Does South Africa's Government Debt Threaten the Sustainability of Fiscal Policy?

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by

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Abstract

The South African government debt has risen alarmingly over the last decade, with the debt-to-GDP ratio increasing from 33% in 1985 to 57% in 1995. These debt movements, combined with historically high conventional deficits equal to 9.0% and 9.8% of GDP in 1993 and 1994 respectively, have cast doubt on the solvency of government.

This paper considers the issue of government solvency by focusing on two questions. Firstly, "Are present fiscal policies sustainable?", and secondly, "What are the limits to future fiscal policy if government solvency is to be maintained?"

The sustainability of present fiscal policy is tested by examining whether or not government is obeying its intertemporal budget constraint. This constraint demands that the present value of future government debt must be zero. If the present value of future debt is greater than zero, government is insolvent.

By manipulating the intertemporal budget constraint, it is shown that for the present value of future debt to be zero, government spending and revenue must be cointegrated. These series are tested for cointegration using the Augmented Dickey Fuller test. The results show that while fiscal policy in the 1960s and 1970s was sustainable, the same cannot be said for fiscal policy since 1982. The relationship between spending and revenue has weakened, and maintaining the current fiscal stance will inevitably result in government becoming insolvent.

The limits to future fiscal policy are determined by reformulating the collateral constraint. It is shown that, for any expected average GDP growth and interest rates, the maximum permissible expenditure growth rate consistent with government solvency can be identified.

the results show that government solvency depends critically on economic growth. If real GDP growth can average 4% per annum, and if real interest rates can fall to 5%, there is little danger of government becoming insolvent. If tax revenues grow apace with GDP, government expenditure growth of 4% is consistent with government solvency.

However, if real GDP growth rates of 3% or less are achieved, government solvency appears inevitable. Government will have to sell off state assets to supplement revenue, and even then a portion of the debt may have to be monetised. Increased inflation would result, which could contribute to macroeconomic instability.

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CHAPTER 1

Introduction

Fiscal sustainability in the broadest sense refers to government's ability to maintain fiscal policies indefinitely. Fiscal policy is sustainable if the current trends in government expenditure and tax revenues do not lead to macroeconomic instability which would in turn enforce a change in government's fiscal stance.

The sustainability of fiscal policy is threatened, *inter alia*, when the stock of government debt becomes excessively high. Government can finance its deficit by issuing government bonds, but the public will only take up these bond issues if they have confidence in government's ability to redeem the debt. If high stocks of government debt erode the public's confidence in government solvency, government will be forced to redeem the debt by printing money. The increased growth in the money supply will increase inflation which, in turn, could decrease macroeconomic stability.

The relationship between high government debt and inflation permits the development of a narrower definition of fiscal sustainability. For the purposes of this paper, fiscal policy is understood as being sustainable if future fiscal deficits can be funded entirely through bond sales and do not necessitate the printing of money to redeem bonds.

Deficits need to be financed by money creation when the public loses confidence in government's solvency and is no longer willing to take up bond issues. The general perception of government solvency is thus central to the concept of fiscal sustainability. A popular and accessible monitor of changes in government solvency is the debt-to-GDP ratio (hereafter referred to as the debt ratio). Historically, the debt ratio has increased during wars and major depressions, but has decreased steadily during years of peace and average economic growth[1]. This trend has changed in South Africa since 1980, with the debt ratio increasing regardless of the rate of economic growth. The increasing debt ratio

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[1] See Spaventa (1988), p.2.

has called into question the solvency of government under the current fiscal stance, and increased the concern that current levels of debt could lead to high rates of inflation and macroeconomic instability.

As argued above, fiscal sustainability depends on government remaining solvent. To determine the sustainability of fiscal policy, we have to determine whether or not fiscal policies are consistent with government solvency. Will government remain solvent if the current fiscal stance is maintained, or will future deficits have to be financed through money creation?

While an exploration of the above question would reveal much about present fiscal policy, it would reveal little about the paths future fiscal policy should follow if solvency is to be maintained. More specifically, what is the maximum rate at which government expenditure can grow without rendering government insolvent, given certain rates of taxes?

This paper will consider both the sustainability of current fiscal policy as well as the constraints on future policy in the South African context. The South African government faces a high demand for expenditures to improve social services where needed, but government's ability to increase tax revenues is limited. Any additional expenditure over and above tax revenues has to be financed through bond sales, but the debt-to-GDP ratio is already nearly 60%[2]. To what extent can government borrow to finance further expenditure and still remain solvent?

The literature presents three approaches to answering these questions. The first approach examines the debt-to-GDP ratio, and considers the factors that cause the ratio to change. This approach reveals a limited amount about the direction of change in government solvency, but discloses little about solvency itself. This approach can show what fiscal policy stance will maintain the indicators of solvency at their present levels, but cannot identify what fiscal stance will actually maintain solvency. Various studies have

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[2] A debt ratio of 60% has no particular theoretical significance. It is used rule of thumb as a prudent ceiling level for the debt ratio, however, and it is the reference value for countries wishing to join the EEC (Gross & Thygsen, 1992, p.470).

applied this approach to South Africa, including Roux (1994), van der Merwe (1994), and ABSA (1996).

The second approach employs the intertemporal budget constraint as developed by McCallum (1984), which shows that governments cannot run conventional deficits indefinitely. Cointegration tests are applied to national public finance data to determine whether or not the constraint is being obeyed. The seminal article using this approach was authored by Hamilton and Flavin (1986). The cointegration tests examine the stability of the relationships between either government spending and revenue, or the deficit and debt. If these relationships are unstable, it can be shown that government is not obeying its intertemporal budget constraint.

A limitation to testing the intertemporal budget constraint is that cointegration tests do not take into account the additional constraint that government debt may not exceed the present value of all future tax revenues. Thus a third approach is considered, namely the use of the collateral constraint. The importance of the collateral constraint was emphasised by Barro (1976) and Kremers (1989), but neither author reviewed the implications of the constraint in any depth. If various assumptions are made about future interest rates and the limits to government's ability to raise tax revenues, the collateral constraint determines the limits to expenditure growth for any given economic growth rate. In other words, for an assumed rate of economic growth, an upper bound can be calculated for the rate of expenditure growth consistent with government solvency.

This paper will employ all three approaches to answering questions about the sustainability of fiscal policy. Firstly, movements in the debt ratio and related indicators such as the primary and conventional deficit-to-GDP ratios will be considered to provide some background on the South African debt situation. Secondly, the sustainability of present fiscal policy will be tested by applying cointegration tests to the intertemporal budget constraint. These cointegration tests will focus on the relationship between government expenditure and revenue. The results of these tests will indicate whether South Africa can maintain its present fiscal stance, or whether fiscal restructuring is required.

Thirdly and finally, sustainable paths for future fiscal policy will be estimated by manipulating the collateral constraint and making assumptions about future growth and interest rates. This approach emphasises the relationships between fiscal policy, interest rates and growth rates, and identifies at what rate government expenditure can grow. Such an analysis defines the limits to spending given the stock of government debt.

Chapter 2 reviews the South African debt situation. Chapter 3 reviews literature dealing with debt, and Chapter 4 tests whether present South African fiscal policy is sustainable. Chapter 5 identifies sustainable government revenue and expenditure growth paths, and Chapter 6 concludes the paper by summarising the findings and highlighting the policy implications.

CHAPTER 2

A Review of South African Debt Indicators

2.1 Introduction

Fiscal sustainability is important because it contributes to overall macroeconomic stability. If unsustainable fiscal policies are maintained, government will be unable to service its debts. Inevitably, government will have to default on its debt commitments, or resort to inflationary money creation. Both increased inflation and debt repudiation would be destabilising and could negatively effect economic growth.

If the level of government debt makes debt-induced macroeconomic instability inevitable, government is said to have fallen into a debt trap. More rigorously, a debt trap is defined as "... an unsustainable government financial position in which an 'explosion' in the government debt ratio can no longer be prevented by an increase in the ratio of government taxation to gross domestic product or by a decrease in discretionary government expenditure (total expenditure less interest payments) relative to gross domestic product." (Van der Merwe, 1993, p. 2).

If debt keeps increasing, the debt servicing costs escalate. When interest costs become so high that debt can no longer be serviced through tax revenue, government will be forced to borrow to service the debt. Government debt will increase, and the public will be reluctant to take up further debt issues if they doubt government's ability to redeem the debt. Government will then be forced to pay the interest costs on debt by printing more money. Loss of control over the money supply is inevitable under these conditions, and inflation will spiral[3].

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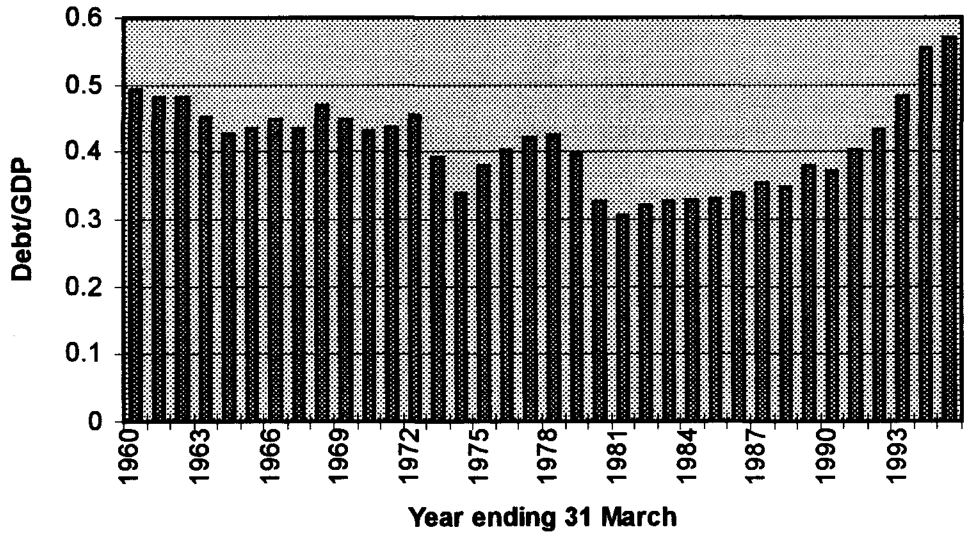
[3] In the short term, an unexpected increase in inflation could reduce the real interest rate on the existing stock of government debt. In the long run, however, the possibility of unexpected inflation would increase the risk of holding government bonds, and real interest rates would have to increase to compensate for this risk

2.2 The South African Public Debt Situation

A perception has developed[4] that South Africa's present fiscal policy may unsustainable, and that the country is moving irreversibly towards a situation of spiralling debt and interest costs. The factors that have given rise to this perception must be examined.

Anticipation of a debt trap has been driven largely by the partly incorrect belief that the government debt-to-GDP ratio has increased continuously over the last decade and a half. Movements in the total government debt-to-GDP ratio for this period (illustrated in Figure 2.1) lend support to this belief.

Figure 2.1. South Africa's Debt-to-GDP Ratio: 1960 - 1995



Source: South African Reserve Bank Quarterly Bulletin

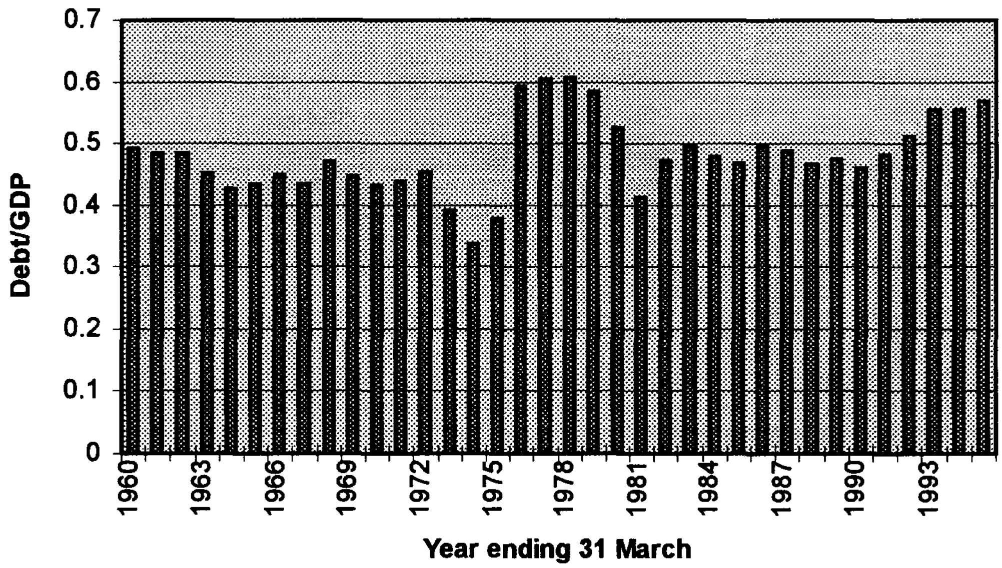
Figure 2.1 shows the debt ratio reaching a historic low of approximately 31% in 1981. The ratio increases gradually until 1986, and then escalates until 1995. This does suggest cause for concern, as the rapid increase in the debt ratio could well be perceived as irreversible. But Figure 2.1 presents a somewhat incorrect picture of the debt situation in that it does not include government financial guarantees in the total debt figure. These

[4] See, for example, Roux (1993, p.324) or van der Merwe, (1993, p.1)

were largely loans to TBVC countries, guaranteed by the South African government, and should therefore be included in the debt total. The adjusted, more accurate debt ratio illustrated in Figure 2.2 paints a different picture of debt ratio movements over the last twenty years.

If guaranteed loan financing is included in government debt, the largest increase in the ratio occurs in 1976, when South Africa established the first independent homelands. The ratio remained constant throughout the 1980s, but increased during the 1990s. The 10% increase in the debt ratio from 1991 to 1995 remains sufficient cause for concern.

