REGIME-DEPENDENT FISCAL REACTION FUNCTIONS: DO THEY TELL US SOMETHING ABOUT GOVERNMENT BEHAVIOUR IN SOUTH AFRICA?

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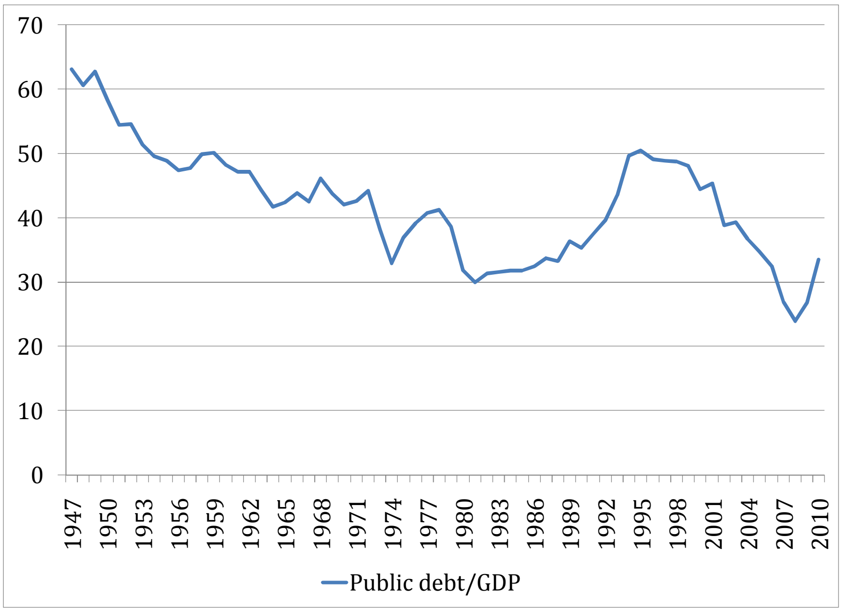
The financial and economic crisis that started in 2008 as well as the response of governments to the crisis resulted globally in fast rising public debt/GDP ratios. Governments in countries such as Greece, Ireland and Portugal face the possibility of debt restructuring and bailouts by the EU and IMF, while countries such as the US and the UK also experienced the sharpest peace-time increase in their debt/GDP ratios since modern times. Financial markets too express uncertainty and several calls have been made in the US and UK to identify an 'exit strategy' from the large stimulus policies pursued by their governments. South Africa also experienced an increase in its public debt/GDP ratio, though the increase is not nearly as dramatic as in the countries cited above (see Figure 1). These increases in public debt/GDP ratios globally raise again the question whether flexible fiscal rules are not necessary. More specifically, is what is needed not rules that allow for stimulus measures during recessions, but also indentify an exit strategy from these measures? Indeed, if these exit strategies are clearly defined in terms of a fiscal rule, the stimulus measures themselves might generate more market confidence and thus, have a larger impact.

Figure 1 – The public debt/GDP ratio in South Africa



Therefore, this paper argues the case for a policy of 'anchored flexibility' in the form of a flexible fiscal rule that allows for the pursuit of economic stability, but anchors that pursuit always in fiscal sustainability. The rule is explicitly structured to be simple and is designed in analogy to the inflation targeting framework. In addition to containing a proposal for a fiscal rule that describes how government should react in future, the paper also explores how government reacted in the past by presenting estimations of the fiscal reaction function. Various specifications of the fiscal reaction function are presented. In addition, the estimated fiscal reaction functions are also used to explore whether revenue or expenditure carried the largest burden of adjustment in the past. Showing that the largest adjustments fell on revenue, the paper also proposes how expenditure measures can be augmented to allow for increased sensitivity to recessions, while also creating a mechanism for a fast adjustment and restitution of fiscal sustainability once the recession passes.

1. Whence fiscal rules?

The debate about fiscal rules is not a recent phenomenon, with the underlying concern regarding the size and burden of public debt being an age-old one, going back centuries. For instance, referring to 18th century United Kingdom, David Hume (1987 (1742)) stated that '…either the nation must destroy public credit, or public credit will destroy the nation.' The oldest fiscal rule is the simple balanced budget rule, succinctly stated for the first time in modern times in the Treasury View of 1929 (Clarke 1988). However, the Great Depression highlighted the untenable nature of this rule during severe recessionary times. Thus, following the Great Depression, rules gave way to discretionary fiscal policy in the 1940s, 50s and 60s. Keynesian economics and Abba Lerner's Functional Finance View emphasised that government should not focus on balancing the budget, but rather focus on balancing the economy; the budget will then take care of itself (Lerner 1951). These views provided the theoretical underpinnings for discretionary fiscal policy.

Discretionary policy seemed to have carried the day in the first three decades following WWII. The exceptional economic growth rates and the rather low interest rates meant that governments could grow their economies out of the public debt burdens that they incurred during WWII. South Africa is no exception, with public debt doubling in amount during the first three decades, though halving as ratio of GDP. However, this does not mean that fiscal rules disappeared altogether. Most governments still followed a basic public sector golden rule whereby loans were predominantly incurred to finance infrastructure and capital, while current expenditure was financed by tax revenues. Fiscal rules also did not disappear from economic literature. As early as 1948 Milton Friedman argued the case for a flexible fiscal rule that allows for the operation of what is today known as automatic stabilisers. To quote him: "The principle of balancing outlays and receipts at a hypothetical income level would be substituted for the principle of balancing actual outlays and receipts." (Friedman 1948: 249-50). Hence, Friedman's proposal essentially aims at balancing the budget over the business cycle.

As Friedman argued, his proposal was not an isolated set of ideas, since it drew on existing ideas circulating in academic and policy circles at the time. Though Friedman made his proposal in 1948, fiscal rules only became a serious topic of discussion again in the 1980s and 1990s, following the significant deficit and debt problems that many developed countries faced at the time. By this time the debate on fiscal rules could also draw on a significant public choice literature emphasising issues such as time inconsistency in the behaviour of governments, the deficit bias of governments, and issues such the political business cycle (cf. Kydland and Prescott 1977, Drazen 2004, Corsetti and Roubini, 1996, Alesina and Perotti 1994).

Different authors also had different definitions of what constitutes fiscal rules, but all definitions implied a constraint of fiscal policy actions over time (cf. Kopits, 2004; Milesi-Ferretti, 2003; Tanner, 2004; Kopits and Symansky, 1998; Drazen, 2004; Buti and Giudice, 2004, 2002; Kell, 2001 and Siebrits and Calitz, 2004). In addition, most authors view fiscal rules as restrictions on budget deficits, the level of public debt or government expenditure (cf. Milesi-Ferretti 2003:378-379, Tanner 2004:719). Differences do exist as to whether rules should be permanent or could also include temporary restrictions (e.g. the 3% stipulation of GEAR), and whether rules should be contained in policy statements, or also encoded in law (cf. Kopits and Symansky 1998:2). According to Kopits and Symansky (1998:18-20) and Kell (2001:8-30) good fiscal rule should be:

1. well-defined;
2. highly transparent;
3. simple in the eyes of the public;
4. flexible enough to accommodate cyclical fluctuations and exogenous shocks;
5. consistent with other macroeconomic policies;
6. adequate with respect to specific goals;
7. enforceable in the given environment and supported by efficient policies.

To the above list one could also add that a good rule should ease the ability of government to pursue fiscal sustainability, or alternatively, constrain the ability of government to run an unsustainable fiscal policy. Kopits and Symansky (1998:19-20) nevertheless argue that a trade-off exists between these characteristics. Thus, probably no rule will possess all characteristics – e.g. simpler rules might be less flexible, but more credible.

An important characteristic of the modern fiscal rules is the concern of reconciling the need for fiscal sustainability with the desire to allow for government to support economic stability, mostly through automatic stabilisers. In doing so, modern fiscal rules follow directly from Friedman's 1948 proposal.

2. A flexible fiscal framework – the basics

Properly designed automatic stabilisers enhance the ability of government to implement a flexible fiscal rule. Such a rule is sensitive to the business cycle, but simultaneously also ensures fiscal sustainability. It is therefore less of a rule and more of a guiding framework; it constitutes 'anchored flexibility'.

A flexible fiscal rule that is embedded in properly designed permanent and temporary automatic stabilisers, allows for both a timely response to a downturn and more certainty about the path back to fiscally sustainable expenditure, revenue and debt levels once the economy stabilises. In 2010/11 concern in countries such as the US and UK regarding the 'path back' found expression in debates about the so-called 'exit strategy' governments should follow in the aftermath of the very large fiscal injections that economies received following the 2008/9 financial crisis. These concerns regarding exit strategies highlight the role that 'anchored flexibility' built into fiscal rules could play to provide more certainty. Moreover, more certainty about the 'path back' to fiscal sustainability might also increase confidence in the success of stimulus policy and thereby enhance fiscal multipliers and thus the impact of a stimulus policy.

Given that fiscal sustainability is largely about the trajectory of debt/GDP, a debt/GDP target level might be the right place to start when thinking about a fiscal rule or framework. The specific level at which to target the debt/GDP ratio might be arbitrary or based on a structural analysis about the optimal level for the ratio. In principle, and following a golden rule that in the long run only investment should be financed by debt (thus allowing for short-run debt financing of current expenditure), the ratio should be set at the level of public capital that accords with society's optimal trade-off between public consumption today and public consumption in the future. In practice though, the level will probably be set at an arbitrary level (such as 60% in the EU or 35% - roughly the average for South Africa since 1994).

Suppose the level is set at 35%. A deficit target can then be derived from the debt target. The deficit target is then defined to keep the debt/GDP ratio in the longer run at the 35% level. Thus, the deficit target will equal:

$$C^*_t = nD_{t-1}/Y_t$$

where C^* is the deficit, n is the long-run nominal economic growth rate, D is debt of last year and Y is expected GDP this year. One could also define n as the central inflation target (4.5% in the case of South Africa) and add the long-run expected real growth rate. The long-run nominal or real growth rate can be estimated or simply be a moving average.[1] Thus, if the central inflation target is 4.5% and the long run growth rate is 3%, the nominal growth rate is expected to be roughly 7.5%. Therefore, with a 7.5% nominal growth rate in the long-run and a debt/GDP target in the long-run level of 35%, the sustainable deficit is 2.4% (note that the real part of the deficit will be 1% (0.03x(0.35/1.03)). Government then also needs to decide at what long-run levels to set revenue and expenditure to yield this deficit level.

