Is South Africa falling into a fiscal dominant regime?

Luchelle Soobyah*, Mulalo Mamburu† and Nicola Viegi‡

February 2023

Abstract

The sustainability of fiscal policy has been at the forefront of policy analysis since the GFC and subsequent debt crises. With the elevated government debt levels observed globally, the emergence of fiscal dominance has caused some concern. In this paper we assess whether there was or is evidence of fiscal dominance in South Africa by determining periods in which fiscal and monetary policy was passive or active. By estimating a markov switching model on the reaction functions of a fiscal and monetary policy rule, we find that there has been some evidence of fiscal dominance in South Africa since 2016.

JEL classification: E50, E60, E62, H63

Keywords: Fiscal policy, monetary policy, markov switch estimation, fiscal dominance, monetary dominance

*South African Reserve Bank, PO Box 427, Pretoria, South Africa, 0001. Email: Luchelle.Soobyah@resbank.co.za. The views expressed are those of the author(s) and do not necessarily represent those of the South African Reserve Bank or Bank policy. While every precaution is taken to ensure the accuracy of information, the South African Reserve Bank shall not be liable to any person for inaccurate information or opinions contained herein.

†South African Reserve Bank. Email: Mulalo.Mamburu@resbank.co.za

‡University of Pretoria. Email: Nicola.Viegi@up.ac.za

1. Introduction

The impact of fiscal policy on the general macroeconomic environment has been a central issue for several years in South Africa, with growing concerns about the impact of fiscal risk on financial markets in particular. Recent questions about the transmission of monetary policy and the operational instruments available to the central bank given the volume and pricing of sovereign debt in capital markets both point to concerns about the emergence of fiscal dominance. This study draws from the literature on fiscal dominance to theorise how the phenomenon might appear in the context of an open, inflation-targeting emerging market. It will then provide some empirical evidence on whether recent market developments do indeed point to fiscal dominance in South Africa.

While the question of fiscal sustainability has long loomed over South Africa's economy, the events set off by the coronavirus pandemic have brought the economic impact of fiscal policy into sharp focus.[1] During the global financial market turmoil of February - March 2020, investors sought to liquidate their holdings of financial assets in favour of cash amid the pronounced economic uncertainty introduced by the COVID-19 pandemic. This resulted in a sharp increase in emerging-market (EM) sovereign yields amid a heavy selloff of EM bonds including South Afroca's, while at the same time the South African Reserve Bank aggressively cut interest rates and introduced a government bond purchasing programme to restore smooth functioning in that market. On the part of the government, National Treasury increased its weekly debt issuance considerably - from R4.5 billion to R6.6 billion for nominal bonds alone tre (2021) - as the government contended with unexpected COVID-related demands on the fiscus, generating concerns about the capacity of the market to absorb the supply of government bonds. Taken together, these developments raise questions about how fiscal policy might affect the conduct and effectiveness of monetary policy.

Firstly, the divergence of sovereign borrowing costs and monetary policy, where government bond yields rose even as the central bank cut the repo rate by 100 basis points in March 2020, raises the prospect that market borrowing costs may not fall in line with the looser monetary policy but remain sticky in line with the elevated sovereign yields. Secondly, these developments have increased the relevance of the issue of fiscal dominance of monetary policy.

In this paper we explore what fiscal dominance is and whether there is empirical evidence of its existence in South Africa. We determine periods in which fiscal and monetary policy was passive or active by estimating reaction functions for a fiscal and monetary policy rule. The paper is structured as follows. Section 1 details a literature review, and is followed by section 2 which outlines the National Treasury's (NT) fiscal framework. Section 3 describes the policy rules and provides regression estimates in a markov switching model, as well as some Vector Autoregression (VAR) analysis. Lastly, section 4 provides concluding remarks.

[1] While both fiscal sustainability and fiscal dominance are relevant for the conduct of monetary policy, they are distinct issues.