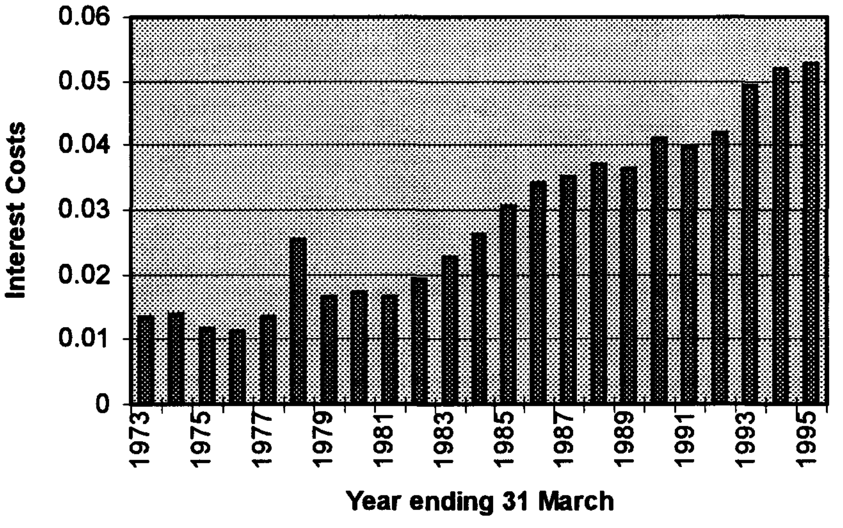
Figure 2.2. Debt plus Financial Guarantees to GDP: 1960 - 1995



Source: South African Reserve Bank Quarterly Bulletin

A related indicator that casts doubt on the financial soundness of government is the ratio of interests costs on government debt to GDP. If interest costs are spiralling, debt will increase, and this will cause an even greater increase in interest costs. As Figure 2.3 indicates, increasing interest costs relative to GDP have been a feature of the past decade. This has been due to high levels of debt and high interest rates. Interest rates have remained high because of the Reserve Bank's tight monetary stance aimed at decreasing inflation, as well as decreased government saving since 1984[5].

Figure 2.3. Interest Costs as a percentage of GDP: 1973 - 1995



Source: South African Reserve Bank Quarterly Bulletin

A final indicator of possible fiscal crisis is the conventional deficit, defined as the difference between total government expenditure including interest costs and total government revenue. It is usually expressed as a percentage of GDP. While it has fluctuated dramatically over the last decade, historically high deficits of 9.0% and 9.8% were recorded in the 1993 and 1994 financial years. The deficit decreased to 5.6% and 6% in 1995 and 1996 respectively (*Budget Review*, March 1996, p. B.58), but these declines were achieved at what was clearly the height of an economic boom. Deficits as a percentage of GDP are expected to decrease during booms and increase during recessions,

[5] See, for example, Reserve Bank (1994a, p. 28). Gross domestic government saving fell from 6.1% of GDP in 1980, to 1.4% in 1984. Since then, it reached a high of 1.6% of GDP in 1985, but has been negative since 1992. A decrease in government saving would, *ceteris paribus*, imply a decrease in the supply of loanable funds. The cost of these funds, i.e. the interest rate, would therefore be expected to increase. (Note that gross domestic government saving as reported here include that portion of provision for depreciation attributable to government. If this is excluded, government has been dissaving since 1984.)

and therefore the 1995 and 1996 decreases do not necessarily indicate increased government commitment to fiscal discipline[6].

Movements in the key debt indicators suggest that concern over the sustainability of fiscal deficits is justified. In addition, because of the interrelatedness of the indicators, deterioration in each indicator reinforces deterioration in the others. If the debt ratio increases, interest costs increase. The implied increase in expenditure, unless accompanied by an increase in taxation, would cause an increase in the size of the deficit, which in turn increases the size of debt.

Although the increasing debt ratios and interest costs ratios and the high conventional deficits suggest that the financial position of the fiscus is getting worse, they reveal little about when or how a debt crisis may occur. But while there is nothing in economic theory that places an upper limit on a sustainable debt ratio, a continually increasing debt ratio must inevitably lead to government insolvency.

2.3 Conclusions

The debt indicators presented above suggest that fiscal sustainability in South Africa may well be threatened by the debt stock. Interest and debt ratios have increased, and historically high deficits have been recorded. The possibility of a debt trap must be investigated, and the constraints on future fiscal policy must be identified if macroeconomic stability is to be maintained.

The debt indicators themselves do not answer the questions on debt sustainability introduced in chapter 1: they merely suggest that these questions are relevant. To answer the questions concerning sustainability, it is not the indicators of government solvency, but government solvency itself that must be considered. The analysis cannot be limited to the popular indicators of solvency; it must investigate whether government is obeying its budget constraint.

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[6] In addition, these decreases in the deficit were part due to some imaginative accounting. Discount costs increased dramatically in 1995 and 1996, with the result that the deficit may have been understated by up to 1% (Biggs, 1995). In addition, revenue in 1996 was boosted by the receipts from sales of strategic fuel stocks worth R1,2 billion (*Budget Review*, 1996, p. B.45).

CHAPTER 3

Fiscal Sustainability: A Literature Review

3.1 Introduction

In chapter 1, two questions were forwarded as being relevant to the issue of fiscal sustainability. Firstly, "Is present fiscal policy sustainable?", and secondly, "What paths must fiscal policy follow if sustainability is to be maintained?". The purpose of this review is to evaluate the methods other researchers have used to answer these questions. But to evaluate these methods effectively, the environment in which the debt debate takes place must also be considered. This review will consider the developments in literature that have affected this environment. Section 3.2 will trace the literature on debt culminating in the development of a government budget constraint, while Section 3.3 will review the approaches to testing this constraint.

A consideration of the questions above contributes to the debate on fiscal sustainability because these questions have not been answered in the context of the South African fiscal situation. Section 3.4 of this chapter will consider the literature on the South African public debt, and will identify the limitations of the existing papers.

3.2 The Development of the Government Budget Constraint: An Historical Overview

The Great Depression and the advent of Keynesian solutions to unemployment provided a justification for governments to run deficits, at least in the short run. The increase in the levels of government debt due to both the Depression and World War II heightened interest in the debates around public debt. Early debates, however, revolved not so much around the issues of sustainability and government solvency, but rather around the issue of who was carrying the burden of deficit financing.

From 1937 to 1957, conventional wisdom held that "... interest ... on internal loans are merely transfers from one set of people in the country to another set, so that the two sets together - future generations as a whole - are not burdened at all." (Pigou (1947), quoted in Mishan (1963)). Debt, and the interest payments on debt, were seen as an intra-generational transfer, and thus no generation as a whole could rightly be regarded as being burdened by the public debt.

This view was challenged by Buchanan (1958), Bowen *et al* (1960), and Modigliani (1961). A synthesis of Buchanan and Bowen *et al's* argument is as follows. Assume two generations, with government selling bonds to generation 1. As generation 1 is not forced to purchase these bonds, it cannot be said to be worse off. In fact, as it willingly engages in trade, it can be assumed to have achieved some gains from trade. Generation 1 then sells these bonds to Generation 2. Again, neither generation is better off or worse off, as the sale is voluntary. Now assume that government chooses to redeem these bonds while they are in the possession of generation 2. To finance the redemption, government raises taxes. As generation 2 is compelled to pay these taxes, they suffer an economic burden.

Modigliani (1961) extended this line of reasoning by noting that, while Buchanan (1958) and Bowen *et al* (1960) were correct in their conclusions, their analysis of the debt burden had focused excessively on flow concepts, without paying enough attention to the stocks involved. Borrowing by government increases the demand for loanable funds and therefore increases the interest rate. Consequently, less private capital formation takes place. This is exacerbated by the bond holding public's perception of the bonds as net wealth. The increase in perceived wealth leads to increased consumption, which in turn implies decreased savings. Both factors contribute to decreasing the rate of capital formation, which decreases economic growth. Government borrowing thus decreases the capital stock that future generations will inherit, and can therefore be regarded as a burden on these future generations.

Modigliani does, however, concede that while debt places a burden on future generations, "The gross burden (of the debt) may be offset in part or *in toto*, or may be even more than offset, in so far as the increase in the debt is accompanied by government expenditure which contributes to the real income of future generations" (p. 731). This qualification is the critical issue. Buchanan, Bowen *et al*, and Modigliani all concentrated on the intertemporal distribution of the costs of debt. Equally important is the distribution of benefits that may arise from debt-financed expenditure. If government uses the deficit-financed expenditures to initiate projects that yield a return for future generations, the effect of debt on future generations may be a net benefit. In fact "... even if government did use bond proceeds wastefully, and did retire the debt during the lifetime of future generations, it is not the public debt *per se* that is responsible for the burden but the wasteful spending of bond proceeds that has left no legacy for the future" (Mishan, 1963, p. 537).

The above review provides a context within which the issue of fiscal sustainability can be considered. Short term deficits can be used to stimulate aggregate demand, but these deficits increase the stock of debt. Debt in itself is neither a burden nor a benefit to future generations. Bond proceeds spent productively will increase the capital stock inherited by future generations, but bond proceeds spent wastefully will result in future generations inheriting the costs of government debt without receiving any associated benefits.

The Keynesian justification for short-term deficits hinged on the notion that deficits affect aggregate demand. Barro (1974) challenged this view, asserting that rational individuals who cared about the utility of future generations would perceive the deficit as postponed taxation, and would increase savings by the amount of the deficit to meet the future tax burden. As a result, aggregate demand would be unaffected by deficit spending. This notion that taxes and debt have exactly the same aggregate demand effects was first suggested by David Ricardo, and is known as Ricardian Equivalence.

Does Ricardian Equivalence hold for permanent primary deficits if the rate of interest exceeds the economic growth rate? Barro (1976) himself admitted that under these circumstances, the Ricardian Equivalence argument would break down. The growth of the debt stock cannot exceed the economic growth rate for any length of time, because

"... the value of the outstanding stock of debt at any point in time is bounded by the government's collateral, which can be measured by the present value of future taxing capacity" (p. 343, note 2).

In indicating the limits of Ricardian Equivalence, Barro presented a condition for government solvency. The stock of government debt may never exceed the present value of all expected future tax revenues less all expected future expenditures. This is the collateral constraint government faces. If tax revenues as a percentage of GDP are limited, and debt grows at a rate faster than the economic growth rate, the debt stock must finally exceed government's collateral.

McCallum (1984) examined the problem of government solvency and, in particular, Barro's solvency condition. He concluded that Barro's arguments were unconvincing, as the collateral constraint is only relevant if the debt is actually to be retired. If the bond issuance policy is permanently maintained, taxes may never have to be collected to retire the debt. In such a case, the taxing capacity of the government is largely irrelevant.

Given this stance, McCallum (1984) attempted to determine to what extent deficits could be financed permanently through bond issues without causing inflation. He concluded that, while government could run a permanent conventional deficit without being inflationary, permanent primary deficits would inevitably result in inflation. In essence, the stock of debt cannot grow at a rate faster than the interest rate. The corollary of this is that the present value of the future debt stock must be zero. This is the intertemporal budget constraint that government faces.

An implication of McCallum's (1984) intertemporal budget constraint is that if the interest rate exceeds the growth rate, it is possible for government to remain solvent even though the debt-to-GDP ratio increases to infinity. However, McCallum himself noted that as debt increases as a percentage of GDP, government has an increasing incentive to default on the debt.

In addition, for McCallum's assertion that debt can grow consistently at a rate faster than economic growth to hold, growth in taxes must also exceed growth in GDP. The logical implication is that tax revenues will eventually exceed GDP. This implies that government are able to tax households by an amount that exceeds the value of their output. While this is possible, given that household incomes include interest payments from government, in practice the high tax rate on interest income may decrease the public demand for government bonds. Obeying McCallum's intertemporal budget constraint can be regarded as a necessary but not sufficient condition for government solvency. In effect, Barro's (1976) collateral constraint remains relevant for the purposes of our analysis.

3.3 Testing the Intertemporal Budget Constraint

The seminal article for devising tests on the intertemporal budget constraint to determine fiscal policy sustainability was authored by Hamilton and Flavin (1986). By manipulating government's budget identity, they showed that if the deficit relative to GDP followed a stationary process, the intertemporal budget constraint was satisfied. In addition, they showed that government's intertemporal budget constraint was mathematically equivalent to the models for speculative bubbles developed by Flood and Garber (1980). Both the generalised and restricted Flood-Garber tests and the Dickey-Fuller tests for stationarity were applied to the government deficit, adjusted for interest payments and various off-balance sheet items. On the basis of these tests, they concluded that the deficit followed a stationary path, and therefore US fiscal policy from 1962 to 1984 was consistent with the government's intertemporal budget constraint.

Wilcox (1989) extended Hamilton and Flavin's work by allowing for stochastic real interest rates and non-stationarity in the primary surplus. (Hamilton and Flavin assumed a constant real interest rate, and a stationary primary surplus). Wilcox constructed a test for sustainability based on the values of debt (as opposed to deficits), discounted back to a particular point of reference. The Dickey-Fuller test was then applied to these discounted values. Wilcox concluded that while fiscal policy was sustainable until 1974, post-1974 movements in US debt and deficits suggested that government's budget constraint was no longer being satisfied. Baglioni and Cherubini (1993) have since applied similar testing procedures to the Italian economy, and also find evidence there of a shift in fiscal policy stance.

Trehan and Walsh (1988, 1991) changed the direction of the tests, focusing not on debts and deficits but rather on the relationship between government revenue and expenditure. They showed that if a linear combination of revenue and expenditure was stationary, the intertemporal budget constraint was satisfied. The assumption of a constant expected real interest rate was maintained. Hakkio and Rush (1991) extended this work by allowing for a stationary real interest rate, and by using different sample periods to test the hypothesis that conventional deficits have become unsustainable only in recent years. By performing cointegration tests on the relationship between revenue and expenditure, they confirmed Wilcox's conclusion that recent budget deficits have not been sustainable. This approach has since been applied under varying circumstances by, among others, Sawada (1994) and Haug (1995).

A weakness in this approach, highlighted by Kremers (1989), Haug (1995) and Spaventa (1988), is that obeying the intertemporal budget constraint can be consistent with a debt-to-GDP ratio tending towards infinity. This is implausible, and highlights a requirement mentioned by Barro (1976), that government debt must remain within the limits of government collateral. If government has no marketable assets, the present value of government debt must remain bounded by the difference between the present value of all future government revenues and the present value of all future non-interest government expenditure. In effect, obeying the intertemporal budget constraint is merely a necessary and not a sufficient condition for government solvency. While McCallum's critique of the collateral constraint is accepted on theoretical grounds, the increased incentive for government to default on the debt and the high tax rates on interest income necessary to maintain solvency will render the situation untenable for all practical purposes.

While a number of researchers have made reference to the collateral constraint (Barro (1976), Spaventa (1988), Kremers (1993), Haug (1995)), none has attempted to apply it to future fiscal policy. Whether or not the collateral constraint is obeyed depends very much on the expected paths of government expenditure and taxation. Growth in tax

The weakness of the research is that, because of the nature of the approach, the paper yields no definite conclusion about whether or not South Africa is in a debt trap, or what should be done to ensure that a debt trap is avoided. In addition, the section on forecasting future debt-to-GDP ratios is weak, because the assumptions made on expenditure movements are simplistic.