The sustainable level of the deficit is the Structural Budget Balance (SBB), i.e. the level of the budget balance after the effect of the business cycle has been stripped out. Using the SBB (=C^*), as well as estimates for the elasticity of various revenues and expenditure and a forecast for the output gap, government can forecast the actual levels of revenue, expenditure and the deficit using Equations (1) to (4) below. Government may then decide to target the level of the actual deficit. Doing so also implies that government implicitly is also targeting the SBB. Furthermore, such a deficit target will, in principle, also allow the automatic stabilisers to operate and thereby build in some flexibility of the budget balance with respect to the business cycle.

$$T = \left(\frac{T^*}{Y}\right)\left(\frac{Y^*}{Y}\right)^{1-\varepsilon_R} \qquad (1)$$

$$G = \left(\frac{G^*}{Y}\right)\left(\frac{Y^*}{Y}\right)^{1-\varepsilon_G} \qquad (2)$$

$$SBB = C^* = T^* - G^* \qquad (3)$$

$$C = T - G \qquad (4)$$

where T and T^* are revenue and long-run revenue, G and G^* are expenditure and long-run expenditure, C is the deficit, Y and Y^* are output and long-run output, and ε_T and ε_G are the elasticities of revenue and expenditure with respect to the output gap.

[1] Given the poor track record of forecasters, the best forecast might be as simple as using an AR model. Favero and Marcellino (2005) argue that simple AR models for macroeconomic and fiscal data forecasts still outperform more complex structural models.

However, targeting the level of the actual deficit as described above is notoriously fraught with problems. Favero and Marcellino (2005) show that even in economies as developed and relatively stable as the Euro-area economies, the standard errors of deficit forecasts are relatively large (note that they wrote prior to the financial crisis and the subsequent sovereign debt crisis and the large and increased economic instability it brought). To target the deficit level using Equations (1) to (4) entails forecasting the output gap, which in turn requires not only forecasting actual output, but also potential output. Given that both actual and potential output are stochastic in nature means that forecasting them involves a degree of uncertainty.[2] Furthermore, even slight uncertainty with respect to the levels of output and potential output translates into considerable uncertainty with respect to the output gap. Thus a relatively small unpredicted change in the level of output or potential output can lead to a large unpredicted change of the output gap, which, through Equations (1) to (4) then translates into considerable unpredicted change in the deficit. Therefore, government faces a high probability of missing the targeted deficit level. Measuring government's success in complying with a fiscal rule that sets a target level for the deficit is nothing more than deception caused by spurious precision.

With or without a fiscal rule, governments always announce a specific point deficit target for the following year and therefore annually target the announced deficit. Fiscal rules constitute a permanent target with which the annual target needs to comply every year. Because governments frequently miss their annual targets as set out in their annual budgets, setting an annual target to comply with the permanent (fiscal rule) target means that governments are bound to violate such fiscal rules, thereby losing credibility. This raises the question of how governments can use a fiscal rule that is not wholly arbitrary, while also dealing with the uncertainty involved in setting the budget deficit.

One solution is for government to set up a permanent (fiscal rule) target that targets the standard deviation of the deficit instead of the level of the budget deficit. Therefore, using historic data on the output gap one can calculate the standard deviation of the output gap. Placing the values of two standard deviations for the output gap into Equations (1) and (2), and then using Equation (4) one can calculate the two-standard deviation band around the SBB, with upper and lower values within which the announced deficit budgeted for the following year must fall. Government will then only need to ensure that the deficit budgeted for the following year falls within the band. This approach in essence allows the automatic stabilisers to act. The benefit of this approach is that when the actual deficit deviates from the budgeted deficit, the probability is high that the actual deficit still falls within the target band. Thus, when the actual deficit deviates from the budgeted deficit but deviations still fall within the target band, government will not lose credibility.

Under normal circumstances a rule such as the deficit rule set out above might be sufficient to ensure fiscal sustainability. Indeed, since two-standard deviations of the output gap are used to set the bandwidth within which the deficit movements will be limited, it is designed to cover 95% of all output gap movements, *ceteris paribus*. However, the *ceteris paribus* clause may be contravened in the event of the unexpected. Furthermore, wrong forecasts for GDP or a lax

[2] The problem might be even more serious given that recent values of GDP included in the model estimation are frequently subject to relatively large revisions. Thus, uncertainty not only exists with regard to the forecasts of the GDP gap, but also with respect to the accuracy of recent past values of GDP.

attitude regarding the deficit that leads to a hardening of the upper bound of the deficit band could lead to a build-up of debt. In addition, government needs to keep in mind the possibility of Japanese-style recessionary conditions when a prolonged recession causes the debt/GDP ratio to keep on increasing. Under these conditions the deficit rule will not ensure fiscal sustainability even if the deficit remains within its band.

To deal with such events that cause a significant built up of debt government may, in addition to the deficit band, also implement a debt feedback mechanism. Thus, for any % deviation above the target of 35%, a correction could be subtracted from the deficit of the next couple of years to reduce the debt/GDP ratio back to target (the opposite can be done if debt falls below target). For instance a feedback rule might state that a third of the deviation of debt from target of previous year should be subtracted from the deficit.[3] The debt feedback rule can be further refined so that in this case too government might consider using a range within which the debt/GDP ratio can be allowed to fluctuate. Thus, the feedback mechanism kicks in when the debt/GDP ratio falls outside for instance the 25-45% band. That will ensure that feedback does not occur in the depth of a recession.[4] The width of the band can be set arbitrarily or with reference to the deficit band. Thus, if the deficit band is set using two standard deviations of the output gap in Equations (1), (2) and (4), and if on average downswings last, for instance, for two or three years, government may set the bandwidth for debt so as to allow two or three successive years of the deficit at the maximum of its upper bound. This will prevent a hardening of the upper bound of the deficit band. More importantly, the debt feedback rule ensures fiscal sustainability in the longer run by overriding the effect of the deficit rule when debt tends to increase above levels acceptable to government.

3. A flexible fiscal framework – the mechanics

So how will a combined deficit-and-debt rule work? Suppose that C^{**}_t/Y_t is the projected budget deficit before adjustments are made to remain within the target ranges for both the deficit and debt:

$$C^{**}_t/Y_t = [(1+g)(G_{t-1}) - (1+r)(R_{t-1})]/(1+n)Y_{t-1} \qquad (5)$$

Where g is the growth rate of government expenditure, r is the growth rate of revenue, n is the nominal economic growth rate, G is government expenditure, T is government revenue and Y is nominal GDP. A deficit rule can then be defined as:

$$C_t/Y_t = C^{**}_t/Y_t - \alpha_1[C_t/Y_t - (C^*_t/Y_t)^L] - \alpha_2[C_t/Y_t - (C^*_t/Y_t)^U] \qquad (6)$$

where C is the actual budget deficit. A debt feedback rule can be defined as:

$$C_t/Y_t = C^{**}_t/Y_t - \beta_1((D_{t-1}/Y_{t-1}) - (D/Y)^L) - \beta_2((D_{t-1}/Y_{t-1}) - (D/Y)^U) \qquad (7)$$

[3] One can also measure the average length of recessions, and think of using half-life calculations (i.e. setting the proportion that must be corrected equal to a value that will ensure that at least half of the deviation is eliminated in half the time that a business cycle lasts).
[4] The band can also be set using the half-life calculations mentioned in the previous footnote.

where $(C^*_t/Y_t)^L$ and $(C^*_t/Y_t)^U$ represent respectively the lower and upper bounds for the target range for C^*/Y, and $(D_t/Y_t)^L$ and $(D_t/Y_t)^U$ represent respectively the lower and upper bounds for the target range for D/Y. In addition:

$\alpha_1 = 1$ if $C_t/Y_t < (C^*/Y)^L$ and $\alpha_1 = 0$ if $C_t/Y_t \geq (C^*/Y)^L$
$\alpha_2 = 1$ if $C_t/Y_t > (C^*/Y)^U$ and $\alpha_2 = 0$ if $C_t/Y_t \leq (C^*/Y)^U$
$0 < \beta_1 \leq 1$ if $D_{t-1}/Y_{t-1} < (D/Y)^L$ and $\beta_1 = 0$ if $D_{t-1}/Y_{t-1} \geq (D/Y)^L$
$0 < \beta_2 \leq 1$ if $D_t/Y_{t-1} > (D/Y)^U$ and $\beta_2 = 0$ if $D_{t-1}/Y_{t-1} \leq (D/Y)^U$

In principle it is possible for government to apply either Equation (6) or Equation (7). The deficit rule as contained in Equation (6) will allow the deficit to move countercyclically, but within limits set by the lower and upper bounds. However, a drawback of this rule is that if the economy remains in a recession for a protracted period (Japan being a prime example), it will not prevent the debt/GDP ratio from increasing. Nevertheless, it will prevent fiscal unsustainability in the strict sense of the word by preventing the debt/GDP ratio and deficit/GDP ratio from both increasing at an increasing rate. More specifically, the rate at which the debt/GDP ratio will increase will remain constant relative to GDP. To ensure that debt does not increase either unboundedly or at a constant rate to GDP, government could use the debt rule contained in Equation (7). Equation (7) in itself is sufficient to ensure that the debt/GDP ratio does not increase without limit. It also allows for countercyclical policy, but it places no limit on how quickly the lower or upper bounds for the debt/GDP ratio are reached from within the acceptable debt/GDP target range. However, as discussed in the previous section, government can also combine the two rules:

$$C_t/Y_t = C^{**}_t/Y_t - \alpha_1[C_t/Y_t - (B_t/Y_t)^L] - \alpha_2[C_t/Y_t - (B_t/Y_t)^U] - \beta_1((D_{t-1}/Y_{t-1}) - (D/Y)^L) - \beta_2((D_{t-1}/Y_{t-1}) - (D/Y)^U) \quad (8)$$

The same conditions for the α's and β's apply as in the case of Equations (6) and (7), and are augmented with the following condition: When $\beta_1 = 0$ and $\beta_2 = 0$, then $\alpha_1 = 1$ and $\alpha_2 = 1$, and when $\beta_1 \neq 0$ or $\beta_2 \neq 0$, then $\alpha_1 = 0$ and $\alpha_2 = 0$. Thus, government applies both rules, with the additional condition ensuring that the debt rule dominates the deficit rule once debt exceeds the acceptable range.

The deficit rule then allows government to run countercyclical policy, but it paces the speed of the stimulus or contraction by setting a limit to the range within which the deficit/GDP ratio can move. However, once government reaches either the lower or upper bound of the debt/GDP ratio, the debt rule kicks in and sets the pace for the deficit/GDP ratio that government can run.

What are the benefits of the above framework? There are three main benefits:

1. The framework is simple to explain, as it is analogous to inflation targeting.
2. Fiscal discipline is ensured, but as long as the actual deficit remains within the band, deviations of actual deficits from announced budget targets do not constitute failure to keep to the fiscal rule.
3. The proposed rule is flexible, yet sets limits. It allows a government to react to recessionary conditions, while also *ex ante* sets out the exit strategy government uses. This increases market confidence, which may also help to improve the impact of fiscal stimulus measures.

