rate for each year
2. The prevailing nominal interest rate for each year is calculated as the assumed real interest rate for each scenario plus an assumed 5% inflation rate.