The second paper by Roux (1993) concentrates on the calculus of the debt-to-GDP ratio in order to identify the factors that cause this ratio to change. It is shown that

$$D_t/Y_t - D_{t-1}/Y_{t-1} = [(r_t-g_t)/(1+g_t)](D_{t-1}/Y_{t-1}) - B_t/Y_t + R_t/Y_t$$

where

D = outstanding debt at the end of period t,

Y = GDP,

r = the interest rate,

g = the GDP growth rate,

B = the primary balance, and

R = a residual included to accommodate changes in off-balance sheet items

The off-balance sheet items in R include changes in the value of government assets and movements in the exchange rates. Clearly, changes in the debt-to-GDP ratio are positively related to the interest rate/growth rate differential and are negatively related to the primary balance.

Roux highlights the important point that while historically in South Africa growth rates have exceeded interest rates, this is no longer the case. Much of the current concern over the debt situation stems from the positive interest/growth differential.

Movements in the debt-to-GDP ratio are outlined for a variety of expenditure, tax and GDP paths. Once again, due to the nature of the approach, very little is said about which of these paths are sustainable. Roux does, however, highlight the importance of future economic growth in determining the sustainability of the debt situation.

The most recent work on the debt situation is ABSA (1996). This paper also concentrates on the fiscal calculus surrounding the debt-to-GDP ratio, but the ratio analysis is developed far beyond that of Roux's. The two major contributions of the paper are the development of a steady state debt-to-GDP ratio when growth exceeds the interest rate, and the identification of a threshold primary surplus that will prevent an explosion of the debt ratio in the event of the interest rate exceeding the growth rate.

ABSA shows that, when the growth/interest differential is positive, the steady state debt ratio equals

$$(debt/GDP) = q(1+y)/(y-r)$$

where

q = the primary deficit,

y = the GDP growth rate, and

r = the interest rate.

ABSA then calculates the limit to the debt-to-GDP ratio (which is the steady state ratio) for every year from 1986 to 1996. Their findings are shown in Table 3.1. The steady state debt-to-GDP ratio is very sensitive to changes in the interest rate and the growth rate. In addition, this analysis is only relevant if the growth/interest differential is positive. ABSA claims that the differential was positive in South Africa for every financial year except for 1993. The interest rate on government debt was estimated 13% for 1996, while GDP growth was estimated 13.5%. The interest and growth rate figures quoted suggest that the debt ratio will tend towards a steady state value of 31.8%.

The 13% interest rate for 1996 was an underestimate, and the 13.5% growth was an overestimate. GDP growth for the financial year ending 31 March 1996 was 11.2%[7]. Replacing 13.5% with 11.2% in the steady state equation yields a debt ratio that increases to infinity.

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[7] Reserve Bank Quarterly Bulletin, June 1996.

Table 3.1 Expected steady-state Debt-to-GDP Ratios for South Africa: 1986 - 1996

ABSA Debt Projections *(Source: ABSA, 1996)*				
Year[1]	**Deficit/GDP**	**Interest Rate**	**GDP Growth**	**Limit**[2]
1986	0.11	12.2%	13.7%	8.3
1987	0.80	12.3%	18.2%	16.0
1988	2.42	11.8%	16.7%	57.6
1989	1.37	11.7%	20.5%	18.8
1990	-1.47	12.0%	18.7%	-∞
1991	-0.63	11.9%	14.1%	-∞
1992	0.96	12.3%	12.8%	216.6
1993	4.60	12.9%	8.6%	+∞
1994	4.92	13.1%	13.7%	932.3
1995	1.11	12.1%	12.7%	208.5
1996	0.14	13.0%	13.5%	31.8

Notes: 1. Year ended 31 March

2. The steady-state debt ratio

The interest rate of 13% was calculated by dividing total interest payments by the value of the state debt. Of the R280 billion of total government debt, R245 billion is made up of domestic marketable government stock. Of this, less than R1 billion was issued before 1982. Since 1982, the average interest rate on 0 to 3 year stock has been 14.2%, and on 10 year and over stock 15.4%. All other stock had yields between these two extreme points. It is therefore improbable that true interest costs as a percentage of total debt was 13%.

The error could have occurred for two reasons. Firstly, ABSA correctly tries to include discount costs as part of total interest costs, but does so by writing off the discount costs over ten years. If discounted bonds were on average of a shorter term, writing off discount costs over ten years would underestimate the true total interest bill[8].

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[8] See Biggs (1995)

While the current accounting treatment of discount costs understates the size of the fiscal deficit, it also overstates total government debt. In the year government stock is issued, discounted bonds should be included in total debt at the amount they were issued for, and not at their coupon value. They are currently included at coupon value, and the obvious distortion arises.

Because of government's treatment of discount costs, ABSA divides underestimated interest costs by an overestimated total debt. The result is a vastly underestimated interest rate on government debt.

As stated earlier, given the current growth rate, interest rate and primary deficit, ABSA calculated the steady state debt ratio as being 31.8%. But even if ABSA's growth and interest estimates were only slightly out, such that the true growth rate was 13.3% and the true interest rate was 13.2% (as opposed to the estimated 13.5% and 13% proposed by ABSA), the steady state debt ratio would become 140%.

The steady state approach is instructive in that it gives one some idea of the limits to future debt ratio movements. The approach is, however, very sensitive to errors in interest and growth rate estimation. In addition, the reality in South Africa at present is that the real interest rate exceeds the real economic growth rate, so that the approach is not applicable to the South African debt situation.

By contrast, the threshold primary surplus approach may be worth pursuing in the South African context. However, because ABSA estimated the growth/interest differential to be positive, the threshold level was not calculated.

In summary, the South African debt literature provides extensive coverage of government solvency indicators, and how these have moved over the last two decades. But no attempt is made to determine whether or not South Africa is in a debt trap, or whether or not past fiscal policies are sustainable. Neither has any attempt been made to outline expenditure and revenue paths that will ensure the sustainability of future fiscal policies. The questions asked at the beginning of this chapter (i.e. Is fiscal policy sustainable?, What policies must be followed if solvency is to be maintained?) have not been answered in the South African context. Approaches to testing government solvency reviewed in section 3.3 can thus be applied without fear of duplication.

CHAPTER 4

Government Solvency: Testing the Intertemporal Budget Constraint

4.1 Introduction

The level of public debt is cause for concern if under the present fiscal stance it leads to government insolvency. Maintaining the fiscal stance would necessitate printing money to finance deficits, which would lead to inflation and macroeconomic instability. If present fiscal policy is sustainable, then no fiscal restructuring is necessary for government to avoid the debt trap. But if present fiscal policy is not sustainable, government must restructure spending and revenue plans to avoid the macroeconomic instability that government insolvency would cause.

A method for assessing the sustainability of past fiscal policy is to consider government's intertemporal budget constraint. This method is introduced and discussed in Section 3.3. The approach was pioneered by Hamilton and Flavin (1986), and has since been adapted and employed by a number of other researchers.

Hamilton and Flavin (1986) showed that government's intertemporal budget constraint is satisfied if the deficit can be shown to follow a stationary process. Wilcox (1987) extended this work to allow for stochastic variation in real interest rates, and Baglioni and Cherubini (1993) applied this approach in analysing the sustainability of Italian fiscal policy.

Trehan and Walsh (1991), Haug (1995), Hakkio and Rush (1991) and Sawada (1994) take a slightly different approach. They show that government satisfies the intertemporal budget constraint if spending and revenue trends are cointegrated. This chapter applies the approach favoured by Hakkio and Rush (1991), which allows for fluctuations in the real interest rate and which looks at fiscal policy over various periods to determine whether fiscal stance has changed in recent years.

The justification for taking such an approach rests on the conjecture that the forces driving movements in taxation and expenditure have changed, with the result that the stable long term relationship between the two series has broken down. In the past, increases in government expenditure were accommodated by increases in taxation revenue through fiscal drag or by increases in the rate of GST or VAT. There may, however, be a limit to the amount of tax revenue that can be raised under a specific tax regime. Increased tax rates may decrease incentive to work. Even if hours worked are insensitive to changes in tax rates, increased taxes may decrease the intensity of work effort, or decrease the amount of reported taxable income earned[9]. Flight of capital and skills could also occur. Finally, if taxes are perceived to be unfairly high, as seems to be the case in South Africa, tax morality is undermined, and tax avoidance and tax evasion increase. These factors combine to put a ceiling on the total tax revenue that can be raised without radical changes to the tax system. Once this ceiling is reached, additional tax revenue can only be raised through economic growth.

The idea that there is a Laffer relationship between tax rates and total tax revenues means that there is an optimal tax rate at which tax revenue is maximised. Previously, increases in government spending could be funded by increases in tax revenue. If, however, the maximum level of tax revenue has been reached, additional tax revenue can no longer be raised to fund additional expenditure. If expenditure continues to increase and tax revenue is unable to follow suit, the stable long term relationship between government revenue and expenditure will be broken. Increases in expenditure will outpace increases in revenue, and unless checked, fiscal insolvency must inevitably result.

This chapter tests, within the context of an intertemporal budget constraint, whether the stable relationship between expenditure and revenue has been broken. Section 4.2 examines the government's budget constraint as outlined by Hamilton and Flavin (1986). Section 4.3 considers the adjustments made by Hakkio and Rush (1991) to derive a testable equation, and Section 4.4 briefly discusses the technique of cointegration.

[9] Feldstein (1993) found evidence that reported taxable income in the USA varied significantly with changes in marginal tax rates.

Section 4.5 lists the sources of data and provides the empirical results, while Section 4.6 discusses the results and considers the policy implications these results might have. Section 4.7 concludes the chapter.

4.2 The Intertemporal Budget Constraint

The government's one-period budget identity for period 't' is

$$(1) \qquad G_t + (1 + i_t)B_{t-1} = R_t + B_t$$

where 'G' is government spending on goods and services and transfers, 'R' is government revenue, 'B' is the value of the public debt outstanding, and 'i' is the interest rate. The debt in year 't' is equal to the difference between spending and revenue for year 't', plus the sum of the outstanding debt and the interest costs thereon. Note that 'G' does not include interest payments on government debt: these are included in the term $(1+i_t)B_{t-1}$. Taking the first difference of this equation and manipulating, we get

$$(1a) \qquad \Delta B_t = i_t B_{t-1} + G_t - R_t$$

Returning to equation (1), solving forward[10] yields

$$(2) \qquad B_0 = \sum_{t=1}^{\infty} r_t(R_t - G_t) + \lim_{n \to \infty} r_n B_n$$

where

$$r_t = \prod_{s=1}^{t} \frac{1}{(1 + i_s)}$$

In other words, the present stock of debt is equal to the sum of the present value of future primary surpluses plus the present value of the stock of debt in year 'n'. Note that (1) is merely an identity, and that (2) is derived directly from (1). Therefore (2) holds regardless of the state of government finance. As Hamilton and Flavin (1986) indicate, "Equation (1) and its implication equation (2) can hardly be a point of serious controversy,

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[10] See Appendix A.

for they do little more than summarise the definitions of monetary and fiscal policy." (p.811).

To develop an intertemporal budget constraint for government, equation (2) has to be examined in more depth. The government would be solvent if the present stock of government debt were equal to the present value of all future primary surpluses. In other words, government is solvent if

$$(3) \qquad B_0 = \sum_{t=1}^{\infty} r_t(R_t - G_t)$$

Looking at (2), it is clear that this will only be the case if

$$(4) \qquad \lim_{n\to\infty} r_n B_n = 0$$

If the left hand side of (4) is greater than zero, then the debt stock would be greater than the present value of future expected repayments, implying that government is redeeming old bonds simply through the issue of new bonds. Government would therefore be playing Ponzi games[11].

Note that the intertemporal budget constraint does not require the debt to decrease to zero, it merely requires that the present value of the debt tends to zero. In other words, debt can be increasing continually, so long as the rate of increase is lower than the rate of interest. This implies that while governments cannot run primary deficits indefinitely, continued conventional deficits can be consistent with the intertemporal budget constraint.

If government spending and revenue continue to follow the historical processes that they have in South Africa, is it expected that lim $r_n B_n = 0$ (as 'n' tends to infinity)? This is the question that Hakkio and Rush (1991) attempt to answer in their evaluation of the United States' fiscal position. To do this, they manipulate (2) to produce an hypothesis that can be tested using the technique of cointegration. Their methodology is discussed next.

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[11] Charles Ponzi was a New Yorker who lead an extravagant lifestyle by simply increasing his borrowing to repay his debt. He was finally arrested and died penniless.

4.3 Developing a Testable Hypothesis

Hakkio and Rush (1991) assume a stationary interest rate with a mean equal to 'i'. Then (1) can be rewritten to obtain

$$(5) \qquad E_t + (1+i)B_{t-1} = R_t + B_t$$

where $E_t = G_t + (i_t - i)B_{t-1}$. In other words, E_t includes all expenditures on goods and services plus interest costs to the extent that the current interest rate exceeds the mean interest rate. Solving forward as we did with equation (2) yields

$$(6) \qquad B_{t-1} = \sum_{j=0}^{\infty} r_{j+1}(R_{t+j} - G_{t+j}) + \lim_{j\to\infty} r_{j+1}B_{t+j}$$

Taking the first difference of (5) yields

$$(5a) \qquad \Delta B_t = (1+i)\Delta B_{t-1} + \Delta E_t - \Delta R_t$$

Solving equation (5a) forward[12], we get

$$(7) \qquad \Delta B_t = \sum_{j=0}^{\infty} r_{j+1}(\Delta R_{t+j+1} - \Delta E_{t+j+1}) + \lim_{j\to\infty} r_{j+1}\Delta B_{t+j}$$

Substituting (1a) into (7) yields

$$(8) \qquad G_t + i_t B_{t-1} = R_t + \sum_{j=0}^{\infty} r_{j+1}(\Delta R_{t+j+1} - \Delta E_{t+j+1}) + \lim_{j\to\infty} r_{j+1}\Delta B_{t+j}$$

The left hand side of (8) equals the sum of government spending on transfers, goods and services, and interest costs. This sum is equal to total government spending (as opposed to non-interest government spending), and will be represented by GG from now on.

Now assume that R and E are stochastic, non-stationary I(1) processes such that ΔR and ΔE are stationary. Hakkio and Rush (1991) assume that both series are random walks with drift. i.e.