4. The fiscal reaction function – assessing government's past behaviour

Achieving deficit and debt targets is done indirectly, through adjusting either revenue or expenditure levels, or both. The IMF's Fiscal Monitor (IMF 2011: 88, 91) reports that when attempting fiscal adjustment G7 countries usually set out to cut expenditure rather than increase taxes.[5] However, expenditure cuts usually turn out to be much less than expected, while revenue collected exceeds expectation. Applying a fiscal rule also entails adjusting either revenue or expenditure, or both. In addition, understanding the revenue and expenditure behaviour of government in the past might therefore act as a guide to what government is likely to adjust to keep to its rule should no explicit changes to its behaviour occur. An understanding of past behaviour can also guide government in making changes to its behaviour that will increase the scope for adjustment. Therefore, this section explores the past behaviour of the South African government to establish the behaviour of the deficit, revenue and expenditure with respect to debt. It shows that, as in the G7 countries, adjustments usually rely on revenue adjustments, though expenditure also adjusts. To investigate the past behaviour of government, this section presents estimates of the fiscal reaction function. In this it follows the specification by Bohn (1998), Claeys (2008), Favero and Marcellino (2005) and Favero and Monacelli (2005). Section 5 then discusses measures to increase the responsiveness of expenditure and revenue.

4.1. Deriving the reaction function

In essence, the reaction function considers the reaction of the primary balance/GDP, revenue/GDP or expenditure/GDP ratios to a change in the public debt/GDP ratio. Starting with the budget constraint of government (Equation 9), one can derive Bohn's (1998) fiscal reaction function.

$$D_t = D_{t-1} + i_t D_{t-1} - B_t \qquad (9)$$

Where D: Public debt, i: Nominal interest rate on government bonds and B: Primary balance (+ surplus; - deficit). From Equation (9) one can get:

$$\Delta(D/Y)_t = ((r_t - g_t)/(1 + g_t))(D/Y)_{t-1} - (B/Y)_t \qquad (10)$$

Where r: Real interest rate, g: Real economic growth rate and Y: Nominal GDP. Define $\alpha_t^{Required} = (r_t - g_t)/(1 + g_t)$ and set $\Delta(D/Y)_t = 0$ to get the primary balance *required* to ensure a stable debt/GDP ratio:

$$(B/Y)_t^{Required} = \alpha_t^{Required}(D/Y)_{t-1} = ((r_t - g_t)/(1 + g_t))(D/Y)_{t-1} \qquad (11)$$

To establish whether government *acted* to keep its debt/GDP ratio stable over time, one can estimate what value $\alpha_t^{Required}$ took in reality. Thus, one can estimate:

$$(B/Y)_t^{Actual} = \alpha(D/Y)_{t-1} + \varepsilon_t \qquad (12)$$

[5] Indeed, in many countries initial plans involve cuts in taxation too, so that expenditure needs to be cut by more than is necessary to stabilise public finances.

Equation (12) can be expanded to include a lag of the primary balance that will allow for inertia in the behaviour of government (De Mello, 2005:10). A constant, α_1, can also be added to allow for an (explicit or implicit) debt/GDP target not equal to zero. If necessary, the output gap can also be included as a control variable. The fiscal reaction function then becomes:

$$(B/Y)_t^{Actual} = \alpha_1 + \alpha_2(B/Y)_{t-1}^{Actual} + \alpha_3(D/Y)_{t-1} + \varepsilon_t \qquad (13)$$

To expect government behaviour and thus the reaction function to remain constant over long periods of time might be construed as possibly (though not necessarily) unrealistic. More specifically, different political administrations may view their debt positions differently. To deal with the possible effect of different administrations, the paper presents estimates of Equation (13) that control for the different political administration since 1948 by including dummies that interact with the debt/GDP ratio.

A further refinement of Equation (13) was made by Claeys (2008:24-30) and Favero and Marcellino (2005:763) who follow Bohn's (1998) specification, but they prefer to separate the components of the primary balance. Therefore, using Equation (13), they substitute expenditure and revenue, in turn, for the primary balance.

As long as $\alpha_3/(1-\alpha_2)$ in Equation (13) is equal or larger than $\alpha^{Required}$ in Equation (11) fiscal policy will be sustainable. However, this condition is limited to cases where r>g. Bispham (1987:67–70) showed that when r<g fiscal policy technically speaking cannot become unsustainable if unsustainability is defined as a public debt/GDP ratio that moves to infinity in finite time. If $r \neq g$ Equation (14) – which is a multi-period budget constraint – describes the dynamics of the debt/GDP ratio over time (with p being the initial debt/GDP ratio at time t=0): [6]

$$D_t / Y_t = (B/Y)(\frac{1+g}{r-g})(\frac{1+r}{1+g})^t - (B/Y)(\frac{1+g}{r-g}) + p(\frac{1+r}{1+g})^t \qquad (14)$$

When $r > g$ and $t \rightarrow \infty$, Equation (14) shows that the debt/GDP ratio will explode unless the first term on the right-hand side of Equation (14), through an adjustment of the primary balance, is set equal in size but opposite in sign to the third term on the right-hand side. However, note that when $r < g$ and $t \rightarrow \infty$, Equation (14) reduces to Equation (15). Equation (15) indicates that when $r < g$ the debt/GDP ratio will converge to a stable ratio and thus, not explode.[7] Therefore, even though it might still decide to react to its debt position when $r < g$, the government need not, within limits of course, react to developments in the debt/GDP ratio.[8]

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[6] If $r = g$: $D_t / Y_t = t(B/Y) + p$ where p = the initial debt/GDP ratio and B/Y = the primary balance/GDP ratio. Note that as $t \rightarrow \infty$: $D_t / Y_t = t(B/Y) + p \rightarrow \infty$.

[7] When $r < g$ the economy is said to be dynamically inefficient since government can improve Pareto efficiency by making transfers from the young to the old, while if $r > g$ the economy is said to be dynamically inefficient since such transfers will reduce Pareto efficiency (see Diamond 1965, as well as Abel *et al.* 1989).

[8] Note that the level to which the ratio converges may itself be high, which in turn might cause interest rates to increase and thereby cause (r-g) to turn positive. However, if the ratio converges to a level acceptable to lenders, this feedback effect to interest rates might be absent or limited.

$$D_t / Y_t \rightarrow -(B/Y)\left(\frac{1+g}{r-g}\right) = (B/Y)\left(\frac{1+g}{g-r}\right) \qquad (15)$$

To deal with the possibility that government may or may not react to the debt/GDP ratio depending on the sign of the $(r_t - g_t)/(1 + g_t)$ gap, Equation (13) can be estimated with a Markov-switching model. A number of studies have used Markov-switching models in which probabilities of different fiscal policy regimes can vary endogenously (cf. Favero and Monacelli, 2005; Claeys, 2005; Afonso et al., 2009; Caceres et al., 2010). Generally, these studies impose two regimes *a priori*, i.e. a fiscal active and a fiscal passive regime as in Leeper (1991), and then compare these models to a single-regime as well as higher-regime models.[9] However, a two-regimes can also be imposed when expecting one regime to apply when $r>g$ (a case where $\alpha_3>0$) and the second when $r<g$ (a case where $\alpha_3 \leq 0$). Neither of these two regimes are fiscally irresponsible; they merely represent two behaviours that, each in its specific setting, represents a sustainable fiscal policy. However, note that when imposing two regimes, the regimes observed might not be so closely linked to the sign of the $(r_t - g_t)/(1 + g_t)$ gap. Thus, one might simply find a stable debt regime, where government reacts to debt irrespective of whether r exceeds or falls short of g, and an unstable debt regime, which technically is only possible when $r>g$. The latter might also be characterised as a fiscal active regime, while the former is the fiscal passive regime.

A further way in which to allow for changing behaviour over time is to follow Favero and Monacelli (2005) and Favero and Marcellino (2005). These authors take a slightly different approach from Bohn (1998) and Claeys (2008), by specifying a reaction function that allows for government's response to debt to vary over time depending on the position of the real interest rate relative to the real economic growth rate. Equation (13) is then adjusted so that using Equation (11):

$$(B/Y)_t^{Actual} = \alpha_1 + \alpha_2 (B/Y)_{t-1}^{Actual} + \gamma_1 \alpha^{Required} (D/Y)_{t-1} + \upsilon_t$$
$$= \alpha_1 + \alpha_2 (B/Y)_{t-1}^{Actual} + \gamma_1 (B/Y)_t^{Required} + \upsilon_t \qquad (16)$$

where α_3 in Equation (13) equals $\gamma_1 \alpha^{Required}$ in Equation (16).

Thus, as shown in Equation (16), the fixed reaction to the debt/GDP ratio estimated with Equation (13) becomes a time-varying reaction in Equation (16) that depends on the movements in $\alpha^{Required}$ and thus $(r-g)/(1+g)$. When fiscal policy is responsive to its debt position, $\gamma_1 = 1$ in Equation (16). However, note that even though Equation (16) allows for government behaviour as captured by $\gamma_1 \alpha^{Required}$ to adjust over time depending exclusively on changes in $\alpha^{Required}$ and thus $(r-g)/(1+g)$), one might also, in addition, allow for the time-varying behaviour of γ_1. The size of γ_1 might then also depend on the position of r relative to g. As with the discussion above, when $r<g$ government might decide not to react to its debt, in which case $\gamma_1 = 0$, or it might act countercyclically, which means that $\gamma_1<0$ (it will be countercyclical provided that the cyclical increase (decrease) in the growth rate outpaces the cyclical increase (decrease) in the interest rate, meaning that $(r-g)$ moves countercyclically). To allow for all these different types of time-varying behaviour, the paper presents results estimated with a single-regime

[9] The reason for this is that there is no criterion for optimal number of regimes in a Markov-switching model (Claeys, 2005; Afonso *et al.*, 2009).

model, a two-regime Markov-switching model, as well as a GMM model estimated with interactive dummies. Just as with Equation (13), Equation (16) can also be estimated with the components of the deficit, thus separating revenue and expenditure. The following two subsections present the estimation results for Equations (13) and (16).

4.2. The reaction of the primary balance/GDP ratio to the debt/GDP ratio

This section presents results for fiscal reaction functions estimated with the primary balance, total expenditure, total revenue as well as revenue collected from income taxes, goods and sales taxes. Because it contains the longest and most detailed time series, the data for the primary balance, as well as government revenue and expenditure originates from the 'National Government Finance' statistics obtained from the SARB online download facility. Monthly and annual data for the level series of the types of revenue are only available since 1990, with quarterly four-term percentage changes available since 1968 (except for sales taxes that were first levied in 1970). Quarterly and annual data for total expenditure and revenue is available from 1960 and quarterly data for interest payments is available since 1971. The public debt/GDP ratio refers to gross public debt for national government and is available on an annual basis since 1947 and a quarterly basis since 1960. Primary balance data using government data is only available since 1971. However, the analysis uses a second primary balance series calculated with national accounts data only available on an annual basis and dating back to 1947. Since the underlying data generating process for government data is the annual budget (i.e. government reacts to last year's debt/GDP ratio), the above data was used to generate annual series using all available data. An exception is made with the Markov switching models. The choice of using quarterly as opposed to annual data in the Markov switching models was governed by concerns about the ability of the model to detect regime-switching behaviour. Studies like Cheung and Erandsson (2005) have found that in addition to selecting a reasonable sample size, an increase in sample frequency offers a better chance of detecting Markov-switching dynamics. Hence, the Markov switching models were estimated using quarterly data and government reacting to the fourth lag. The output gap was generated using a Hodrick-Prescott filter.[10] The regressions presented below use all available data (unless otherwise indicated), which means that sample periods are not always the same.