2. Literature review

Different strands of economic literature describe various ways in which fiscal policy affects price stability. In their seminal paper, Sargent et al. (1981) define a fiscal-dominant regime as one in which the fiscal authority exogenously sets its budgets and announces current and future deficits and surpluses. In this way, it determines the revenue that must be generated through bond sales and seigniorage which leads to the monetary authority's options being constrained by the demand for government bonds. They note that in a fiscal-dominant regime, if the primary deficit cannot be financed solely by bond sales then the monetary authority - which in their model targets a monetary aggregate - is forced to create new money and tolerate higher inflation. In a surplus-based monetary policy implementation framework such as South Africa's, where the central bank maintains a certain level of surplus liquidity in the system, this could manifest in the central bank maintaining superfluous liquidity conditions in the market to enable banks to absorb the higher supply of government bonds implied by high fiscal deficits. The elevated liquidity conditions, in turn, could weaken the transmission of monetary policy within the banking system. Sargent and Wallace conclude that if primary fiscal deficits are exogenous - that is, if projected primary balances are independent of historical primary balances and the existing stock of debt - then tighter current monetary policy implies higher inflation in future as the fiscal authority's financing requirement will eventually exceed the demand for government bonds.

Other scholars have since built on the Sargent-Wallace model of fiscal dominance beyond money aggregate-targeting frameworks. McCallum (1984) uses a theoretical model to argue that persistent primary fiscal deficits financed by bond issuance are inflationary. Zoli (2005) conceptualises the Sargent-Wallace theory as a question of whether primary balances as set by the fiscal authority are exogenous or responsive to current government liabilities. This study estimates the empirical relationship between fiscal and monetary policy for a group of emerging markets and finds no evidence of monetary dominance in the sample countries. Leeper (1991) shifts focus away from deterministic models such as those of Sargent et al. (1981) and McCallum (1984) and analyses the interaction between fiscal and monetary policy in a stochastic model, allowing for the consideration of the financing of shocks to government debt. Leeper (1991) defines "active" and "passive" fiscal policy according to the constraints faced by the authority: an active authority acts independently of the state of government debt and sets its policy instrument as it sees fit, whereas a passive authority responds to government debt shocks and sets its policy instrument to balance the government budget. When monetary policy is active and fiscal policy is passive, the central bank is unconstrained and can set the nominal interest rate to respond strongly to inflation while the government passively adjusts direct taxes to balance the budget. Such a regime corresponds to the monetary-dominant regime in Sargent-Wallace's framework. When monetary policy is passive and fiscal policy is active, the government does not sufficiently adjust direct taxes in response to a deficit shock and the central bank allows the money stock to grow to prevent an explosive path for real government debt. This regime corresponds to the Sargent-Wallace fiscal-dominant regime. In

Leeper's model, both regimes where one authority is active and the other is passive result in a unique and stable equilibrium, while a regime in which both authorities are unresponsive to government debt lead to an unstable outcome with an explosive government debt path.

Much of this preceding work is related to a literature which complicates the empirical testing of fiscal dominance, namely the fiscal theory of the price level (FTPL). In this literature the price level is determined by the government's total liabilities comprising of government debt and money supply. The real value of government liabilities is equal to the sum of expected primary government surpluses. Woodford (2001) describes a system in which fiscal policy can affect the price level through a wealth effect: given the relationship between the government budget balance and taxes, lower expected surpluses make households feel wealthier, increasing aggregate demand and raising the price level. Cochrane (2005) argues that nominal government liabilities are a residual claim to primary government surpluses similar to how stocks are a residual claim to a company's expected earnings. To address some criticisms of the FTPL, Cochrane (2005) develops a model with zero money demand where the central equilibrium condition that determines the price level is the relation between government liabilities and primary surpluses. He argues that a government can affect the price of nominal liabilities and thus the price level because it defines these liabilities in the same way a firm defines its stock and can undertake corporate actions which affect its share price. The FTPL leads to findings consistent with the literature related to fiscal dominance. For instance, consistent with Leeper (1991), Woodford (2001) further argues that a commitment to an interest rate rule will not be sufficient for maintaining price stability in such a system, but such a commitment must be coupled with constraints on fiscal policy such as through the adoption of a fiscal rule.