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[12] Using the same method as for equation (2).

$$R_t = a_1 + R_{t-1} + \varepsilon_t$$

$$E_t = a_2 + E_{t-1} + \varepsilon_t$$

Then (8) can be rewritten as

$$(9) \qquad GG_t = R_t + a + \lim_{j\to\infty} r_{j+1}\Delta B_{t+j} + \varepsilon_t$$

For solvency to hold, the limit of r_{j+1} as 'j' tends to infinity must equal zero. If solvency holds, the equation can be rewritten as

$$(10) \qquad R_t = a + bGG_t + \varepsilon_t$$

If R and GG are I(1) processes, then GG and R must be cointegrated for the government to be solvent. If ε_t is not stationary, then the value of the limit term in (9) is not zero[13]. The present value of future debt stock is positive, and the expected future government surpluses (based on the historical movements of taxes and spending) will not be sufficient to redeem the debt.

A further condition that Hakkio and Rush (1991) categorise as being "probably necessary" for solvency is b = 1. While they show that fulfilling this condition is not necessary for solvency in the strictest sense, b < 1 would mean that the undiscounted value of debt tends to infinity. In such a case, the government may struggle to market its debt, and the incentive for government to default on the debt would increase.[14]

In summary then, (10) is tested to check i) whether ε_t is stationary, and ii) whether b = 1. If ε_t is stationary, then the discounted value of future debt is indeed zero, and the current stock of debt is equal to present value of future expected primary surpluses. If b < 1, although the country may be solvent in the strictest sense, the increasing nominal value of the debt may cause investors to expect government to default on its debt. Government

[13] Note that changes in the present value of future debt tending to zero is a necessary but not a sufficient condition for solvency. The present value of future debt could be a positive constant. Then changes in the present value are zero, even though government is insolvent.

[14] For a more comprehensive discussion on this point, see Hakkio and Rush (1991), or Haug (1995)

might then be unable to raise further debt finance. Condition i) is necessary for solvency, while condition ii) merely warns of possible debt marketing problems in the future.

4.4 Cointegration

A brief discussion of cointegration is appropriate here, and such a discussion must necessarily start with the concept of stationarity. A series is stationary when it has a constant mean and variance that are independent of time. In other words, a stationary series always tends to return to its mean value, and the fluctuations around this mean are of a constant magnitude. An example of a stationary series would be $Y_t = 0.5Y_{t-1} + \varepsilon_t$, where ε is independently identically distributed, with a mean of zero. In this case, Y_t would also fluctuate around a mean of zero. More generally, the series $Y_t = \rho Y_{t-1} + \varepsilon_t$ is stationary for all p such that $|\rho| < 1$.

If $\rho = 1$, then Y_t is a non-stationary random walk series. Such a series has no tendency to revert to its mean value. In fact the concept of a mean is inappropriate when referring to a non-stationary process, as the mean changes continually over time.

A non-stationary variable can become stationary if it is differenced, and the number of times it must be differenced to achieve stationarity depends on the number of unit roots it contains[15]. A series that needs to be differenced three times before it becomes stationary has three unit roots, and is denoted as an I(3) process, while a stationary process is denoted as an I(0) process.

If two series follow random walk processes and are I(1), then generally any linear combination of these two variables will also be I(1). However, it may be possible that two series have a stable long term relationship, and even though both series are random walks, the difference between the two series is stable. In other words, even though the two series contain a number of stochastic trends, they always move together. Thus a linear combination of these two I(1) processes may yield a stationary I(0) residual. If this is the case, then these two series are cointegrated.

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[15] See Harris (1995), Chapters 1 to 4.

In the context of this paper, we would expect that taxes and government spending each follow random walks. For fiscal policy to be sustainable, however, there must be a stable long term relationship between the two. If taxes and government spending move independently of each other, there is no reason why they should not move infinitely far apart in the long run. This would imply infinite deficits and fiscal crisis. In short, while taxes and government spending might be I(1) processes, sustainability requires a linear combination of the two to produce an I(0) process.

Cointegration will be tested for using the Augmented Dickey-Fuller test. It was shown earlier that

$$Y_t = \rho Y_{t-1} + \varepsilon_t$$

is stationary for all p such that $|\rho| < 1$. Subtracting Y_{t-1} from both sides yields

$$\Delta Y_t = (\rho-1)Y_{t-1} + \varepsilon_t$$

In the simplest form of the Dickey Fuller test, the null hypothesis that $\rho = 1$ and Y_t is non-stationary is tested against the alternative hypothesis that $\rho < 1$ and Y_t is stationary. Such a test would only be appropriate if the overall mean of the series is zero. This is obviously not the case when one is testing series such as government spending and taxes, and thus an intercept term is included. The appropriate Dickey-Fuller test is

$$\Delta Y_t = \alpha_t + (\rho-1)Y_{t-1} + \varepsilon_t$$

In such a test, ΔY_t is being tested only against Y_{t-1}. This assumes that Y_t is an AR(1) procedure. If Y_t actually follows an AR(n) process with $n > 1$, then the simple Dickey-Fuller would no longer be appropriate, as it might incorrectly reject the null hypothesis of non-stationarity. The Augmented Dickey Fuller test includes lagged values of ΔY_t in the regression in order to correct for this shortcoming. The selection of an appropriate number of lags is important, for as Harris (1995) points out, " ... too few lags results in over rejecting the null hypothesis, while too many lags may reduce the power of the test" (p. 47). The power is reduced because of the decreased number of observations that results from using lagged variables.

The Augmented Dickey Fuller is used for all stationarity tests documented in the rest of this chapter.

4.5 Data Sources and Empirical Evidence

The tests were done using Quarterly data on the Exchequer Account from the South African Reserve Bank Database SARB94. Total Exchequer Receipts (series 4045M) was used for government revenue, and the sum of Departmental Issues, Other Issues and Cash Flow Adjustments was used for government expenditure (series 4049M). Revenues and Expenditures of the former TBVC countries are included in the data. When discount costs were included to achieve a more meaningful expenditure series, the data were also obtained from the SARB94 database. The discount costs were included as if these costs were written off on an accrual basis, assuming that all bonds had a life of ten years. It was necessary to make this estimate, as more detailed information on discount costs is not available from the Reserve Bank.

A key assumption of the testable budget constraint is that the interest rate is stationary. This assumption would be inappropriate if one were to consider the nominal interest rate, but the real interest rate could be expected to follow a stationary path. For this reason, all variables used in the tests are real. All variables obtained in nominal form were divided by the GDP deflator.

As was outlined in the previous two sections, the analysis must begin by testing whether government spending and government revenue behave in the expected manner. In other words, are revenue and spending I(1) processes? (i.e. Are both series non-stationary, while the first differences of both series are stationary?) These tests were done for the full period (1960:1 to 1994:4), the hundred observation period (1970:1 to 1994:4) the sixty observation period (1980:1 to 1994:4) and the fifty observation period (1982:3 to 1994:4). In all cases the Augmented Dickey Fuller Test with four lags was used. The results are recorded in Table 4.1 below.

As hypothesised, the series are non-stationary at levels (non-stationarity cannot be rejected at the 10% level), but are stationary in first differences (generally at the 1% level).

The exception to this rule is the first difference of revenue for the last 50 periods (1982:3 to 1994:4), which cannot be shown to be stationary, even at the 10% level. A look at real expenditure and real revenue for the period under study is informative.

The conjecture mentioned in the introduction, that the relationship between government spending and revenue is weakening, is vindicated by figure 4.1. Government spending has continued to increase as a percentage of GDP, but since 1990 increases in tax revenue have not kept pace. Even in 1994 and 1995, periods of relative economic boom, tax revenues as a percentage of GDP are lower than the levels they reached in 1990.

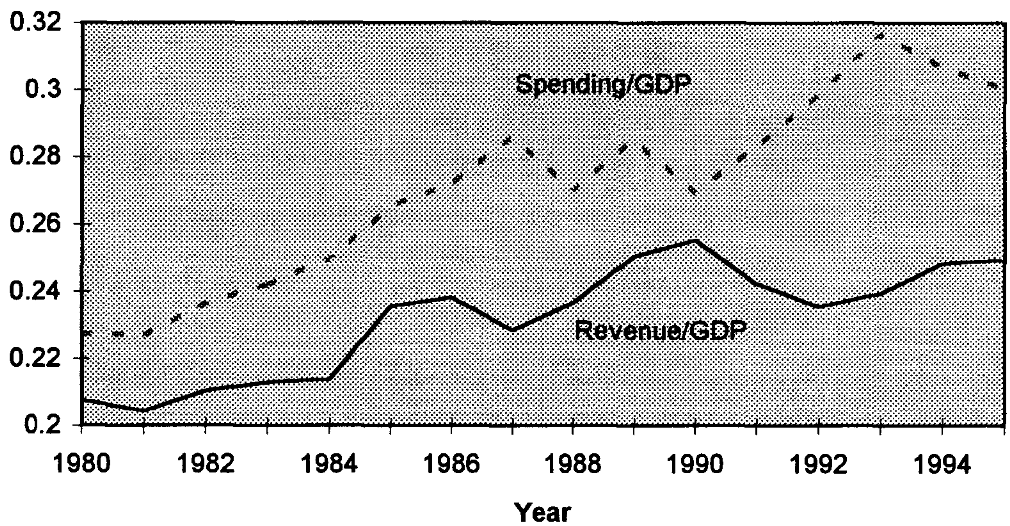
Table 4.1. Testing the Stationarity of Expenditure and Revenue in South Africa

Series	**Levels**		**First Difference**	
	ADF Stat	Critical Value[1]	ADF Stat	Critical Value
Entire Sample				
Real Expenditure	-0.37	N	-6.75	1%
Real Revenue	-0.52	N	-5.28	1%
100 Observations				
Real Expenditure	-0.88	N	-5.71	1%
Real Revenue	-0.95	N	-4.35	1%
60 Observations				
Real Expenditure	-0.13	N	-4.40	1%
Real Revenue	-1.39	N	-3.12	5%
50 Observations				
Real Expenditure	-0.62	N	-4.32	1%
Real Revenue	-1.39	N	-2.49	N

1. The Null Hypothesis is that the series is non-stationary. Values in this column indicate at what significance level the null hypothesis can be rejected. 'N' implies that the null hypothesis could not be rejected at the 10% level. The critical values are MacKinnon values, as provided by the software package EViews.

The second difference of total receipts since 1982 is stationary at the 1% level. Total Receipts is thus an I(2) process for the fifty observation period, and testing for cointegration between two series of differing order of integration would be incorrect. It is impossible that they move together. Testing confirms this, total payments and total receipts are not cointegrated, even at the 10% level of testing.

Figure 4.1. Government Expenditure and Taxes as a percentage of GDP, South Africa, 1980 - 1995



Source: South African Quarterly Bulletin

This result is sufficient cause for concern. Since the third quarter of 1982, spending and revenue have not moved together. It follows that the present value of future debt stock is positive. If government spending and revenue are expected to follow historical processes, then government is technically insolvent.

It can be argued that $12^1/_2$ years is not long enough to be considered long term, and that perhaps the series involved return very slowly to the mean. Therefore, it may still be worth testing for cointegration over longer periods. This argument is supported by the fact that the first difference of total revenue for 60 observations is stationary at the 5%

level. Consequently, tests for cointegration were performed on spending and revenue for the periods 1960:1 to 1994:4, 1970:1 to 1994:4 (100 obs), and 1980:1 to 1994:4 (60 obs).

To ensure that the results achieved were not due to some statistical anomaly caused by the shortening of the time period, the period was halved. Spending and revenue were tested for cointegration for the periods 1960:1 to 1977:4 and 1978:1 to 1994:4. Since four lags were used, each period contains an equal number of observations. Any difference in results must reflect on the changing degree of solvency of the fiscal position.

The results of the cointegration tests are tabled below. As the tests were on the ε_t term in (10), the residual was tested for stationarity assuming no trend or intercept component.

Table 4.2. Cointegration Test Results: Expenditure and Revenue, South Africa, 1960 - 1994

Results of Cointegration Tests			
No. of Observations	**ADF Statistic**	**Critical Value**	**b Estimates**
Whole Period (1960:1 - 1994:4)	-3.182	1%	0.804
100 Observations (1970:1 - 1994:4)	-2.598	1%	0.764
60 Observations (1980:1 - 1994:4)	-1.916	10%	0.534
1st Half (1960:1 - 1977:4)	-2.683	1%	0.690
2nd Half (1978:1 - 1994:4)	-2.390	5%	0.615

Since 1980, non-cointegration between spending and revenue can only be rejected at the 10% level. As 5% significance level is normally considered appropriate in these circumstances, the relationship between spending and revenue has not been stable since 1980.

As (8) showed, the correct measure of government expenditure to use in the cointegration tests includes the costs of bond financing. But the costs of bond financing include both the interest paid annually, as well as the discount costs on bond issues[16]. An

[16] For a comprehensive discussion of the issues involved, see Biggs (1995).

estimate of the appropriate amount of discount costs to add to government expenditure was made by writing off these costs on an accrual basis, assuming all bonds had ten year maturities. These costs were added to the expenditure on the Exchequer's Account, and the cointegration tests were rerun.

Table 4.3. Cointegration Tests including Discount Costs

Results of Cointegration Tests			
No. of Observations	**ADF Statistic**	**Critical Value**	**b Estimates**
Whole Period (1960:1 - 1994:4)	-3.095	1%	0.790
100 Observations (1970:1 - 1994:4)	-2.551	5%	0.743
60 Observations (1980:1 - 1994:4)	-1.928	10%	0.515
1st Half (1960:1 - 1977:4)	-2.683	1%	0.690
2nd Half (1978:1 - 1994:4)	-2.385	5%	0.592

The addition of discount costs has very little effect on the stationarity measures in most of the periods. The increased expenditure was sufficient, however, to render the 100 observation sample stationary at only the 5% level. In all observation periods containing the years 1980 to 1994, the 'b' estimates decrease.

4.6 Analysis and Implications of the Results

For the full period, expenditure (both including and excluding discount costs) and revenue are cointegrated. The long run relationship between the two series is stable, and the government is therefore solvent.

For the 100 observation period, spending and revenue are still cointegrated. But when discount costs are added to total expenditure, the series are only cointegrated at the 5% level. Government is still obeying the intertemporal budget constraint, but the relationship between expenditure and revenue is getting weaker.

For the 60 observation period, the tests reject cointegration at the 5% level for both expenditure series. This indicates that the behaviour of expenditure and revenue has changed, and that the relationship between the two series is no longer stable. The residual term ε_t is not stationary, implying, from equations (8) and (10), that the present value of future debt stock is greater than zero. Future primary surpluses will not be sufficient to redeem the current stock of debt if spending and revenue continue to behave in the manner that they have for the last 60 quarters.