The KPSS stationarity tests (with stationarity as the null hypothesis) yield mixed results, in most cases indicating that at a 5% level the series are non-stationary, but at a 1% level they are stationary. Bohn (1998) notes that the debt/GDP ratio and the primary balance/GDP ratio usually display very high levels of persistence, so high indeed that it becomes extremely difficult to establish unambiguously whether or not the series are stationary. However, in several papers he argues why the series should be accepted as stationary on economic grounds (Bohn 1998). His reasoning is based on the fact that in the US the real interest rate paid by government has for the most part of the 20th century been below the economic growth rate, a point Bohn (2010) recently repeated.[11] Bohn (2007) also argues that one should not be overly concerned with the

[10] To deal with the end-point problem often encountered with the Hodrick-Prescott filter, the paper follows Mise *et al* (2005). An AR(n) model (with n set at 12 quarters to eliminate serial correlation) was used. The AR model was used to forecast two additional years that were then added to each of the series before applying the HP filter. An annual series is the constructed from the quarterly series.
[11] Note that Equation (10) can be slightly altered to:

stationarity of the debt, expenditure or revenue series (whether or not expressed as ratio to GDP), because, if differencing these series any number of times renders them stationary, then government satisfies its intertemporal budget constraint. Instead he argues for the use of 'error-correction-type policy reaction functions', such as the one defined above, in which he does not explicitly control or account for the stationarity properties of the data. Favero and Marcellino (2005:759) concur with Bohn when they argue in their article that:

> "As there are strong economic reasons to assume that all the seven variables [which include government receipts, expenditure, debt and the fiscal balance, all expressed as ratio to GDP] are stationary, we will proceed under this assumption even though the outcome of augmented Dickey–Fuller unit root tests is mixed, likely due to the low power of these tests in samples as short as ours (42 observations)." Text in [ ] not in the original, but refers to the variables that the authors included.

Claeys (2002), writing before Bohn (2007), first established whether or not cointegration exists between the primary balance/GDP and the public debt/GDP ratios as well as between government expenditure and revenue. Having found cointegration and without taking any further note of the stationarity conditions of the data he then follows Bohn by estimating fiscal reaction functions that regress the deficit, revenue or expenditure ratios on, among other, the debt/GDP ratio.[12]

Following Bohn (2007) this section presents estimates of various forms of the fiscal reaction function as specified in Equation (13). Note that all the reaction functions were estimated using GMM to deal with problems of endogeneity (lags of the explanatory variables are used as instruments and all estimations are just identified).

Table 1 – The fiscal reaction function

	B/Y
(B/Y)(-1)	0.947 (0.000)
(D/Y)(-1)	0.090 (0.015)
(Y gap)(-1)	-0.553 (0.025)
C	-0.033 (0.024)
Adj R-sq	0.29

Sample 1971-2010, p values in ( )

$(D/Y)_t = ((1 + r_t)/(1 + g_t))(D/Y)_{t-1} - (B/Y)_t$

With the difference between r and g usually not more than two percentage points, means that $((1 + r_t)/(1 + g_t))$ will usually be very close to 1. If government sets the primary balance, B, to offset the effect of the first term on the right-hand side, it may render the debt/GDP ratio either level stationary, but too close to a unit root for stationarity tests to establish unambiguously whether or not the series is stationary, or first-difference stationary.

[12] For this paper cointegration tests and models for South Africa were run for the both the relationship between the primary balance/GDP ratio and the debt/GDP ratio (1949-2010), as well as the relationship between government revenue/GDP and government expenditure/GDP (1960-2010). In both cases cointegration was found and the estimation yielded statistically significant and meaningful results. The results are available on request.

Table 1 presents an estimate of Equation (13) with the primary balance as a left-hand side variable and the output gap as a control variable. The model runs from 1971 to 2010 and was estimated using the primary balance data calculated with government data. As Burger, Stuart, Jooste and Cuevas (2011) indicated using a state space model for the period 1947-2009, government's reaction changed in the 1970s and 1980s. To address the issue of possible breaks in government behaviour over time, the analysis uses a set of dummies that will interact with the debt/GDP ratio and distinguishes between the terms of the various administrations in power. In addition, the analysis uses the primary balance calculated with national accounts data and which covers a sample running from 1949 to 2010. Thus, it covers all the terms of both the National Party and African National Congress administrations. The dummy takes a value of one starting in the year after an administration took power since that would be the first budget fully under control of that administration. The administrations were: Malan (1948-54), Strijdom (1954-58), Verwoerd (1958-66), Vorster (1966-78), Botha (1978-89), De Klerk (1989-94), Mandela (1994-99), Mbeki (1999-2008), Motlanthe (2008-09) and Zuma (2009-present). Since the Motlanthe administration was a caretaker administration for and until Zuma took power in 2009, their terms are put together.

Table 2 shows the results for the terms of the various administrations. It was run for the full sample for which debt and deficit data is available, 1949-2010 (and thus includes all National Party and African National Congress administrations). Adding in turn the parameters of the various administrations' dummies that interact with the debt/GDP ratio, to the parameter of the debt/GDP ratio, clearly indicates how the reaction of government changed over time. As mentioned above, prior to 1990, *(r-g)/(1+g)* in Equation (13) was clearly negative, allowing the government to run a primary deficit without putting upward pressure on the debt/GDP ratio. The sum of the parameter of the dummy that interacts with the debt/GDP ratio and the parameter of the debt/GDP ratio is negative up to the late 1970s. Under the Botha administration the sum is slightly positive (-0.054+0.057=0.003). However, during the De Klerk administration the sum is again negative (-0.054+0.035=-0.019) and this in an era when *(r-g)/(1+g)* was turning positive for the first time (though it remained close to zero and only once slightly exceeded 1%). This period was characterised by falling tax receipts as a result of negative economic growth and investment falling due to the political instability that preceded the 1994 political transition. Political conditions also made it difficult to reduce expenditure to stabilise debt. Hence, the debt/GDP ratio increased from roughly 35% to 50%. During the Mandela administration the *(r-g)/(1+g)* gap turned strongly positive, reaching 5% in 1998. It turned negative again under the Mbeki administration. However, the sum of parameters turned strongly positive during both the Mandela and Mbeki administrations, a result that is visible in the decrease in the debt/GDP ratio from roughly 50% to 23% in 2008. The Zuma administration has a strong negative parameter[13] since the debt/GDP ratio increased sharply in the first two years of his administration as a result of the recession affecting the country, while the *(r-g)/(1+g)* gap turned positive again. This negative parameter should be interpreted with care, as it only covers a short span of time during an unusual period of international economic and financial instability. Note that in these and all further estimates containing interactive dummies, including the output gap did not yield significant results. Hence, it was omitted.

[13] No dummy is included for the Zuma administration since 9 administrations require 8 dummies. Thus, the parameter on the debt/GDP ratio is the value for the Zuma administration.

Table 2 – The deficit reaction function with interactive dummies

	B/Y
(D/Y)(-1)	-0.054 (0.000)
D4954*(D/Y)(-1)	0.032 (0.002)
D5558*(D/Y)(-1)	0.023 (0.073)
D5966*(D/Y)(-1)	0.033 (0.004)
D6778*(D/Y)(-1)	0.022 (0.152)
D7989*(D/Y)(-1)	0.057 (0.000)
D9094*(D/Y)(-1)	0.035 (0.027)
D9599*(D/Y)(-1)	0.090 (0.000)
D0008*(D/Y)(-1)	0.125 (0.000)
Adj R-sq	0.48

p values in ( )

Table 3 – Total revenue and expenditure reaction functions

		Estimated models			Long-run parameters ($\alpha_3/(1-\alpha_2)$)		
		Rev/Y	**Exp/Y**	**Non-interest Exp/Y**	**Rev/Y**	**Exp/Y**	**Non-interest Exp/Y**
(Rev/Y)(-1)		0.967 (0.000)					
(Exp/Y)(-1)			0.860 (0.000)				
(Non-interest Exp/Y)(-1)				0.972 (0.000)			
(D/Y)(-1)		0.023 (0.039)	-0.060 (0.014)	-0.095 (0.001)	0.697	-0.429	-3.373
C			0.060 (0.003)	0.045 (0.013)		0.429	1.602
Adj R-sq		0.93	0.87	0.89			
Wald	**t-statistic**	0.155	0.006	0.681			
Test	**F-statistic**	0.155	0.006	0.681			
(Prob)	**Chi-square**	0.148	0.006	0.679			

Sample 1960-2010, except for non-interest model, which runs from 1971. p values in ( )

Following Claeys (2002) and Favero and Marcellino (2005), the primary balance was in turn replaced with respectively total and non-interest expenditure, total revenue as well as various types of taxes. First, Table 3 presents the results for total expenditure and revenue for the period 1968 to 2010. It as yet does not include any of the dummies defined above. The results indicate, as expected, a high degree of persistence (the Wald test fails to reject the null hypothesis that the parameter of the lag of the revenue/GDP ratio and the lag of non-interest expenditure equals one; however, for total expenditure it is rejected). Furthermore, both revenue and expenditure reacts to changes in debt, and both with the right direction. Thus, in reaction to an increase in the debt/GDP ratio the revenue/GDP ratio increases, while the two expenditure/GDP ratios decrease. The last two columns of Table 4 also present the long-run values of the parameters, calculated as $\alpha_3/(1-\alpha_2)$ – as can be seen the long-run parameter for revenue is larger than that of total expenditure, indicating that revenue contributes more to the adjustment. This result is in line with the finding of the IMF's Fiscal Monitor (2011) cited above. However, the long-run parameter of non-interest expenditure is larger than that of revenue.