As noted by Bassetto (2008), the FTPL has long been controversial, with detractors citing issues such as fundamental economic misspecification problems that have implications for the equilibria derived under the FTPL Buiter (2002). Nevertheless, this strand of literature's emphasis on fiscal policy's contribution to price stability has spurred increased focus on fiscal policy and its interaction with monetary policy recently. Woodford (2001) and Leeper (1991) stress the importance of fiscal rules for macroeconomic stability, while Penalver and Thwaites (2006) estimate a model deriving fiscal rules consistent with debt sustainability within an EM context. Davig and Leeper (2005) estimate Markov-switching rules for monetary and fiscal policy, with monetary policy following a Taylor rule and fiscal policy adjusting taxes to changes in government debt. Bianchi and Ilut (2017) use empirical evidence to argue that the Great Inflation experienced by the US during the 1960s and 1970s was only brought to and end when fiscal authorities credibly committed to debt sustainability.

The global context can also affect the interaction between monetary and fiscal policy for a small, open economy. Following the Global Financial Crisis (GFC), there has been growing interest in the spillover of monetary policy from major economies such as the United States and the impact of such spillovers on international financial conditions. Rey (2015) argues that because of financial globalisation, there is a global financial cycle in which financing conditions are set by the main world financing centres and transmitted to the rest of the world regardless

of FX regime.

In this strand of literature, financial conditions are transmitted through capital flows and asset prices that respond to monetary policy conditions in a centre economy such as the US. In Degasperi et al. (2020) financial transmission channel of monetary policy, a Fed rate hike is transmitted along the yield curve and reduces the prices of risk assets; investors rebalance their portfolio is response the changes in risk asset prices, causing capital outflows for foreign countries, increases in their longer-term yields and a fall in their risk asset prices. Employing a high-frequency identification to explore the effects of a US monetary policy shock, they find that a contractionary US monetary policy shock is followed by a depreciation in foreign currencies against the US dollar and a reduction in global risk appetite and cross-border flows, supporting the existence of a global financial cycle. On the contrary, Cerutti et al. (2019) find no evidence of a global financial cycle driving changes in capital flows.

Therefore, risk premia can affect the transmission of monetary policy by acting as the conduit through which external shocks affect domestic financial conditions. In Kalemli-Özcan (2019) study of US monetary policy and risk spillovers, changes in US monetary policy have impact on EM risk premia and capital flows, and the sensitivity of the EM's capital flows drives the EM's monetary policy response to changes in US monetary conditions. Kalemli-Özcan (2019) finds evidence that domestic monetary policy transmission in EMs is imperfect when they respond to the effect of capital flows on local financial conditions, with the incomplete pass-through of policy rate changes to credit costs a function of risk premia. Such findings suggest that risk premia and external monetary conditions such as those in the US must be taken into account when analysing the factors that affect monetary policy conditions in an open EM.

In a case study illustrating the extent to which fiscal risk premia can impede the conduct of monetary policy, Blanchard (2004) proposes a model in which real interest rates affect sovereign risk and the exchange rate, which in turn affect inflation. If an increase in the real interest rate under inflation targeting also increases the probability of default on government debt, then it may make government debt less attractive and lead to a real depreciation of the exchange rate and higher inflation. In this case, inflation targeting would have perverse outcomes where monetary tightening leads to a real depreciation and higher inflation. This outcome is more likely the higher the initial level of debt, the higher the proportion of foreign-currency denominated debt and the higher the price of risk. Indeed, this theory fits well with Brazil's experience during its macroeconomic crisis in 2002-2003. Blanchard (2004) presents this interaction as a form of fiscal dominance in the context of a standard open EM with an inflation targeting framework.