Tests done on the first and second halves of the full period yield similar results. Spending and revenue are cointegrated at the 1% level for the period 1960 to 1977, but only at the 5% level from 1978 to 1994.

These results rationalise the concern that current fiscal policy, if continued, violates government's intertemporal budget constraint. Expenditure inclusive of discount costs and revenue are cointegrated at the 1% level for the period 1960 to 1994, at the 5% level for the period 1970 to 1994, and at the 10% level for the period 1980 to 1994. The 5% level is normally regarded as the appropriate significance level for this type of testing, and thus spending and revenue are not cointegrated from 1980 onwards. For the fifty observation period (from 1982:3 to 1994:4), spending and revenue are of a different order of integration, and are consequently not cointegrated at any level.

These results support the conclusions that one can draw from Figure 4.1. From about 1985, revenue has been driven by forces independent of the spending needs of the government. From 1990, real tax revenue has fluctuated around a relatively constant mean. This suggests that tax revenues may have reached a ceiling, and can only be increased under the present tax structure by strong economic growth. Increases in real expenditure have, however, continued unchecked. This may be due to attempts to reduce the social spending backlog in certain communities by providing basic social services. Whatever the cause, it appears spending has grown without due regard to how the revenue is to be raised. The result is a fiscal position that is unsustainable.

4.7 Conclusions and Policy Implications

The nature of the cointegration technique is such that it draws conclusions about the future that are based purely on past behaviour. It is unable to use any information about the future that is not included in the historical record. For example, if government were committed, through the constitution, to paying out an amount equal to 10% of GDP annually from 1997 until 2010 to previously disadvantaged communities, government solvency would be seriously affected. However, as such payments would occur in the future, such an agreement would not affect the estimate of government solvency using cointegration. This is a weakness of cointegration testing, and implies that our results may be incorrect if there is anything likely to affect future government spending and revenue that is not mirrored in the past.

One such factor may be economic growth. Figure 1 shows that the period during which government spending and revenue diverged most noticeably was from 1985 to 1994. This period was characterised by slow economic growth, and a mounting imperative for government to spend on social services. If the rate of economic growth is expected to be higher in the future, tax revenues can also be expected to increase. That being the case, there might be no reason to arrest the increases in real government expenditure, for if revenue is expected to increase apace, the long term stable relationship between expenditure and revenue may be restored.

Support for this argument comes in the form of predicted economic growth for 1996 of 3.5%[17], which is only marginally lower than the average growth of real government spending for the same period of 3.7%. If, for example, a slightly higher economic growth rate of 4% can be sustained, and if this growth translates into a 4% increase in tax revenues, the present fiscal position may yet be sustainable without fiscal restructuring.

Two counter factors suggest that this might not be the case. Firstly, the 3.5% economic growth expected for 1996 is being achieved at the height of an economic boom[18]. Unless a macroeconomic growth strategy is implemented successfully, it would be unrealistic to expect GDP growth of 3.5% to be sustained.

[17] Department of Finance, (1996) "Growth, Employment and Redistribution: A Macroeconomic Strategy", p.7. Hereafter referred to as GEAR.

[18] GEAR, for example, expects GDP growth to decline to 2.9% in 1997.

Secondly, the decrease in the rate of inflation has resulted in a high real interest rate of about 7%. The real costs of government borrowing have consequently increased, and this will increase real government expenditure. Nominal interest rates could fall, reducing the real interest rates to sustainable levels. However, the as yet unredeemed long government stock was issued at nominal interest rates of at least 15%, and thus government will continue to pay high servicing costs on its debt, regardless of changes in current nominal interest rates. Even though short-term interest rates may fluctuate, the interest rate on government debt will remain at its present level for some time. Sustained high real interest rates on government debt mean that, all else being equal, government spending will increase.

Unless higher economic growth is achieved, tax revenues will not grow apace with expenditures. Given that expenditures are expected to increase further because of higher real interest rates, no factor in the near future, not accounted for in the past, will improve the solvency of South Africa's fiscal position[19]. South Africa's fiscal policy is unsustainable based on past behaviour. If current policies are continued in the absence of higher GDP growth, this position of insolvency will not change. What is required is a drastic restructuring of fiscal policy.

What are the policy options? Obviously, either expenditure must be reduced or government revenue must be increased. But the current literature suggests that very little extra revenue will be obtained from increasing already high tax rates[20], and reducing

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[19] Government could earn additional revenues in the future by privatising state assets, and the effect this has on government's budget constraint will be examined in chapter 5. Privatisation is not discussed here because, due to the limited number of state assets, assets sales cannot be considered a sustainable revenue source.

[20] Fallon and Pereira da Silva (1994) state that "Not much can be done to increase revenue as a share of GDP. ... Further tax evasion and possibly increased emigration may result if attempts are made to raise the top rates of personal income tax" (p. 111). This view is supported by IMF (1992), but disputed by Zarenda (1992) and Harber (1995). However, Zarenda provides no empirical support for his arguments, and his main suggestions for increasing tax revenues are economic growth and improved collection efficiency (pp. 6-7), and he does not advocate an increase in tax rates. Harber (1995, p.30) employs regression analysis on the variables real per capita GNP, Industrial share of GNP, Trade share of GNP, dummy variables for each region, and an intercept term. Of the 8 variables used, only 2 are significant at the 5% level (one of which is the intercept term). An R^2 of 23.4% is achieved, and no attempt is made to test for heteroskedacticity. On the basis of the regression he concludes that South Africa is undertaxed. Harber provides no justification for the variables he chooses. One notable omission is the Gini-Coefficient, or some other measure of income distribution. South Africa's Gini-Coefficient is high, and if it were included, the regression could very possibly show South Africa to be overtaxed. He also provides no justification for retaining the dummy variables, even though they cannot be shown to be significant.

government expenditure may be infeasible in the light of the country's social service needs. Three directions for policy present themselves as potential solutions.

Firstly, government expenditure can be reduced without reducing the quantity or quality of government services provided. This would involve more efficient and more rational use of resources, and a decrease in resource wastage. Obviously all governments aim to do this, and the task is not an easy one. Employing budget techniques that relate inputs to outputs could increase the efficiency of government expenditure on a microeconomic scale.

Secondly, tax revenue can be increased by more efficient tax collection. Increasing collection efficiency would increase tax revenue without raising tax rates. Improved tax collection could raise the ceiling on tax revenues. This option is already being implemented. The South African Revenue Service has estimated that an additional R1,5 billion (*Budget Review*, 1996, p.5.11) will be collected during the 1996/97 financial year because of improved collection methods.

Finally, tax revenue can be increased indirectly by spending on activities that enhance economic growth. Increased growth would increase revenue without affecting government spending.

This list of potential solutions to the fiscal problems is not comprehensive, nor is it certain that such steps are feasible and able to be implemented. The list merely indicates the sort of solution that must be implemented if fiscal crisis is to be averted. The evidence shows clearly that spending and revenue are no longer cointegrated. Spending appears to be driven by the need to provide social services to the poor, while revenue is constrained by the already heavy tax burden on the upper and middle income groups. The stable long term relationship between revenue and spending has grown progressively weaker, and the resulting fiscal policy is unsustainable. This link must be re-established if government is to avoid insolvency.

CHAPTER 5

The Collateral Constraint and Fiscal Sustainability

5.1 Introduction

The fiscal stance taken by the South African government since 1982 is unsustainable. This was shown clearly in the last chapter. But while the cointegration tests can adequately answer questions about past policies, they can tell us very little about future policies. The importance of public debt is that it casts doubt on the solvency of government. From a policy perspective, it is essential to indicate what paths fiscal policy should follow if government solvency is to be maintained.

This chapter will identify the upper bounds to the growth of government expenditure if fiscal policy is to be sustainable, given various future growth and interest rates. To do so, the differences between the intertemporal budget constraint and the collateral constraint must be made clear.

The intertemporal budget constraint was identified in chapter 3 as being:

$$B_0 = \sum_{t=1}^{\infty} r_t(R_t - G_t) + \lim_{n\to\infty} r_n B_n$$

The budget constraint is satisfied if the second term on the right hand side of the equation is equal to zero. In other words, if the government debt is increasing at a rate lower than the interest rate, the government is solvent.

This constraint is satisfied if government consistently runs primary surpluses in present value terms, regardless of the size of the conventional deficit. With a balanced primary budget, government debt will increase at the interest rate. A primary surplus thus ensures that debt grows at a rate slower than the interest rate.[21]

[21] This holds only if the present value of these surpluses exceeds zero. If the present value of future surpluses tends to zero while the present value of future debt is still positive, the debt will grow at a rate that tends to the interest

But consider the case where the interest rate exceeds the GDP growth rate[22]. Government debt may grow at a rate d which is slower than the interest rate (i), but faster than the economic growth rate (y), such that

$$i > d > y$$

Thus even though the intertemporal budget constraint is satisfied, debt is growing faster than GDP, and the debt-to-GDP ratio tends to infinity. Is this a solvent position?

Under these circumstances, solvency depends on government collateral. Government's collateral is the sum of its assets and the present value of all future revenues adjusted for essential non-interest spending. If the present level of government debt exceeds the present value of government's collateral, then government is insolvent, regardless of future movements in taxes and expenditure. The limitations to government collateral mean that a continually increasing debt-to-GDP ratio implies that government is insolvent. Therefore movements of government debt could satisfy the intertemporal budget constraint presented above, without satisfying the requirement that debt remain within the limits of government collateral.

Kremers (1989) argued that debt may exceed collateral because taxes are limited as a percentage of GDP. When this limit is reached, tax revenue can grow at most at a rate equal to the growth rate of GDP (y).[23] If debt grows at a rate faster than y, debt will finally exceed government collateral, and the government will be insolvent. For debt to remain within the limits of government collateral, growth of debt must not permanently exceed the growth in tax revenues. In terms of our notation, d cannot exceed y permanently.

If $i > y$, then satisfying the intertemporal budget identity is a necessary but not sufficient condition for solvency. The sufficient condition for solvency is that d does not

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rate. The present value of government debt will therefore be constant, but positive. Government will therefore not be solvent.

[22] Most studies on this subject assume that the interest rate exceeds the growth rate. Fischer and Easterly (1990), for one, agree that "...market forces tend to prevent the real interest rate from remaining below the real growth rate permanently. The normal situation should be thought of as one in which the real interest rate exceeds the growth rate." (P. 136)

[23] In essence, the solvent path may require growth in tax revenue that is infeasible given the GDP growth rate.

exceed y permanently. In other words, a permanently increasing debt-to-GDP ratio is not consistent with government solvency.

This theoretical formulation justifies the concern about the dramatic increase in South Africa's debt-to-GDP ratio over the last decade. The previous chapter showed that South African fiscal policy over the last ten years has not been consistent with the intertemporal budget constraint. This chapter will outline options for government expenditure growth under various scenarios, given the collateral constraint. It must be stressed that the expenditure growth paths outlined are sustainable, but not necessarily optimal. These growth paths show the limits to sustainable expenditure growth. But while a sustainable fiscal policy path may not be optimal, an optimal fiscal policy path must be sustainable. Therefore the optimal path for future fiscal policy will be found within those paths we identify as being sustainable.

In Section 5.2, a theoretical framework will be developed to identify sustainable expenditure growth paths. This framework will be applied to South Africa in Section 5.3. In Section 5.4, the limitations of the framework will be considered, and various attempts will be made to overcome these limitations. Concluding remarks are made in Section 5.5.

5.2 Government Collateral and Fiscal Solvency

Following Kremers (1989), government collateral C at time 't' is equal to

$$(1) \qquad C_t = \tau Y_t \sum_{j=t+1}^{\infty} Q_{t,j}$$

where τ is the upper limit of taxes as a percentage of GDP, and $Q_{t,j}$ is the relevant discount factor. τY is adjusted for essential non-interest expenditure. Given the goal of outlining the limits to future fiscal policy, (1) can be rewritten as

$$(2) \qquad C_t = A_t + \sum_{t=1}^{\infty} r_t(R_t - E_t)$$

where A_t is the value of government assets at time t, R_t and E_t are government revenue and expenditure respectively, and

$$r_t = \prod_{s=1}^{t} \frac{1}{(1+i_s)}$$

Assume expected revenue growth is equal to GDP growth *y*, the interest rate remains *i*, and expenditure grows at a rate *e*. Then

$$\text{(3)} \qquad C_t = A_t + \frac{R_t}{1 - \frac{1+y}{1+i}} - \frac{E_t}{1 - \frac{1+e}{1+i}}$$

Equation (3) holds only if $i > y$ and $i > e$. If $i < y$, then the present value of all expected future tax revenue is infinite, and the collateral constraint does not hold. If $e > i$, then the present value of future expenditure is infinite, and government's collateral is zero. The existence of any government debt would mean that government is insolvent. These possible cases are ignored: the former would probably not exist for any length of time, and the latter is unsustainable unless the former holds.

In addition, (3) holds only if all government revenue is received and expenditure made on the first day of the year. This is unrealistic. If the simplifying assumption is made that revenues match expenditures throughout the year, such that any surplus or deficit is paid out or received on the last day of the financial year, then (3) must be modified to:

$$\text{(3a)} \qquad C_t = A_t + \left[\frac{R_t}{1 - \frac{1+y}{1+i}} - \frac{E_t}{1 - \frac{1+e}{1+i}} \right] / (1+i)$$

to obtain the present value of government collateral.

Government debt may not exceed government collateral. At the limit of government solvency, debt equals collateral.

$$\text{(4)} \qquad C_t = D_t$$

where D_t is government debt at the beginning of year t.

For the moment, let us ignore government's stock of assets. If government has no intention of decreasing asset holdings, then collateral depends entirely on the present value of all expected revenue and expenditures. Inserting (4) into (3a), removing A_t, and solving for *e* yields

$$(5) \qquad e = i - \frac{E}{\frac{R}{(i-y)} - D}$$

For various values of E, R, D, *i* and *y*, the upper limit to government expenditure growth can be calculated if the solvency constraint is to be met. Note that (5) holds only in a constant price environment. In an inflationary environment, if prices have increased revenue and expenditure received at the end of the financial year are worth less in present value terms. All growth and interest rates in (3a) must be multiplied by the expected rate of inflation to allow for this. Within the parenthesis, inflation appears in both the numerator and the denominator, and thus cancels out. Only the term outside the parenthesis is affected by the introduction of inflation, and the result is:

$$(3b) \qquad C_t = A_t + \left[\frac{R_t}{1 - \frac{1+y}{1+i}} - \frac{E_t}{1 - \frac{1+e}{1+i}} \right] / (1+i)(1+\pi)$$

where π is the inflation rate. When $(1 + \pi)$ is taken across to the other side and the equation is solved, (5) changes to:

$$(5a) \qquad e = i - \frac{E}{\frac{R}{(i-y)} - D(1+\pi)}$$

5.3 Expenditure Growth Options for Sustainable Fiscal Policy in South Africa

The values for E, R and D can be taken from the 1996/97 budget. Budgeted revenue R for the year is R144 857 million. Included in this is an amount of R1 880 million of revenue earned through the sale of strategic fuel reserves which cannot be considered a sustainable source of revenue. The full amount is included in the calculations for 1996/97, but tax revenue for the 1997/98 year is calculated by increasing tax revenues net of the amount obtained through fuel sales by the expected rate of economic growth.