Table 4 – Types of revenue reaction functions

		Estimated models			Long-run parameters (*$\alpha_3/(1-\alpha_2)$*)		
		Inc tax/Y	**Goods tax/Y**	**Sales tax/Y**	**Inc tax/Y**	**Goods tax/Y**	**Sales tax/Y**
(Inc tax/Y)(-1)		0.923 (0.000)					
(Goods tax/Y)(-1)			0.976 (0.000)				
(Sales tax/Y)(-1)				0.937 (0.000)			
(Prop tax/Y)(-1)							
(D/Y)(-1)		0.028 (0.009)	0.007 (0.222)	0.011 (0.008)	0.363	0.156	0.173
Adj R-sq		0.78	0.96	0.95			
Wald	**t-statistic**	0.029	0.388	0.027			
Test	**F-statistic**	0.029	0.388	0.027			
(prob)	**Chi-square**	0.023	0.383	0.021			

Sample 1968-2010 for income and property taxes, 1970-2010 for Goods and sales taxes, p values in ( )

Subsequent to the total revenue and total expenditure reaction functions, reaction functions for the main types of taxes were estimated (times series for types of expenditure are not available for long enough samples). These types of taxes are income taxes (corporate and individual), goods takes, sales taxes (which constitutes the largest component of goods taxes), property taxes and trade taxes. All were expressed as ratio of GDP in the estimations. Trade taxes did not yield any significant results, while the reaction of property taxes to the public debt/GDP ratio, though statistically significant, was very small. Thus, trade and property taxes were excluded from the analysis presented below. The parameter for the debt/GDP ratio was positive (as one would expect) and statistically significant for income taxes and sales taxes, with the parameter for income taxes being the largest. These results therefore indicate that the main types of taxes, being income and sales taxes, increased as percentage of GDP in the face of an increase in the debt/GDP ratio. Table 4 also presents the long-run values of the parameters, from which it is clear that in the income tax/GDP ratio equation the long-run parameter value for the debt/GDP ratio is the largest.

The estimates containing the interactive dummies for the terms of administration of the various prime ministers and presidents yield significant results (see Table 5) (presented for the period 1960-2010). Note that the parameter for the debt/GDP ratio itself was statistically *in*significantly different from zero (thus indicating no reaction in the Zuma administration – again a result that should be considered with caution since the administration is young and took power during a recession so that the administration has not had the opportunity to demonstrate fully its stance with regard to debt). Therefore, the reaction of each administration is summarised by the parameter for the interactive dummy multiplied by the debt/GDP ratio. Table 5 shows that both revenue and expenditure consistently reacted to increases in debt with the requisite sign (positive for revenue and negative for expenditure). Also note that once one controls for the different regimes the Wald test conducted to test whether the parameters on the lags of the revenue/GDP and expenditure/GDP ratios equal one are rejected. Lastly, Table 5 also presents the long-run values of the parameters, from which it is clear that in the revenue/GDP ratio equation the long-run parameter value for the debt/GDP ratio is larger than in both the expenditure/GDP ratio and the non-interest expenditure/GDP ratio equations. Thus, the finding that the non-interest expenditure/GDP ratio responds with more than revenue found when the regression was run without the interactive dummies, is overturned when including the interactive dummies.

Table 5 – Total revenue and expenditure reaction functions with interactive dummies

	Estimated models			Long-run parameters ($\alpha_3/(1-\alpha_2)$)		
	Rev/Y	**Exp/Y**	**Non-interest Exp/Y**	**Rev/Y**	**Exp/Y**	**Non-interest Exp/Y**
(Rev/Y)(-1)	0.961 (0.000)					
(Exp/Y)(-1)		0.573 (0.006)				
(Non-interest Exp/Y)(-1)			0.548 (0.009)			
D5966*(D/Y)(-1)	0.019 (0.011)	-0.120 (0.023)		0.499	-0.282	
D6778*(D/Y)(-1)	0.025 (0.002)	-0.094 (0.009)	-0.148 (0.009)	0.642	-0.220	-0.327
D7989*(D/Y)(-1)	0.035 (0.006)	-0.089 (0.027)	-0.125 (0.006)	0.897	-0.209	-0.277
D9094*(D/Y)(-1)	0.017 (0.173)	-0.052 (0.015)	-0.057 (0.020)	0.429	-0.122	-0.127
D9599*(D/Y)(-1)	0.025 (0.001)	-0.043 (0.012)	-0.061 (0.002)	0.647	-0.100	-0.135
D0008*(D/Y)(-1)	0.024 (0.125)	-0.071 (0.007)	-0.076 (0.002)	0.622	-0.166	-0.168
C		0.136 (0.021)	0.140 (0.009)		0.318	0.309
Adj R-sq	0.92	0.87	0.86			
Wald t-statistic	0.018	0.036	0.029			
Test F-statistic	0.018	0.036	0.029			
(Prob) Chi-square	0.014	0.030	0.022			

Sample 1960-2010, except for non-interest model, which runs from 1971. p values in ( )

Table 6 presents regressions with the income tax/GDP ratio, goods tax/GDP ratio and the sales tax/GDP ratio. The income tax/GDP ratio was regressed on its own lag and the dummies for the terms of prime ministers and presidents that interact with the public debt/GDP ratio. Note that the debt/GDP ratio is not included as it is statistically insignificant when included. The parameters show a consistent reaction of the income tax/GDP ratio, with the lowest reaction in the period 1989-94, a period of low growth and thus lower tax income due to the political uncertainty preceding the transition to democracy, and of course, the period 2009-10, when the parameter has a zero value (as indicated by the debt/GDP ratio being omitted from the model due to its statistical insignificance). The Wald test also indicates that the parameter on the lagged value of the income tax/GDP ratio is not equal to one.

Table 6 also presents estimates for the goods tax/GDP and sales tax/GDP ratios. As mentioned above, sales tax constitutes the largest proportion of goods taxes, with the petrol levy being the second largest component. Estimations with the terms of the various prime ministers did not yield satisfactory results. A possible explanation for this might be the rather fragmented history of sales tax. In 1970 government imposed a sales tax on goods when the goods left the factory or were imported. According to Browne (1983) this sales tax did not yield the expected income stream for government. Therefore, government replaced this first sales tax with the General Sales Tax (GST) levied on final consumers at a rate of 4% in 1978. In 1991 government in turn replaced GST, then levied at 12%, with Value Added Tax (VAT) at a rate of 10%. Thereafter the VAT rate increased to 14% (a period during which the debt burden also increased).[14] Since the ANC government came to power, it has not changed the VAT rate.

Table 6 – Types of revenue reaction functions with interactive dummies

		Estimated models			Long-run parameters ($\alpha_3/(1-\alpha_2)$)		
		Inc tax/Y*	Goods tax/Y**	Sales tax/Y**	Inc tax/Y*	Goods tax/Y**	Sales tax/Y**
(Inc tax/Y)(-1)		0.943 (0.000)					
(Goods tax/Y)(-1)			0.968 (0.000)				
(Sales tax/Y)(-1)				0.935 (0.000)			
D7890*(D/Y)(-1)			0.018 (0.000)	0.019 (0.000)		0.563	0.292
D9110*(D/Y)(-1)			0.006 (0.035)	0.011 (0.011)		0.188	0.169
D6778*(D/Y)(-1)		0.028 (0.000)			0.485		
D7989*(D/Y)(-1)		0.024 (0.000)			0.416		
D9094*(D/Y)(-1)		0.011 (0.157)			0.195		
D9599*(D/Y)(-1)		0.020 (0.000)			0.353		
D0008*(D/Y)(-1)		0.024 (0.014)			0.425		
Adj R-sq		0.78	0.97	0.97			
Walt	**t-statistic**	0.000	0.006	0.024			
Test	**F-statistic**	0.000	0.006	0.024			
(Prob)	**Chi-square**	0.000	0.003	0.018			

* Sample 1968-2010, ** Sample 1970-2010, p values in ( )

Therefore, instead of using the terms of prime ministers and presidents, dummy variables that cover the GST period (1978-1990) and the VAT period (1991-2010) respectively were created and subsequently interacted with the debt/GDP ratio. Table 8 shows that both these dummy variables interacting with the debt/GDP ratio have the correct sign and are statistically significant. The positive value for the VAT dummy interacting with the debt/GDP ratio in the face of an unchanged VAT rate since the mid-1990s possibly follows from the sharp increase in the VAT rate in the early 1990s, during a period when the debt/GDP ratio also increased sharply.

Thus to conclude, the above discussion shows that once one controls for different administrations or changes made to the types of taxes levied, as was the case with GST and VAT,

[14] At the time it was argued that because VAT has a broader base, it could be introduced at a lower rate than GST. Hence, whereas the last GST rate was 12%, the first VAT rate was 10%. However, it soon became clear that the base was not broader, and government increased the rate until it reached 14%. Our thanks to Estian Calitz, Director General of Finance in the early 1990s, for providing this information to us.

almost all the series turned out to be stationary – a finding that concurs with the arguments by Bohn, Claeys and Favero and Marcellino that these series are inherently stationary.

More importantly, regarding the question raised above, whether government depended on adjustments to revenues or expenditure, or both when pursuing a fiscal rule, the above analysis indicates that when the debt/GDP ratio increased, both revenue and expenditure adjusted, thereby ensuring the sustainability of fiscal policy in the post-WWII period. However, when comparing the size of the long-run tax and expenditure parameters, calculated as $\alpha_3/(1-\alpha_2)$, it would appear that the expenditure parameters are smaller than the tax parameters. This finding accords with the IMF's finding about the behaviour of G7 government, set out in its Fiscal Monitor (2011).

Lastly, irrespective of which set of dummies (political administrations or types of sales taxes) are included in the regressions with the primary balance as dependent variable, it is clear that the size of the parameters mostly reflect the stance of the $(r-g)/(1+g)$ gap. Thus, although the reaction of the various administrations differed, the extent to which they differed seem to reflect the stance of the $(r-g)/(1+g)$ gap at the time. Hence, this analysis calls for the use of a time-varying analysis that controls for the movements in the $(r-g)/(1+g)$ gap. This is done in subsection 4.4.

4.3. Allowing for a time-varying reaction to the debt/GDP ratio using a Markov Switching model

Using quarterly data for the period 1972Q1-2010Q4 (i.e. 156 observations) this section presents the Markov-switching estimations for fiscal reaction functions as specified in Equations (13) and (16). Because of a lack of data the analysis does not attempt to extend the analysis to the period prior to the 1970s. Thus, the analysis uses the primary balance calculated with government data. The following two specifications were estimated for South Africa over the period:

$$(B/Y)_t^{Actual} = \alpha_{0st} + \alpha_{1st}(B/Y)_{t-4}^{Actual} + \alpha_{2st}y_{t-4} + \alpha_{3st}(D/Y)_{t-4} + \varepsilon_{tst} \quad (13.1)$$

$$(B/Y)_t^{Actual} = \beta_{0st} + \beta_{1st}(B/Y)_{t-4}^{Actual} + \beta_{2st}y_{t-4} + \gamma_{1st}(B/Y)^{Required}_{t-4} + \upsilon_{tst} \quad (16.1)$$

Where s_t is a state variable that is unobserved and assumed to be generated by a probability distribution that takes into account both the parameters and the variables in the model. In addition, s_t takes on values of $N = 1, 2$, thus denoting two regimes (i.e. assumption of a two-state Markov chain is made). Transition probabilities are given by $p_{ij} = Pr(s_t = j| s_{t-1} = i)$, and assuming that the current regime is i, the expected average duration of staying in the same regime is $(1 - p_{ii})^{-1}$. The specification in Equations (13.1) and (16.1) allows all of the model parameters to vary across regimes. Finally, errors ε_t and υ_t are considered to be normally distributed with a zero mean and a constant variance that is allowed to be different in each regime.[15] Note, that all of the regressors have been lagged 4 quarters to capture the annual nature of the national budget process. Tables 7 and 8 below report the estimation results.

[15] See Hamilton (1994) for more on Markov-switching models.

Table 7 – Estimation Results: Equation (13.1)

	α_0	α_1	α_2	α_3	Probability: p_{11}, p_{22}	Duration of regime
Regime 1	-0.012	0.765	-0.150	0.052	0.97	32.67 quarters
	(0.013)	(0.000)	(0.000)	(0.000)	(0.000)	
Regime 2	-0.027	0.506	0.495	0.059	0.84	6.37 quarters
	(0.341)	(0.177)	(0.000)	(0.201)	(0.000)	
Constant	-0.027	0.836	-0.115	0.083	-	-
	(0.001)	(0.000)	(0.012)	(0.000)		

p-values in ().

Figure 2 – The probability of being in Regime 1

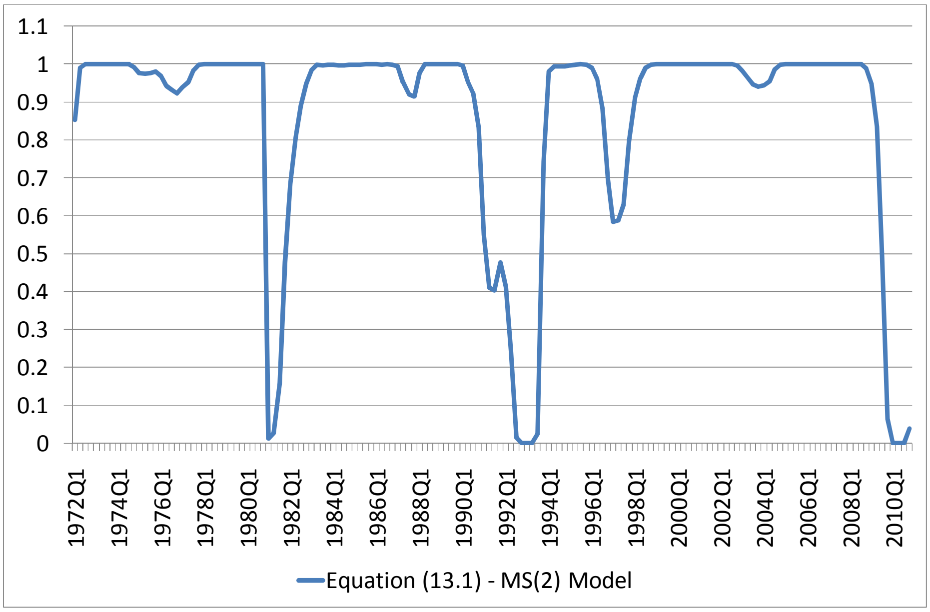


Table 7 (bottom row) reports the results obtained making the assumption of a constant fiscal regime over the estimation period. This model uses the same data as the model reported in Table 1, the only difference being that the one is specified with an annual frequency, while the other is quarterly. The parameters are statistically significant and indicate that fiscal policy has been active and procyclical over the estimation sample. With respect to the Markov switching model, the results reported in Table 9 show that two fiscal regimes can be identified for South Africa over the estimation sample. Regime 1 has a positive and statistically significant α_3 coefficient (i.e. fiscal pacifism)) and a negative (i.e. procyclical) and statistically significant α_2 coefficient. Regime 2 has a positive and statistically *in*significant α_3 coefficient (i.e. fiscal activism) and a positive (i.e. countercyclical) and statistically significant α_2 coefficient. In terms of the durations of the two regimes, Regime 1 is more persistent, with Regime 2 detected in three brief periods: 1980-2, 1992-4 and 2009-10 (see Figure 2 that indicates the probability of being in Regime 1). Notice that especially the last two periods were characterised by relatively sharp increases in the debt/GDP ratio (while in the case of the first period, it marked the end of the longer term decrease in the debt/GDP ratio).

The estimates under the assumption of a constant regime reported in Table 8 (bottom row) indicate that fiscal policy in South Africa has been active and procyclical. However, it implies that when r>g, government did not run a sustainable fiscal policy by adjusting the size of the actual primary balance to fit the size of the required primary balance. This contradicts the results in Table 7. The results of the estimation for equation 16.1 are also reported in Table 8. Equation (16.1) explores the possibility that γ_1 is also a time-varying parameter (in addition to

$\alpha^{Required}$ in Equation (16)). While the majority of the coefficients are statistically significant, the transition probability estimates are not and thus cast doubt on the time-varying probabilities associated with the assumed two regimes.

Table 8 – Estimation Results: Equation (16.1)

	β_0	β_1	β_2	γ_1	Probability: p_{11}, p_{22}	Duration of regime
Regime 1	0.013	0.605	-0.144	0.074	0.95	19.43 quarters
	(0.022)	(0.000)	(0.001)	(0.031)	(0.741)	
Regime 2	-0.009	0.532	-0.279	-0.723	0.92	12.09 quarters
	(0.652)	(0.253)	(0.002)	(0.000)	(0.866)	
Constant	0.004	0.706	-0.160	-0.243	-	-
	(0.017)	(0.001)	(0.000)	(0.000)		

p-values in ().

Next, the actual primary balance is compared to the primary balance consistent with Markov-switching estimates of equations (13.1) and (16.1). These two are obtained as follows (i.e. using the estimates reported in Tables 7 and 8):

Primary balance consistent with Equation (13.1) = $[p(Regime\ 1)_t][-0.01 + 0.77(B/Y)_{t-4} - 0.15y_{t-4} + 0.05(D/Y)_{t-4}] + [1 - p(Regime\ 2)_t][-0.02 + 0.51(B/Y)_{t-4} - 0.50y_{t-4} + 0.06(D/Y)_{t-4}]$ [3]

Primary balance consistent with Equation (16.1) = $[p(Regime\ 1)_t][-0.01 + 0.61(B/Y)_{t-4} - 0.14y_{t-4} + 0.07(B/Y)^*_{t-4}] + [1 - p(Regime\ 2)_t][-0.01 + 0.53(B/Y)_{t-4} - 0.28y_{t-4} - 0.72(B/Y)^*_{t-4}]$ [4]

Where $p(Regime\ 1)_t$ and $p(Regime\ 2)_t$ are the time-varying estimated probabilities associated with Regimes 1 and 2 for each specification. Similarly, primary balances consistent with constant regime estimates of Equations (13) and (16) are constructed as (i.e. using estimates reported in Tables 7 and 8):

Primary balance consistent with Equation (13) = $-0.03 + 0.84(B/Y)_{t-4} - 0.11y_{t-4} + 0.08(D/Y)_{t-4}$ [5]

Primary balance consistent with (16) = $-0.00 + 0.71(B/Y)_{t-4} - 0.16y_{t-4} - 0.24(B/Y)^*_{t-4}$ [6]

Figure 3 – Comparison of actual primary balance and the primary balance consistent with Equations (13) and (13.1)

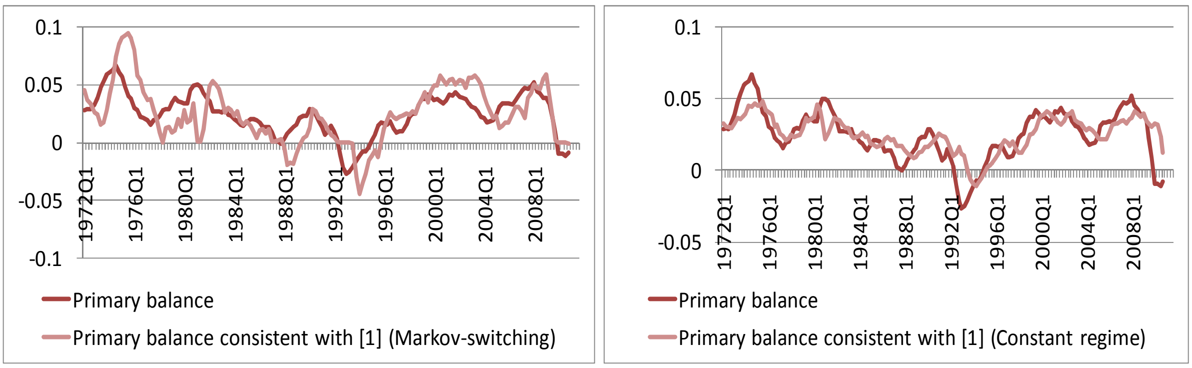
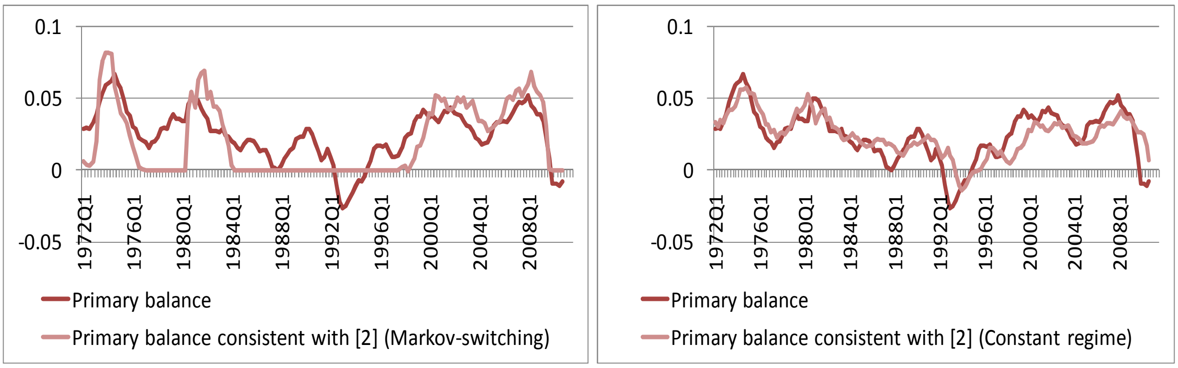


Figure 4 – Comparison of actual primary balance and the primary balance consistent with Equations (16) and (16.1)



Figures 3 and 4 below present the results of this exercise. For Equation (13.1), what can be seen is that both the Markov-switching as well as the constant regime estimates seem to fit data quite well. For Equation (16.1), on the other hand, the constant regime estimate seems to follow the actual primary balance more closely (this can be due to poor statistical properties of the Markov-switching estimate of Equation (16.1) mentioned earlier).