Budgeted expenditure for the year is R173 659,4 million. Subtracting R34 445 million for interest costs leaves R139 214 million of non-interest expenditure. Budgeted expenditure increased by 5.4% from 1995/96 to 1996/97, and a further 3.5% increase from 1996/97 to 1997/98 is predicted. Debt at 31 March 1996 is estimated at R280 billion, and GDP for the year ending 31 March 1996 is estimated at R500 billion. The rate of inflation, π, is assumed to be 7.5%

The current real interest rate for government is approximately 8%. While this interest rate may be maintained at least until the turn of the century, it is arguable whether a real interest rate of 8% could be sustainable. Calculations were done using an estimated future interest rate of 5%, 6.5%, and 8%.

Table 5.1. Maximum Permissible Real Government Expenditure Growth Rates

Economic Growth Rate	Interest rate	Maximum Expenditure Growth
3.5%	5%	3.49%
3.5%	6.5%	3.38%
3.5%	8%	3.15%
4%	5%	4.01%
4%	6.5%	3.94%
4%	8%	3.76%
3%	5%	2.96%
3%	6.5%	2.86%
3%	8%	2.51%

Future economic growth is uncertain. While the consensus view appears to be an economic growth rate of approximately 3.5% for 1996[24], this may be the climax of an economic upturn, soon to be followed by recession. Estimates for the limit of growth of

[24] See, for example, GEAR, 1996, p.7.

government expenditure were computed using economic growth rates of 3%, 3.5% and 4%.

Revenue for the 1997/98 financial year had to be estimated to free the revenue totals of the distorting influence of capital revenues from fuel sales. Expenditure for 1997/98 then also had to be estimated (3.5% real growth on the 1996/97 expenditures) so that expenditure and revenue had a common base year. The expenditure growth paths illustrated in Table 5.1 are the maximum sustainable growth paths for government expenditure for the financial year 1998/1999 onwards, given various growth and interest rates.

If a consistent economic growth rate of 4% is achieved, and if real interest rates have decreased to 5% by March 1998, then government expenditure can increase to a rate of 4% and debt will still be bounded by government collateral. But if a real growth rate of 3% is achieved, and real interest rates remain at 8%, real government expenditure can only increase at a rate of 2.5% per annum. To put these figures into perspective, average real expenditure growth rates for various periods are tabulated below.

Table 5.2. Average Government Expenditure Growth: Selected Periods

Period	Real Expenditure Growth
1960 - 1994	5.29%
1985 - 1994	3.31%
1991 - 1994	3.73%
1996 - 1997 (budgeted)	5.41%

The present budgeted expenditure increase of 5.4% exceeds even the most optimistic estimates of sustainable expenditure growth. If interest rates remain at 8%, and an average growth rate of 3.5% is achieved, the rate of growth in government expenditure will have to be lower than at any time in the last thirty five years.

For the sake of fiscal planning, assume that an average economic growth rate of 3.5% is expected. Given the current anti-inflation position of the Reserve Bank, the continued high demand for credit extension, and the fact that investment exceeds savings in South Africa at present, a substantial decrease in the real interest rate may be a long time in coming. Assuming real interest rates fall to 6.5%[25] (with 7.5% inflation, this would mean a nominal interest rate of 14.5%) expenditure growth cannot be allowed to exceed 3.4%.

5.4 Limitations of the Analysis

The major limitation of the analysis thus far is that it is static in the extreme. Firstly, the various expenditure and revenue paths are assumed to have no effect on the real interest rate or the economic growth rate. Secondly, no attempt has been made to determine to what extent government can change the levels and growth rates of revenue, expenditure, and debt, and to calculate how this would affect the solvency constraint.

5.4.1 Fiscal Policy and Economic Growth

To address the first limitation, one would have to estimate the effects of taxes, government spending and debt on economic growth. If fiscal policy affects aggregate demand, it must affect the economic growth rate in an economy operating at less than full capacity. Increased growth could, in turn, attract further investment. Government spending could also affect growth through investment in human capital and infrastructure. Finally, fiscal policy could help create a positive environment for investment. Investors may perceive that the risk of macroeconomic instability is lower in a country with low debt and deficit ratios, and this could affect the direction of investment.

Given the different ways that fiscal policy can affect growth, and given that these effects may depend not on the fiscal policy itself, but on investors' perceptions of fiscal policy, it would be impossible to estimate the total effect of fiscal policy on growth.

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[25] An assumption on the interest rate is made simply to illustrate possible policy implications of the analysis. Many commentators expect a far more rapid fall in the interest rate. GEAR, for example, expect the real bank rate to decline to 3% by the year 2000 if their macroeconomic strategy is implemented.

Instead, the approach here will be to examine the various expenditure growth paths outlined above that obey the solvency constraint, and to see what happens to various key ratios such as the debt-to-GDP and deficit-to-GDP ratios in the long run. While the expenditure and revenue paths may obey the solvency condition that government debt remains bounded by government collateral, the deficit and debt ratios that these expenditure and revenue paths produce may not be consistent with the assumed future economic growth rate. If deficits or debt to GDP become too high, the combination of the continued contractionary fiscal policy and the potential macro instability can undermine growth. In addition, the private sector may no longer want to lend to government. The deficit could take up an increasingly larger portion of South African savings, or as debt increases, the public might become aware of government's increasing incentive to default on the debt. For whatever reason, despite the solvency constraint being met, the debt situation could become untenable.

The expected movements in the key ratios for three of the scenarios for the period 2000 to 2100 are shown in Table 5.3. The high growth/low interest rate scenario and the low growth/high interest rate scenario will be considered in some depth. The middle growth/middle interest rate scenario is included in Table 5.3 simply to give the reader an idea of the rate of change in the key ratios when growth and interest rates change. Detailed movements in the key ratios for all nine scenarios are included in appendix B.

The High Growth/Low Interest Scenario

First, the most optimistic growth scenario will be considered, with economic growth continuing to average 4% forever and the real interest rate falling to 5%. It is assumed that expenditure grows at the limit of its boundedness (i.e. it grows as fast as it can while still fulfilling the solvency condition), which in this case is 4% per annum. Movements in the key ratios are shown in column 1 of Table 5.3.

The debt-to-GDP ratio starts decreasing immediately, and will be less then 50% by the year 2020. Perhaps the best measure of the aggregate demand effect of fiscal policy on the economy is the primary balance. While this remains in surplus, it is less than 0.8% in 2000 and continues to fall throughout the period.

Table 5.3. Future Debt and Deficit ratios assuming selected Interest and Economic Growth Rates

Key Ratios	Interest Rate = 5% Growth Rate = 4%	Interest Rate = 6.5% Growth Rate = 3.5%	Interest Rate = 8% Growth Rate = 3%
Debt/GDP			
2000	55.0%	59.5%	64.1%
2010	52.4%	69.1%	85.6%
2020	49.8%	78.5%	106.2%
2050	42.0%	106.1%	162.3%
2100	28.9%	150.3%	239.8%
Conventional Deficit/GDP			
2000	5.6%	6.9%	8.2%
2010	5.3%	7.9%	10.2%
2020	5.0%	8.8%	12.1%
2050	4.2%	11.6%	17.3%
2100	2.8%	16.0%	24.5%
Primary Deficit/GDP			
2000	(0.79%)	(0.74%)	(0.79%)
2010	(0.77%)	(1.02%)	(1.95%)
2020	(0.74%)	(1.31%)	(3.05%)
2050	(0.67%)	(2.14%)	(6.05%)
2100	(0.54%)	(3.48%)	(10.2%)

Note: Brackets indicate negative values.

The only possible concern regarding this scenario is the conventional deficit. The conventional deficit is the popular measure of fiscal discipline. While the expenditure and tax revenue paths outlined are consistent with macroeconomic stability, the perception remains that high conventional deficits imply fiscal indiscipline. South Africa may lose out on foreign investment to other developing countries with lower conventional deficits, even if the policies themselves are sustainable.

These key ratio movements were calculated assuming that the expenditure grew at the allowable maximum of 4%. The 1996/97 year excluded, expenditure has in fact grown at an average rate of nearer 3.3% over the last decade. If a rate of 3.5% were maintained, a balanced budget would be achieved by the year 2018. The debt-to-GDP ratio would be 23.8%, but the primary surplus would be 3% and rising. It is doubtful whether an economic growth rate of 4% could be maintained in the face of a primary surplus of 3%, but expenditure growth would no longer be at the limit of boundedness. There would thus be scope for increasing expenditure to promote growth. By the year 2018, the rate of expenditure growth consistent with the solvency constraint would exceed 4.1%.

The South African fiscal authorities would be forced to choose between high expenditure growth combined with higher conventional deficits, or lower expenditure growth combined with high primary surpluses. Although there is no technical reason why moderate conventional deficits of just over 5% should tarnish South Africa's image in the eyes of investors, fiscal authorities will lose credibility if they do not achieve the deficit targets outlined in GEAR (1996). Alternatively, the falling debt ratio could be evidence enough of South Africa's commitment to fiscal discipline. In addition, the higher expenditure growth rate gives fiscal authorities more scope for addressing the backlog in social services to the poorer communities in the country. But if government is unsure about the returns on additional expenditures, they could reduce debt or reduce taxes.

In summary, if real interest rates are 5% and the economy grows at 4%, there is no reason why expenditure growth rates of 4% should be growth-inhibiting. In fact, the steady decline in the debt-, conventional deficit- and primary surplus-to-GDP ratios should contribute to an environment of macroeconomic stability. This, in turn, would promote investment and stimulate economic growth. In the high growth/low interest rate scenario, the level of debt will not constrain fiscal policy, and fiscal policy will not inhibit growth.

The Low Growth/High Interest Scenario

The second scenario to be considered is the low growth/high interest rate scenario. If the maximum sustainable expenditure growth path is followed, the key ratios will follow the paths outlined in column 3 of Table 5.3. The primary surplus, conventional deficit and debt ratios are all high and rise dramatically over the entire period.

If expenditure grows at 2.5% per annum, the conventional deficit reaches 10% by 2010, the primary surplus reaches 3% by 2020, and the debt ratio reaches 100% by 2018. The increase in all three ratios could, through their effect on growth and the general perception of government solvency, cause the expenditure growth of 2.5% to become unsustainable.

Both the primary and conventional budget imbalances affect economic growth. The high primary surpluses decrease aggregate demand. In a demand-constrained economy with spare capacity, such as in South Africa, this puts downward pressure on economic growth. In addition, the high conventional deficits may increase the perceived risk to investors. Because increased risk implies a decreased risk-adjusted return, investment would consequently decrease. Low investment would slow economic growth.

The slower economic growth rate would mean a slower growth in tax revenues, which in turn implies a decrease in government collateral. The expenditure growth rate was determined assuming government collateral equalled government debt. If collateral decreases because of slow growth, collateral becomes less than debt, and government is bankrupt.

Government can also become insolvent if the debt ratio keeps rising. Even if government is solvent in the technical sense of the word and a 3% economic growth rate can be maintained despite the increasing budget imbalances, the increasing debt ratio may cause the public to doubt government's ability to redeem the debt. In addition the public will be aware of government's increasing incentive to default as the debt ratio rises. For both reasons, the public may be unwilling to take up bond issues. If government cannot sell new bonds, it will be unable to roll over its debt, and it will therefore be insolvent.

Government cannot avoid the high primary surpluses, as movements in the key ratios were calculated with expenditure growing at its maximum sustainable rate. To stop the conventional deficit and debt ratios increasing rapidly, government could reduce expenditure. But this would result in increasingly contractionary primary surpluses, reduced aggregate demand, and slower growth.

In addition, in order to reduce government expenditure, government would have to lower public spending on social and economic services. Apart from the effect this would have on growth, one has to ask by how much expenditure growth can be reduced? South Africa's population is currently growing at a rate of 2.02%[26] a year. The majority of government expenditures are on social and economic services. If the level of services is to be maintained in the absence of major public service efficiency gains, then expenditure will have to grow by at least 2.02% a year as well. Note that this is only sufficient to maintain service standards, and not to improve them. Any attempts to address the chronic social backlog will have to be made at the cost of decreasing the quality of services in other areas. If taxpayers perceive that the standard of services they are receiving from government is dropping, their resistance to paying taxes may increase.

A weakness of the analysis is that interest rates remain constant, regardless of what happens to economic growth. If growth were to slow down, would it be reasonable to assume interest rates remained as high as 8%? Perhaps not. But South Africa's high real interest rate may be due in part to risk perceptions based on the large conventional deficit. Increasing conventional deficits and the increased risk of government defaulting in the face of a growing debt-to-GDP ratio would all put upward pressure on the real interest rate. It would not be prudent to rely on falling real interest rates to ensure the sustainability of fiscal policy.

If the worst case scenario of 3% economic growth and 8% interest is expected, the answer to the debt problem will not be found in fiscal restructuring. A combination of high interest rates and low economic growth will ensure that government becomes insolvent,

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[26] Boshoff and Haldenwang (1996), or Republic of South Africa (1995, p. 1).

regardless of fiscal policies chosen. This situation can be called a pre-privatisation debt trap. Either state assets must be privatised to pay off government debt, or the tight monetary policy stance must be relaxed to lower real interest rates. Both solutions will be discussed further in the next section.

The analysis shows that sustainable expenditure growth is closely linked to the economic growth rate. Expenditure can only be increased to rates above those outlined in Table 5.1 if there is a genuine expectation that the spending policies implemented will be growth enhancing. If increased expenditure does not lead to increased growth, the adjustment process becomes progressively more painful.

Advocates of expansionary fiscal policies aimed at kick-starting economic growth in South Africa suggest a risky path. Increased fiscal deficits put upward pressure on the interest rates. The more interest rates increase due to fiscal policy, the greater the increase in fiscal policy-induced economic growth must be to ensure that the policy is sustainable. The consequence of policy failure is high. If economic growth does not respond to high deficit spending, the country will be saddled with high levels of debt, high interest rates, and high conventional deficits which result from high interest costs[27].