4.4. Allowing for a time-varying reaction to the debt/GDP ratio using GMM and an interactive dummy

Using interactive dummies, this section presents the results of the time-varying reaction function (Equation (16)) that not only allows behaviour to change in line with changes in $\alpha^{Required}$, but also allows for change in γ_1. As discussed above, it is only when the *(r-g)/(1+g)* gap is positive, that fiscal policy can technically become unsustainable, meaning that when r>g government will need to run a primary surplus to prevent the debt/GDP ratio from increasing at an increasing rate. Therefore, in terms of the Markov switching model (Equation (16.1)) one would expect one regime to be present when r>g and another when r<g. The failure of the Markov switching model above might therefore be ascribed to behaviour that did not comply with this expected behaviour. More specifically, as Figures 5 and 6 show, the late 1990s (1997-9) and the period after 2008 were the only two periods in which the *(r-g)/(1+g)* gap was significantly positive for more than one year. Therefore, in these periods government should have been running primary surpluses if it wanted to prevent the debt/GDP ratio from increasing. However, only during the late 1990s period did the debt/GDP ratio not increase (indeed, it decreased), while in the period after 2008 it did increase. To deal with these two very different reactions to a positive *(r-g)/(1+g)* gap, the analysis created dummies for the two periods that interacted with the required primary balance. Only the dummy for the period 1997-9 yielded statistically significant results (presented below). In addition, since the required primary balance is calculated with the actual effective interest rate of government obtained from government data, the actual primary balance measure used is that calculated with government data.

Figure 5 – The *(r-g)/(1+g)* relationship

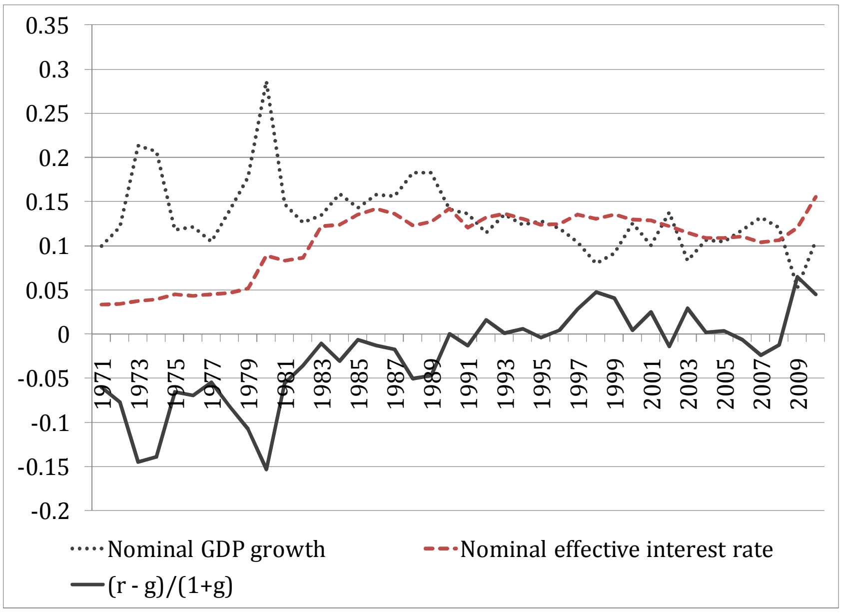


Figure 6 – The *(r-g)/(1+g)* gap and the actual and required primary balances

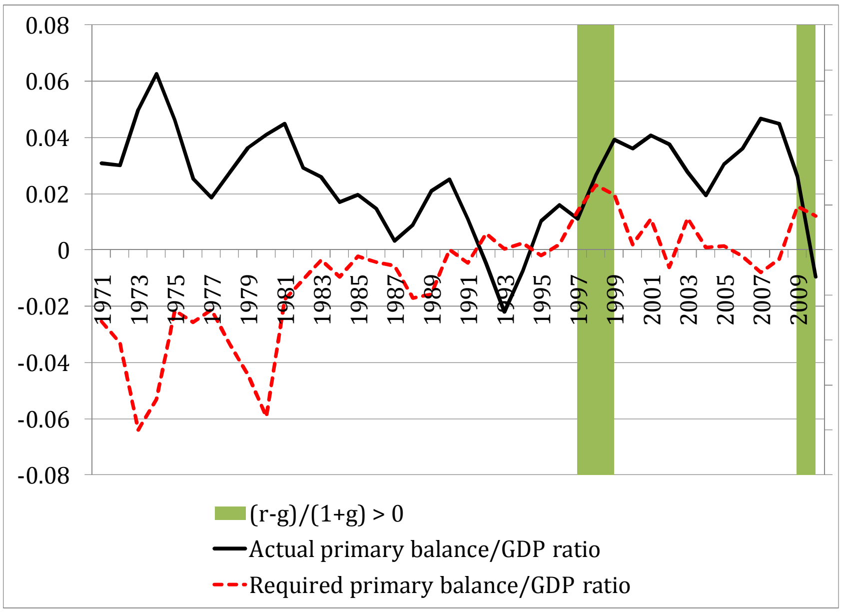


Table 9 shows that for most of the sample period the reaction of the actual primary balance/GDP ratio to changes in the required primary balance has been negative, only turning positive for the period 1997-99. As mentioned above, when the *(r-g)/(1+g)* gap is positive, the primary balance should increase in response to an increase in the required primary balance. Government's behaviour accorded with this requirement in the late 1990s, but not in the period since 2008. As discussed above, when the *(r-g)/(1+g)* gap is positive the value for the parameter of the required primary balance/GDP ratio is expected to equal 1. The Wald test indicates that the null hypothesis that $\alpha_2+\alpha_3=1$ cannot be rejected, pointing to government acting in a fiscally sustainable manner during the budgets for period 1997-1999.

Table 9 – Reaction functions with time-varying debt parameters (1)

	B/Y*	Rev/Y	Exp/Y	Non-interest Exp/Y
(B/Y)(-1)	0.720 (0.000)			
(Rev/Y)(-1)		0.840 (0.000)		
(Exp/Y)(-1)			0.676 (0.005)	
(Non-interest Exp/Y)(-1)				0.450 (0.006)
$(B/Y)^{Required}$	-0.484 (0.034)	0.222 (0.055)	0.242 (0.288)	1.146 (0.002)
$D9799*(B/Y)^{Required}$	1.470 (0.000)		-0.520 (0.045)	-1.377 (0.002)
Ygap(-1)	-0.422 (0.032)			
C		0.037 (0.010)	0.087 (0.146)	0.138 (0.001)
Adj R-sq	0.21	0.82	0.70	0.78
Walt t-statistic	0.909			
Test F-statistic	0.909			
(Prob) Chi-square	0.909			

Sample 1971-2010, p values in ( )
* Wald test H_0: $\alpha_2+\alpha_3=1$

When *(r-g)/(1+g)* gap is negative government can run a primary deficit without putting upward pressure on the debt/GDP ratio. Should it run a larger primary deficit than is required to keep the debt/GDP ratio stable, the debt/GDP ratio will increase but at a decreasing rate, thus converging to a higher level – i.e. it will not display explosive behaviour.[16] Thus, for periods when the *(r-g)/(1+g)* gap is negative, one would expect the parameter for the required primary balance to be statistically insignificant, or negative and statistically significant, signifying a government that pursued a countercyclical fiscal policy.[17] As indicated by the negative parameter for the required primary balance in times when the *(r-g)/(1+g)* gap was negative, this countercyclical fiscal policy seems to have been present in South Africa particularly when the *(r-g)/(1+g)* gap was negative (also see Figure 5 and 6). Furthermore, given the statistical insignificance of the dummy for the short period after 2008 (and hence, its exclusion from the model), countercyclical policy might also have dominated the requirement to stabilise the debt/GDP ratio even though the *(r-g)/(1+g)* gap was positive. However, what seems to contrast with the countercyclical behaviour of the actual primary balance with respect to movements in the required primary balance (i.e. the negative parameter on the required primary balance), is the procyclical impact of the output gap (i.e. the negative parameter of the output gap).

Table 9 also presents the results for the reaction function estimated with expenditure and revenue. Revenue seems to always move in the same direction as the required primary surplus, with a positive parameter of 0.222. However, both total and non-interest expenditure seem to move countercyclically when the *(r-g)/(1+g)* gap is negative. Nevertheless, as can be seen from

[16] Of course, provided that lenders are willing to accommodate the higher level at which the debt/GDP ratio will stabilise – if they do not accept it, the interest rate might increase causing the *(r-g)/(1+g)* gap to turn positive, in which case fiscal policy can technically become unsustainable.
[17] Provided that the *(r-g)/(1+g)* gap moves countercyclically – which seems to have been the case in South Africa (see Figure 5 which shows that the growth rate registered much higher variation than the effective interest rate on government debt, thereby dominating the behaviour of the *(r-g)/(1+g)* gap).

adding the parameter on the required primary balance to that of the required primary balance multiplied by the interactive dummy, both total and non-interest expenditure act to stabilise the actual primary balance by decreasing when the required primary balance increases. In addition, as can be expected given that interest expenditure is non-discretionary, the parameters in the non-interest expenditure model are larger than those in the total expenditure model. Comparing the behaviour of the different models, show that expenditure display the same behaviour as the primary balance. Re-specifying the models with the different types of taxes did not yield good results, indicating that the behaviour of revenue is mostly displayed on the aggregate level and not so much on the level of individual types of revenue. In addition, the output gap was not significant in any of the expenditure or revenue models, hence, it was excluded from the final specification.

4.5. Explaining the results

Should the primary balance/GDP and debt/GDP ratios be taken as non-stationary, the cointegration analysis indicates the presence of a relationship. The same is true for the relationship between the revenue/GDP and expenditure/GDP ratios. In addition, the weak exogeneity tests indicate that at a 5% level of significance causality runs from expenditure to revenue. However, if, following Bohn, Claeys, Favero and Monacelli, as well as Favero and Marcellino these ratios are taken as stationary, one can again follow these authors and estimate fiscal reaction functions. Indeed, when estimating these reaction functions and controlling for changing behaviour over time, the persistence parameters in these relationships are less than one, whether the relationship is estimated with GMM or a Markov switching model. In GMM models where the parameters were close to but less than one, the Wald tests indicate that they nevertheless are statistically significantly less than one.

In the reaction functions containing the debt/GDP ratio, the inclusion of interactive dummies multiplied by the debt/GDP ratio, indicate that:

1) The behaviour of total and non-interest expenditure as well as the different types of revenue changed over time.
2) The size of the reaction of the primary balance to changes in the debt/GDP ratio mostly seem to reflect the stance of the *(r-g)/(1+g)* gap.
3) The reaction of the revenue/GDP ratio to changes in the debt/GDP ratio is larger than those of the expenditure/GDP ratio. This is accordance with recent findings by the IMF (IMF Fiscal Monitor 2011) for the G7 countries.

Table 10 contains the summary of the different models estimated in subsections 4.1-4.4. The first row reports the signs of the (r-g)/(1+g) gap over the period 1971-2010. Subsequent rows report the government's reaction to an increase in public debt (in the case of the baseline model as well as Models 1 and 2) or to an increase in the required primary balance (in the case of Model 3). Given that Model 3 regresses the actual budget balance on the required budget balance, the sign of the (r-g)/(1+g) gap needs to be taken into account when interpreting the coefficient estimates. This has been done in the last row of Table 10 where the signs of the estimated coefficients, $\gamma_1\alpha^{Required}$, change when the (r-g)/(1+g) gap is negative (i.e. when fiscal policy can technically not become unsustainable). What is notable is the relatively high degree of consistency in terms of the results, particularly when considering that different frequencies of the data (quarterly and annual) as well as different estimation techniques were used (GMM with dummy variables that imposes exogenously determined regimes and Markov-Switching estimations where the regimes are endogenously determined). The baseline model indicates that government has been fiscally passive (indicated by white cells) over the entire sample under consideration whereas Models 1-3 indicate that government has been *largely* fiscally passive over the same sample period. Episodes where Models 1-3 indicate fiscal activism (indicated by darker cells) and/or no (ambiguous) government reaction (indicated by lighter cells) are also consistent for the most part – particularly so for the periods 1990-94 and 2008-10. It should be noted that the fiscal activism indicated during the 2008-10 period makes a case for fiscal guidelines (or fiscal rules) given that debt levels are rising and that there are some real pressures on the budget (such as job-creation efforts set out in the New Growth Path as well as the National Health Insurance).

Table 10 – Summary of the estimation results: reaction of the primary balance to either debt (Models 1 and 2) or the required primary balance (Model 3)

<table>
<tr><th>Sign of the (r-g)/(1+g) gap</th><td colspan="4">71-90
(-)</td><td colspan="4">91-6
(0)</td><td>97-9
(+)</td><td>00-08
(+/-)</td><td>09-10
(+)</td></tr>
<tr><th colspan="12">Reaction of government</th></tr>
<tr><th>Baseline model</th><td colspan="11">71-10
(+)</td></tr>
<tr><th>Model 1</th><td>71-78
(-)</td><td colspan="3">79-89
(+)</td><td colspan="3">90-4
(-)</td><td colspan="3">95-08
(+)</td><td>09-10
(-)</td></tr>
<tr><th>Model 2</th><td colspan="2">72-81
(+)</td><td>81-
2
(0)</td><td>82-90
(+)</td><td colspan="2">90-4
(0)</td><td colspan="4">94-09
(+)</td><td>09-10
(0)</td></tr>
<tr><th>Model 3</th><td colspan="5">71-90
(-)(-)=(+)</td><td colspan="3">91-6
(-)(0)=(0)</td><td>97-9
(+)(+)=(+)</td><td>00-08
(-)(+/-)=(-/+)</td><td>09-10
(-)(+)=(-)</td></tr>
</table>

Note: Baseline model and Model 1 are models reported in Table 3 and Table 4, respectively (subsection 4.2 above). Model 2 is the Markov-switching model reported in Table 9 (subsection 4.3 above), while Model 3 is the model reported in the second column of Table 11 (subsection 4.4 above). Note that for Model 3 the first sign in brackets each time represent the sign of the parameter (i.e. the reaction of the primary balance to the required primary balance), while the second represents the sign of the (r-g)/(1+g) gap. Thus, the sign in brackets on the right-hand side of = represents their combined sign and thus the sign of the reaction of the primary balance to debt, $\gamma_1\alpha^{Required}$.

According to the estimates of Equations (13), (13.1), (16) and (16.1) that contain an output gap, the reaction of the actual primary balance to the output gap is procyclical. However, it should also be mentioned that the inclusion of the political administration dummies rendered the output gap statistically insignificant. It is also insignificant in the expenditure and revenue models controlling for the *(r-g)/(1+g)* gap (i.e. the expenditure and revenue versions of Equation (16)). The analysis also shows that when the *(r-g)/(1+g)* gap was positive in the period 1997-99, the government did act to contain debt and ensure fiscal sustainability. More specifically, the analysis shows that the actual primary balance reacted to the size of the required primary balance to the extent that the public debt/GDP ratio did not increase during that period. However, the same cannot be said for the period after 2008.

5. Adjusting the sensitivity of the automatic stabiliser

The estimations above indicated that the reaction of revenue/GDP ratio to the debt/GDP ratio is larger than that of the expenditure/GDP ratio. Thus, there might be a need to enhance the reaction of the expenditure/GDP ratio. In addition, the fiscal rule set out above allows for the deficit to move in a countercyclical fashion by allowing revenue to drop and expenditure to increase when the economy experiences a recession. With government expenditure and revenue set to vary around a predefined long-run level the rule very much depends on the workings of the automatic stabilisers. Government's reaction to the cycle is therefore 'automated'. However, as the reaction of governments to the 2008/9 financial crisis indicated, governments also change their discretionary fiscal policy. This, of course, raises the question whether or not the burden of reaction should not to a larger extent be shifted to the automatic stabilisers, thereby automating fiscal reaction to a larger extent. Automatic stabilisers eliminate the observation and decision lags that hamper discretionary reactions. Shifting the burden of reaction more to the automatic stabilisers, though, may require the enhancement of these stabilisers.

Baunsgaard and Symansky (2009) suggested several ways in which the automatic stabilisers can be enhanced without increasing the size of government. These include permanent and temporary changes to tax and expenditure frameworks. Temporary changes are like trip switches that are triggered when specific macroeconomic thresholds are crossed (Baunsgaard and Symansky 2009:6). Baunsgaard and Symansky (2009:8-11) argue that changes to permanent measures, such as increasing the progressiveness of personal income tax or increasing the share of personal income tax in total revenues collected, will not yield a significant enhancement of the automatic stabilisers. Thus, they argue for the use of temporary measures.

Baunsgaard and Symansky (2009:16-7) thus propose the use of temporary measures with high multiplier effects such as temporary tax policies targeted at low-income households that are probably credit or liquidity constrained. These measures could take the form of rebates on personal income taxes, temporary reductions in VAT, temporary investment tax incentives for businesses that might be credit or liquidity constrained and temporary job creation tax credits. On the expenditure side government could use temporary transfers, again to credit and liquidity constrained households, as well as temporarily expand existing unemployment benefits (e.g. longer period of eligibility, higher benefits). Furthermore, transfers to lower levels of government will alleviate the pressure on lower tiers of government when these are not allowed to run budget deficits (Baunsgaard and Symansky 2009:17).

In addition to the measures listed by Baunsgaard and Symansky (2009), government could also create a catalogue of 'shovel-ready infrastructure projects'. Usually, investment projects do not make for good fiscal stimulus projects. In addition to the observation and decision lags that hamper all discretionary fiscal policy, infrastructure projects also suffer from 'n long implementation phase. Project specifications must be drawn up, a tender process then follow, which, in turn is followed by contractual negotiations. However, government could have a catalogue of projects that are already negotiated and concluded with private construction companies that are activated once a recession occurs. Such a catalogue can be modelled on the UK Strategic Infrastructure Partnership (SIP) model. This model is ideal when there are successive phases of similar types of work. In such model there is certainty about the kind of infrastructure, but there is uncertainty with regard to the timing and exact phases of the work (cf. HM Treasury 2008:21-22).[18] Another measure to use with a trip switch would be the payment of temporary subsidies to employers not to retrench workers. Thus, government pays companies directly to keep workers employed. This also means that companies do not lose good workers and are geared to benefit from the upswing the moment conditions improve.

The implementation of temporary measures needs to depend on economic trigger indicators (or trip switches). Only when the indictor reaches a particular value will the measure be activated. In addition, the trigger also needs to work in the opposite direction, so as to ensure the deactivation of the temporary measure. This will provide an automatic 'exit strategy' from such a stimulus policy. GDP, which is usually only available with a lag, might not be the most suitable indicator. More timely data or forward-looking indicators would make for better indicators. Baunsgaard and Symansky (2009:16) mention Feldstein's 2007 proposal for the US to use a three-month cumulative decline in payroll employment as trigger point and Elmendorf and Furman's 2008 proposal for a three-month change in employment that is negative for three successive months. Forward-looking indicators require proper forecasting and Baunsgaard and Symansky (2009:16) suggest that this be done by an independent agency to prevent manipulation by government and ensure credibility.

6. Conclusion

This paper contains a proposal for the use of a simple deficit-and-debt fiscal rule. Because of the difficulty of forecasting deficits and macroeconomic variables such as output and potential output with a satisfactory degree of precision, the fiscal framework contained in this paper proposes a permanent (fiscal rule) target that targets the standard deviation of the deficit instead of the level of budget deficit. Using historic data about the output gap, as well as estimates of tax and expenditure elasticities government can set a band around the SBB within which the actual deficit will be allowed to fluctuate. Government then needs to ensure that the deficit budgeted for the next year falls within the band. Setting the deficit within a band then allows the automatic stabilisers to act. As discussed, the benefit of this approach is that when the actual deficit then deviates from the budgeted deficit, the probability is high that the actual deficit still falls within the target band. Government is then guided by the fiscal rule, but where deviations still fall within the target band it will not lose credibility when the actual deficit deviates from the budgeted deficit.

The estimates of the fiscal reaction function showed that historically the South African government contained debt and ensured fiscal sustainability. Thus, in general the South African government ran a passive fiscal policy. The exceptions were the early 1990s and the period since 2008, periods during which the debt burden increased. The fiscal activism observed during the 2008-10 period makes a case for fiscal guidelines (or fiscal rules) given that debt levels are rising and that there are some real pressures on the budget (such as job-creation efforts set out in the New Growth Path as well as the National Health Insurance).

[18] One might also ask, though, why government would wait for a recession before implementing these projects and not simply make the investment when the yield is expected to be positive, irrespective of the business cycle. However, it should be kept in mind that government operates under a budget constraint and might not consider it advisable to increase the future debt tax and debt burden to finance these projects, even when projects are expected to yield a positive return. In a recession and thus in the face of falling demand, there might be scope to increase public investment, thereby offsetting the fall in private investment.

Compared to the expenditure/GDP ratio, the revenue/GDP ratio was historically more reactive to changes in the debt/GDP ratio. This is in line with behaviour in G7 countries. Government could also consider measures to increase this reactiveness of revenue and expenditure, both to changes in debt and the business cycle. Thus, the last section of the paper contains proposals to increase the reactiveness of the revenue and expenditure to both the cyclical movements and the need to restore fiscal sustainability. These proposals aim at the creation of so-called 'trip switches' where a recession causes an increase in expenditure and a reduction in revenue, and thereby enhances the ability of the automatic stabilisers. However, once, the economy returns to potential the trip switches ensure a decrease in expenditure and an increase in revenue. The latter not only enhances the automatic stabilisers, but defines an 'exit clause' for fiscal stimulus that acts as an adjustment policy that ensures fiscal sustainability.

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