5.4.2 Factors Affecting Sustainable Expenditure Growth Paths

Solutions to the debt problem, such as privatisation of state assets and a relaxing of monetary discipline, were mentioned in the previous section. By privatising government assets, the state could raise significant revenues and write these off against the state debt. Estimates of the amount of revenue government could earn through privatisation have varied from R30 billion to R100 billion. But the privatisation process is fraught with political problems. Organised labour fears that privatisation will mean job losses as the companies aim for increased efficiency, and that privatisation will make the ownership structure in the South African economy even more concentrated. In addition, some public

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[27] In a small open economy such as South Africa, expansionary fiscal polices also face a Balance of Payments constraint. In addition, the public sector's ability to absorb additional funds is doubtful. For a brief discussion on these issues, see GEAR (1996, Appendix 5).

companies play a redistributory role by providing certain basic goods at below market price. The policing of this role may become more difficult if the company were privatised.

While relaxing monetary discipline would decrease interest costs in the short term, it could have counterproductive inflationary consequences. The fear is that added macro-instability could further decrease economic growth. Even though interest costs would fall, so too would government revenues.

Both privatisation and an easing of monetary discipline carry costs. The aim is to determine what the benefits would be in terms of increased allowable expenditure growth if such policies were undertaken. Consider:

$$(5a) \qquad e = i - \frac{E}{\frac{R}{(i-y)} - D(1+\pi)}$$

Firstly, the issue of privatisation must be examined. If a marginal change in D does not affect any of the other variables, (a reasonable assumption), then taking the partial derivative of *e* with respect to D will yield the rate at which expenditure growth can change if state assets are privatised and the proceeds used to reduce government debt.

$$(6) \qquad \frac{\delta e}{\delta D} = -\frac{E(1+\pi)}{\left(\frac{R}{i-y} - D(1+\pi)\right)^{\wedge}2}$$

Expenditure (E) and Revenue (R) are given, and will not be discussed. The sign of (6) shows the expected fact that as debt decreases, expenditure growth can increase and still maintain the collateral constraint. The noteworthy result in (6) is that the amount expenditure growth can increase with a decrease in debt is strongly dependent on the denominator in equation (6). The lower the denominator, the greater is the whole function. More specifically, the greater the difference between interest rates and growth rates, the greater the benefits of reducing debt. This result is confirmed if the allowed expenditure growth rates are calculated as if debt was zero, and compared to the results in Table 5.1.

For the high growth/low interest rate scenario, eliminating debt merely increases allowable expenditure growth from 4.01% to 4.03%. But for the high interest rate/low growth scenario, allowable expenditure increases from 2.5% to 3.1%, an increase of 0.6 of a percent. The message is clear: if high growth is expected and interest rates do not remain excessive, the public debt does not constrain fiscal policy. But if the economy is expected to perform poorly, the benefits of privatisation are marked[28]. In any case, privatisation in the low growth/high interest scenario may be the only method of avoiding fiscal crisis.

Table 5.4. The Effect of Eliminating Debt on Allowable Expenditure Growth Rates

Economic Growth Rate	Interest rate	Maximum Expenditure Growth	
		Actual Debt	*Zero Debt*
0.035%	0.05%	3.49%	3.53%
0.035%	0.065%	3.38%	3.58%
0.035%	0.08%	3.15%	3.62%
0.04%	0.05%	4.01%	4.03%
0.04%	0.065%	3.94%	4.07%
0.04%	0.08%	3.76%	4.12%
0.03%	0.05%	2.96%	3.04%
0.03%	0.065%	2.80%	3.08%
0.03%	0.08%	2.51%	3.11%

The issue of relaxing monetary policy is more complex. The partial derivative of allowable expenditure growth with respect to interest rate is:

[28] This statement deals only with the effect of privatisation on the debt stock. If privatisation increased economic growth, the effect on sustainability would be even more pronounced.

$$(7) \qquad \frac{\delta e}{\delta i} = 1 - \frac{\dfrac{\text{ER}}{(i-y)^{\wedge}2}}{\left(\dfrac{\text{R}}{i-y} - \text{D}(1+\pi)\right)^{\wedge}2}$$

Equation (7) can either be negative or positive, depending on the relative sizes of debt (D), revenue (R), and expenditure (E). If debt is zero and tax revenue exceeds non-interest government expenditure, the partial derivative is positive. Increasing the interest rate increases the rate of expenditure growth consistent with the collateral constraint, regardless of the values of i and y. But as debt increases, (7) becomes negative. Increasing interest rates imply higher interest costs, and thus growth of non-interest expenditure is constrained.

The effect of the difference between i and y appears ambiguous in equation (7), but for the current values of D, E and R in South Africa, certain relationships are noticeable. If debt is zero, changes in i do not affect e if y is constant. But if debt is positive, then the greater the difference between i and y, the more an increase in interest rates inhibits fiscal policy.

Table 5.5. The Interest Elasticity of Permissible Expenditure Growth Rates ($\delta e/\delta i$)

GDP Growth Rate	Real Interest Rates		
	5%	6.5%	8%
3%	(0.066)	(0.143)	(0.231)
3.5%	(0.038)	(0.111)	(0.194)
4%	(0.011)	(0.080)	(0.160)

Note: Brackets indicate negative values.

Table 5.5 requires some explanation. The data show the rate of change in permissible expenditure growth rates for a 1% change in interest rates. For example, if the growth rate was 3.5% and the real interest rate was 6.5%, then, at current levels of debt, a 1% increase in the interest rate would cause the permissible expenditure growth rate consistent with the collateral constraint to fall by 0.111%. The table shows clearly that changes in interest rates, given our current debt levels, will relax the pressure on fiscal policy only if interest rates are high, and growth rates are low.

the country with a skewed income distribution will pay more tax than an individual with the same income in the country with the more even income distribution. If the relatively wealthier South Africans already pay as much tax as their European counterparts[30], increasing tax revenues would have to mean increasing taxes on the lower income groups.

Secondly, the amount of tax revenue raised is dependent to some extent on the willingness of taxpayers to pay the tax. This may be high in various OECD countries, where the wealthy receive substantial high quality government services. But in South Africa, more and more expenditure is being directed at easing the plight of the previously disadvantaged black community, while less is being spent on the relatively wealthy whites[31]. Willingness to pay is accordingly not high. If, for example, the wealthy were to receive free schooling and medical services, they could perhaps be persuaded to pay more tax. The fact that the wealthy carry a heavy tax burden but receive little in terms of government services puts a limit to the amount of tax revenues government can raise. Increased taxes may face fierce resistance if the taxpayers perceive that they don't benefit from these taxes.

Thirdly, even if taxes can be increased as a percentage of GDP, it is not desirable to do so if it will hamper economic growth. High tax rates may make South Africa a poor investment proposition. South Africa already raises far greater levels of tax revenue than the developing countries it competes against. From 1986 to 1990, South Africa raised tax revenues on average equal to 25.8% of GDP (IMF, 1995, p.99). For the same period, average tax revenues as a percentage of GDP were 14.1% for non-OECD Asian countries,

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[30] "... the tax share of white South Africans is very high by the standards of other middle income countries and at least comparable to that prevailing, on average, in the industrial countries" (IMF, 1992, p. 29) In 1988, white South Africans paid 32% of their incomes in taxes.

[31] IMF (1992) introduced the concept of a net tax burden, which is equal to the amount of tax revenue paid, less the value of the education, health, housing and social welfare services received by each racial group, as a percentage of GDP. White South Africans bore a net tax burden of 23.3% in 1987, while the net tax burden on blacks for the same year was -3.41%. (p. 30). The net tax burden on whites was more than double the average net tax burden for any other country measured. The country with the second highest net tax burden was Canada (11.06). While the wealthy, white population of South Africa is being compared to the entire populations of the OECD countries, this does not detract from the relevance of the measure because the per capita income for white South Africans is lower than the per capita income for their OECD counterparts. The per capita income of white South Africans in 1992 was $9725 (Whiteford and McGrath, 1994, p. 36), while the average per capita income in OECD countries in 1992 was $22460. World Bank, 1994, p.29)

16.5% for non-OECD western hemisphere countries, and 13.6% for middle-eastern countries. No non-OECD Asian countries and only Barbados and St Lucia of the non-OECD western hemisphere countries raised greater levels of tax than South Africa. Fiscal policies here that necessitate future tax increases will make South Africa increasingly less competitive internationally. In short, it may not be prudent for South Africa to implement fiscal policies that depend on tax revenue increasing as a percentage of GDP.

To determine a minimum expenditure growth rate needed to maintain standards of government services, a population growth rate of 2.02% was used. However, the population growth rate is expected to fall, and while it is 2.02% at present, it is expected to average 1.5 % over the next 30 years[32]. Therefore real expenditure growth to maintain the quality of service standards may not need to be more than 1.5%, which is far less than the 2.5% used in the analysis.

If expenditure grows at 1.5% per annum, it may be possible to avoid the debt trap even in our worst case scenario of 3% growth and 8% real interest rates, but only if growth of 3% can be maintained. Table 5.2 shows that South Africa has never come close to achieving an expenditure growth rate as low as 1.5%. In addition, the greater the difference between expenditure growth and revenue growth, the faster the primary surplus increases. Large primary surpluses reduce aggregate demand and will inevitably affect economic growth. Taxpayers will continue to bear a heavy tax burden while receiving little in the form of government services, and resistance to taxes may well increase. The debt trap can be avoided only if the 1.5% expenditure growth, the 3% revenue growth, and the 3% economic growth can be maintained, which is doubtful under the circumstances.

Policy Implications

The results illustrated in Tables 5.1 to 5.5 show the relationship between economic growth, interest rates and expenditure growth. The results do not outline an optimal fiscal policy path to follow, they simply define the options available to fiscal policy makers. Certain crucial points become evident.

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[32] Boshoff and Haldenwang (1996)

Fiscal policy is constrained by economic growth. If South Africa can achieve growth of 4% or above, the current debt stock will not hamper fiscal policy. But if growth averages at 3% or less, a debt trap may no longer be avoidable through fiscal restructuring. Privatisation of state assets may be necessary to maintain government solvency. The benefits of privatisation increase as the difference between growth rates and interest rates increases.

Fiscal policy that can give rise to and maintain high economic growth is desirable. But if policies involve extensive deficit spending to achieve growth, and the expected growth does not materialise, painful fiscal restructuring will have to occur in the future. While bad policies guarantee poor economic growth, good policies will not necessarily ensure high growth. The prudent approach might be to accept that fiscal policies have had a limited effect in stimulating growth, to make reasonably conservative estimates of future economic growth, and to let expenditure grow accordingly.

The current high real interest rates and the high level of debt-to-GDP are not compatible if high GDP growth is not achieved. Either monetary policy must be relaxed, or fiscal policy must be tightened. The cost of relaxing monetary policy is inflation, while the cost of tightening fiscal policy could be a slowdown in the development of social services for the poor. The analysis provides the set of possible policy options facing government. The aim here is not to choose between these policy options, but to indicate that a trade-off exists.

CHAPTER 6

Conclusions and Policy Implications

6.1 Analytical Conclusions

Whether or not macroeconomic stability in South Africa is threatened by the high level of public debt depends on the general perception of government solvency. Government solvency, in turn, depends on future fiscal policies, interest rates and economic growth.

Is Current South African Fiscal Policy Sustainable?

This paper set out to answer two questions. The first question, "Is current South African fiscal policy sustainable?", was answered by testing whether or not South Africa has obeyed its intertemporal budget constraint. Whereas fiscal policy in the 1960s and 1970s was sustainable, the same cannot be said for fiscal policy since 1982. Cointegration tests show that the long term stable relationship between government expenditure and revenue has weakened over the past decade and a half. If spending and revenue continue to follow their current trends, the present value of future government debt is greater than zero, and government is therefore insolvent.

The evidence indicates that in the 1960s and 1970s, a decision to increase government spending was accompanied by a concurrent decision to increase tax revenues. While economic recessions may have caused taxes and expenditure to diverge in the short term, these movements were corrected for in the long term. If government increased spending, they also increased tax revenues to finance this spending.

In the 1980s this stable relationship broke down. Spending and revenue appear to have been driven by independent forces. Total government spending has increased because of increased spending on social services in an attempt to reduce the social backlog, and higher interest costs on the public debt. At the same time, an upper bound on tax revenues as a percentage of GDP (of around 25%) appears to have been reached. Tax revenues can therefore only increase at the rate of economic growth. Expenditure increases that exceed the rate of economic growth cannot be matched by equivalent increases in tax revenue, and hence the fiscal position steadily worsens.

Clearly, current fiscal policy is not sustainable. South Africa must change its fiscal stance. This can be done either by increasing economic growth and thereby increasing the rate of growth of tax revenues, or by decreasing the expenditure growth rate. But increasing growth is obviously no simple matter, and government is committed to certain social expenditures in its attempts to improve the plight of the South African poor. Thus government's ability to increase tax revenues is limited economically, and its ability to decrease expenditure is constrained politically.

What are the Constraints on Future Fiscal Policy?

The collateral constraint was used to specify exactly what combinations of economic and expenditure growth rates and interest rates are required for the South African government to remain solvent.

Various future economic growth and interest rates were assumed, and the maximum allowable expenditure growth rates satisfying government's collateral constraint were calculated. As shown in Table 5.1, expenditure can grow at 4% if real interest rates are 5% and an economic growth rate of 4% is achieved, but it can only grow at 2.5% if the real interest rate rises to 8% and economic growth averages 3%. Permissible expenditure growth rates for economic growth and interest rates between those mentioned here are detailed in Appendix B.

The analysis assumes that the effect of fiscal policy on economic growth and interest rates is constant. However, the expenditure paths outlined in Table 5.1 for each rate of economic growth may well give rise to debt and deficit ratios incompatible with the economic growth rate they were estimated from.

For the high growth/low interest rate scenario, with government expenditure growing at 4%, the primary surplus, conventional deficit and debt-to-GDP ratios decrease.

Clearly, the level of debt will not constrain fiscal policy, and fiscal policy will not constrain economic growth.

But as expected growth rates decrease and interest rates increase, the debt-, conventional deficit- and primary surplus-to-GDP ratios all increase. This could render fiscal policy unsustainable, either through the effect of the deficits on economic growth, or through the effect of debt on the general perception of government solvency. When this happens at an already low rate of expenditure growth, the possibility of a debt trap arises.

At an economic growth rate of 3%, a real interest rate of 8%, and a maximum allowable expenditure growth rate of 2.5%, all three key ratios increase dramatically. The conventional deficit- and debt-to-GDP ratios could be decreased by drastically reducing expenditure, but this would imply increased primary surpluses, which would further reduce aggregate demand and could slow economic growth. In addition, the expenditure cuts might not be politically feasible. Government is then in what might be called a pre-privatisation debt trap. Government insolvency can no longer be avoided merely by fiscal restructuring; either assets must be sold, or the debt must be monetised. If keeping control over inflation is seen as vital to economic growth, state assets would have to be sold if government is to avoid bankruptcy.

Privatisation

The issue of privatisation is complex, dogged by many political economy factors. However, government may have no choice on whether or not to privatise if it is the only method of avoiding insolvency. The benefits of privatisation increase with an increase in the interest rate/growth differential.

Monetary Policy

If government were willing to accept some inflation for lower interest rates, the pressure on fiscal policy would be relaxed most effectively when interest rates are high and growth is slow. In addition to lowering interest costs, lower interest rates might also stimulate faster economic growth, which would, in turn, give rise to faster growth of tax revenues.

Alternatively, increased inflation could decrease investment by increasing the perceived risk to investors. In addition, whereas non-accommodating monetary policy forces government to confront its budget constraint, accommodating monetary policy may increase the incentives for fiscal authorities to pursue a more expansionary fiscal regime[33]. If fiscal authorities know that the monetary sector will absorb some of the effects of their fiscal excesses, they may be less inclined towards fiscal discipline. This is evidenced in the South African situation. The government ran primary deficits unchecked throughout the seventies and eighties, and it is only since monetary policy has tightened that debt has caused public concern.

6.2 Policy Implications

The analysis carries a number of implications for the country's fiscal policy. South Africa must change its fiscal stance, as current fiscal policies are not sustainable. If current policies are maintained, government will become insolvent, causing inflation to increase. Macroeconomic instability will result, which could decrease economic growth.

Arguments in favour of increasing tax revenue as a percentage of GDP are not convincing, and it can thus be assumed that growth in tax revenues is constrained by GDP growth. If future real interest rates are assumed, permissible combinations of expenditure and GDP growth consistent with government solvency can be calculated. If future GDP growth is also predicted, a unique, sustainable expenditure growth path is defined. It remains to estimate future interest and GDP growth rates, and thereby define the limits to future growth in government spending.

It must be emphasised that the analysis is not prescriptive, and does not provide an optimal fiscal policy path. It defines a set of deficit and growth combinations that will ensure technical solvency. The policy makers must then estimate future GDP growth and interest rates to determine which of the sustainable fiscal policy paths is attainable.

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[33] See Tabellini (1988), p.93.

Both the nominal interest rate and the inflation rate fluctuate continuously, and therefore predicting the real interest rate is hazardous. However, because government borrows long (the average term to maturity on marketable government stock is $9^1/_2$ years[34] at March 1996), it is committed to paying interest at the current rate until the stock is redeemed. The average nominal interest rate on bonds with a ten year or longer maturity since 1982 has been 15%.[35] Of the total government debt of R280 billion on the 31 March 1996, R250 billion is marketable domestic debt. Of this R250 billion, only R23 billion is scheduled to be redeemed by the end of 1997, and less than R50 billion is to be redeemed by the end of the century. Until then, government will continue to pay interest at a nominal rate of 15% on at least 80% of the total stock of marketable debt.

It is improbable that the average nominal interest rate on government bonds will be below 14% by the year 2000. The real interest rate, therefore, depends on future inflation rate movements. If 7% inflation is maintained, the real interest rate will be 6.5%.

Growth in GDP is more difficult to forecast, but attempts at prediction can be made based either on economic fundamentals or historical precedent.

Considering the fundamentals, it has been estimated that a domestic savings rate of 22% of GDP is necessary to sustain real economic growth of 2.5% per annum, while a savings rate of 24% is required to maintain a 3.5% growth rate.[36] Shortfalls in savings may, however, be met by capital inflows.

In 1995, the domestic savings ratio equalled 16.7% of GDP, a 0.5% decrease from the 1994 value of 17.2%. Capital inflows of 3.5% of GDP were measured in 1995, while gold and foreign reserves decreased by 0.9% of GDP. Consequently, an amount equal to 19.3% was available for investment, which is far below the 24% estimated as necessary to maintain 3.5% real growth.

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[34] South African Reserve Bank (1996), p. S-64.

[35] This was calculated on the basis of an unweighted average of monthly interest rates on government stock since 1982.

[36] Prinsloo (1994), p. 35.

But savings levels could easily increase to their early 1980s levels of 24.5%. If savings do increase, and capital continues to flow into the country, future growth will not be constrained by a lack of funds available for investment.

Historical data shows that since 1946, South African real GDP growth has averaged 3.3%. If GDP was an I(1) process, such that GDP growth was stationary, average future growth could be expected to equal average historical growth. If future growth is to average a rate higher than the historical average, the underlying structure of the economy that generates growth would have to change.

However, an examination of real GDP trends in South Africa from 1946 to 1995 shows that the GDP series is an I(2) process and GDP growth is I(1).[37] GDP growth appears to follow a random walk, and therefore analysing past growth rates reveals little about future growth rates.

Neither the fundamentals nor the historical precedent indicate a probable future GDP growth path. Real economic growth of 3.5% is predicted for 1996, but growth is expected to be slower in 1997.[38] While we have been unable to predict future economic growth, for the sake of illustrating policy implications, it is assumed that real growth will remain between 3% and 3.5%.

If future real interest rates of 6.5% and growth rates of 3% to 3.5% are expected, government expenditure growth must remain between 2.8% and 3.4% for government to remain stable. An economic growth rate of 3.5% may be difficult to achieve in the face of rising conventional deficit and debt-to-GDP ratios (Conventional deficit and debt-to-GDP ratios would be 8.8% and 78.5% respectively by 2020), but these ratios could be reduced by decreasing expenditure growth to 3.25% per annum. However, this would cause the primary surplus to be increasingly contractionary, reaching a level of 2% of GDP by 2020.

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[37] The first difference of GDP growth with four lags is stationary at the 5% level.

[38] GEAR (1996, p. 7). GEAR predict a growth rate of 2.9% for 1997 if their macroeconomic growth strategy is implemented.

If economic growth of 3% is to be achieved, the maximum allowable expenditure growth rate would be 2.8%. But at this rate, the key ratios react even more dramatically. The conventional deficit would reach 10% of GDP by 2023, and the debt ratio 100% by 2030. Decreasing expenditure to prevent increases in the debt and deficit ratios would simply result in an increase in primary surpluses, which would slow growth.

Anything that leads to increased growth will ensure that government remains solvent. If increased government expenditure, spent for example on infrastructure investment, could ensure increased economic growth, then the government would have no reason for concern about the debt situation. But if these high expenditure policies fail to stimulate economic growth, they will simply accelerate government's move to fiscal bankruptcy.

Privatising state assets may relieve some of the pressure on fiscal policy. How much revenue there is to be gained from selling state assets is, however, doubtful. Estimates on the value of marketable state assets have ranged from R30 to R100 billion. Assuming the R100 billion could be realised immediately, expenditure growth could be increased from 2.8% to 2.9%, or from 3.4% to 3.45%, depending on the growth rate. The key ratios (debt-, conventional deficit- and primary surplus-to-GDP ratios) would also increase at a slower rate.

The increases in expenditure growth are fairly small, and while privatisation revenues may decrease pressure on fiscal policy, they would not be sufficient to solve the debt problem. Monetising the deficit would cause macroeconomic instability, and should be regarded as the result of government insolvency rather than the cure.

The only solution to South Africa's debt problem is economic growth. Paths for expenditure growth have been outlined for various estimates of interest and economic growth, but the challenge is to maintain these levels of economic growth despite primary surpluses. Any factors that enhance growth increase the flexibility of fiscal policy, and consequently increase government's ability to address social issues in South Africa. However, these issues can only be addressed because of economic growth, and not at its expense.

6.3 The Collateral Constraint in Macroeconomic Models

The reformulation of the collateral constraint proposed in this dissertation constitutes a theoretical advance because it identifies the range of sustainable fiscal polices for given macroeconomic conditions. Integrating the reformulated constraint in a macroeconomic model would increase the robustness of the econometric analysis.

If the collateral constraint is considered in isolation, expected economic growth determines the limits to expenditure growth if government is to remain solvent. In doing so, it ascertains the limits to the primary[39] and conventional deficits. The causality runs one way, from growth to deficits.

But the causality between growth and deficits is bi-directional.[40] In a macroeconomic model that recognises the relationship between deficits and growth, the deficits would feed into the GDP growth forecasts. The changed growth forecast would then change the limits to permissible deficits. Growth would affect deficits, and deficits would affect growth.

Couching the collateral constraint in a macro model would emphasise the relationship between fiscal sustainability and growth, particularly if the effect of the primary surplus on growth is strong. If high and rising primary surpluses slowed GDP growth, the value of future tax revenues would decrease. Expenditure growth would have to decrease to maintain solvency, but this would increase the primary surplus, resulting in a downward growth spiral.

Alternatively, if increased government spending increased growth, the present value of future tax revenues would increase. Consequently, government would be able to increase expenditure, which would again increase growth.

In either case, the growth spiral, be it upward or downward, would be emphasised, and unsustainable fiscal policies would be more easily identified. Including the collateral constraint in a macro model would ensure that the limits to fiscal policy would be more

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[39] Chapters 4 and 5 showed that the primary balance would have to be in surplus. The word "deficit" is used here simply for ease of expression

[40] Ahsan *et al (1989)*, amongst others, present evidence of bi-directional causality between growth in government expenditure and GDP growth. If tax revenues are constrained, this implies a similar relationship between deficits and GDP growth.

evident and more accurately quantifiable. The macro model itself would become more comprehensive, as fiscal policy would be constrained by the solvency condition.

Appendix A

The Derivation of Government's Intertemporal Budget Constraint

Government's one period budget identity is

(1) $G_t + (1 + i_t)B_{t-1} = R_t + B_t$

Assume t=1. Then to solve (1) forward, we solve for B_0. This yields

(2) $B_0 = (R_1 - G_1)/(1 + i_1) + B_1/(1 + I_1)$

Using the same method, B_1 is equal to

(3) $B_1 = (R_2 - G_2)/(1 + i_2) + B_2/(1 + i_2)$

Now inserting (3) into (2) yields

(4) $B_0 = (R_1 - G_1)/(1 + i_1) + [(R_2 - G_2)/(1 + i_2) + B_2/(1 + i_2)]/(1 + i_1)$

Rearranging the terms in (4) yields

(5) $B_0 = (R_1 - G_1)/(1 + i_1) +(R_2 - G_2)/[(1 + i_1)(1 + i_2)] + B_2/[(1 + i_1)(1 + i_2)]$

It is obvious from (5) that continually substituting for the 'B' term on the right hand side will finally yield (6)

(6) $B_0 = (R_1 - G_1)/(1 + i_1) + \ldots + (R_\infty - G_\infty)/[(1 + i_1)\ldots(1 + I_\infty)] +$

$B_\infty/[(1 + i_1)\ldots(1 + i_\infty)]$

which is the mathematical equivalent of equation (2) in chapter (3)

(2) $$B_0 = \sum_{t=1}^{\infty} r_t(R_t - G_t) + \lim_{n\to\infty} r_n B_n$$

where

$$r_t = \prod_{s=1}^{t} \frac{1}{(1+i_s)}$$

Appendix B

Tables B.1 to B.3 show movements in the key ratios for all nine growth and interest rate assumptions.

Table B.1. Future Debt and Deficit ratios given a 4% Economic Growth Rate

Key Ratios	Interest Rate = 5%	Interest Rate = 6.5%	Interest Rate = 8%
Debt/GDP			
2000	55.0%	58.3%	61.6%
2010	52.4%	63.9%	75.5%
2020	49.8%	69.5%	89.1%
2050	42.0%	86.1%	127.9%
2100	28.9%	113.1%	187.0%
Conventional Deficit/GDP			
2000	5.6%	6.7%	7.8%
2010	5.3%	7.2%	9.2%
2020	5.0%	7.8%	10.6%
2050	4.2%	9.6%	14.6%
2100	2.8%	12.4%	20.7%
Primary Deficit/GDP			
2000	(0.79%)	(0.82%)	(0.91%)
2010	(0.76%)	(0.96%)	(1.48%)
2020	(0.74%)	(1.10%)	(2.03%)
2050	(0.67%)	(1.51%)	(3.62%)
2100	(0.54%)	(2.17%)	(6.03%)

Appendix B

Table B.2. Future Debt and Deficit ratios given a 3.5% Economic Growth Rate

Key Ratios	Interest Rate = 5%	Interest Rate = 6.5%	Interest Rate = 8%
Debt/GDP			
2000	56.2%	59.5%	62.9%
2010	57.5%	69.1%	80.6%
2020	58.8%	78.5%	97.7%
2050	62.8%	106.1%	145.8%
2100	69.4%	150.28%	215.7%
Conventional Deficit/GDP			
2000	5.81%	6.89%	7.99%
2010	5.94%	7.85%	9.73%
2020	6.07%	8.79%	11.41%
2050	6.47%	11.57%	16.13%
2100	7.14%	15.98%	22.99%
Primary Deficit/GDP			
2000	(0.68%)	(0.74%)	(0.85%)
2010	(0.70%)	(1.02%)	(1.68%)
2020	(0.72%)	(1.31%)	(2.49%)
2050	(0.78%)	(2.14%)	(4.75%)
2100	(0.87%)	(3.48%)	(8.04%)

Appendix B

Table B.3. Future Debt and Deficit ratios given a 3% Economic Growth Rate

Key Ratios	Interest Rate = 5%	Interest Rate = 6.5%	Interest Rate = 8%
Debt/GDP			
2000	57.4%	60.7%	64.1%
2010	62.7%	74.2%	85.6%
2020	67.9%	87.4%	106.2%
2050	83.5%	125.6%	162.3%
2100	109.1%	184.4%	239.8%
Conventional Deficit/GDP			
2000	6.04%	7.11%	8.20%
2010	6.54%	8.39%	10.20%
2020	7.05%	9.65%	12.10%
2050	8.56%	13.28%	17.30%
2100	11.02%	18.87%	24.47%
Primary Deficit/GDP			
2000	(0.58%)	(0.65%)	(0.79%)
2010	(0.68%)	(1.14%)	(1.95%)
2020	(0.78%)	(1.62%)	(3.05%)
2050	(1.09%)	(2.99%)	(6.05%)
2100	(1.60%)	(5.11%)	(10.20%)

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