Beyond the spillover of international financial conditions, Bonam and Lukkezen (2019) consider how the existence of sovereign risk can affect the requirements of a stable and unique macroeconomic equilibrium as described by Leeper (1991). They modify a standard New Keynesian model by introducing a sovereign risk premium that forms a wedge between the risk-free rate and the sovereign yield and is nonlinear in its relationship to government in that the

risk premium increases in debt elasticity at higher levels of government debt. They show that in the presence of sovereign risk, a stable and unique equilibrium may not be possible when the government pursues a countercyclical fiscal policy, even if monetary policy is active and fiscal policy is passive. Therefore, the existence of sovereign risk increases the significance of the fiscal authority's commitment to managing debt dynamics, regardless of the stance of the central bank.

3. National Treasury's fiscal framework

The analysis that follows rests on the assumption that the fiscal authority uses a budget balance rule or some other fiscal anchor as a commitment device in its budgeting process. To the extent that this assumption is inaccurate, using the responsiveness of the budget balance to changes in the debt stock may not accurately characterise the fiscal rule and whether fiscal policy is active or passive. Thus, we consider National Treasury's budgeting process to evaluate whether the fiscal rule can be characterised by using the relationship between changes in debt and the budget balance.

National Treasury (NT) has an overall fiscal framework that it publishes in its Budget Review in February and Medium Term Budget Policy Statement in October. The starting point for the budget process is the review of macroeconomic forecasts, which include projections for growth, inflation and tax revenues. In addition to being driven by changes in macroeconomic forecasts, adjustments to projected revenues are also made according to the performance of actual revenue collections over the budget period. To project the expenditure part of the budget, National Treasury modifies and aggregates the expenditure forecasts of individual line departments transfers to provincial governments to determine non-interest expenditure. The projected primary balance is then implied by the difference between projected revenues and expenditures.

If not the primary balance, what does NT target in pursuit of medium-term fiscal objectives such as debt sustainability? To contain the growth of non-interest government spending, National Treasury introduced the expenditure ceiling as a fiscal anchor in 2012. The level of the expenditure ceiling was determined in 2012 according to the expenditure of line departments and provincial transfers at that time, and it is inflation-adjusted each year to maintain a constant real target for non-interest expenditure. In terms of the implementation of the ceiling, NT provides technical guidelines to line departments regarding the projected expenditure ceiling for a forecast period, which the line departments then use in their production of their individual budgets. In the aggregation process to arrive at a consolidated budget, NT may adjust the expenditure ceiling to reflect the fiscal stance or in response to shocks.

The expenditure ceiling, then, can be considered the main fiscal anchor that NT uses as a commitment device as a specific target is set for it and adjusted to reflect the objectives of fis-

cal policy. However, in its determination and implementation, the expenditure ceiling operates more as a guide than a binding constraint. The process through which the forecasted nominal expenditure ceiling for a fiscal year is finalised is discretionary. After adjusting for inflation, further qualitative adjustments to the expenditure ceiling are made to reflect factors such as the fiscal stance and changes in macroeconomic conditions. For instance, NT may resolve to reduce the primary balance in response to a debt shock and do so by lowering the expenditure ceiling. This is a discretionary process, and there is no automatic feedback loop from variables such as the debt stock in one period to the nominal expenditure ceiling in the next. Furthermore, the expenditure ceiling can be adjusted upwards not only on account of negative shocks such as the COVID pandemic but also in response to positive shocks. For instance, an upside surprise in revenue collections may prompt an upward revision of the expenditure ceiling for that period, as happened in 2021/22 following the commodity-price rise. The expenditure ceiling can also be breached, as it did in 2017 due to unexpected allocations to the state-owned South African Airways and South African Post Office. In addition, there is also the problem of implementation whereby a high proportion of state expenditure in the National Treasury's budget allocation is implemented by provincial and local government departments and, at times, this implementation has not been consistent with the nationally budgeted amounts.

Therefore, while the literature uses the primary balance as a fiscal rule for the fiscal authority, NT does not employ binding fiscal rules. To the extent that it has fiscal anchors, it uses an expenditure ceiling. The primary balance, then, can be considered an element of the broader fiscal strategy, informing the fiscal stance and guiding the direction and extent to which decisions on the revenue side such as tax changes or the nominal ceiling on the expenditure side are to be adjusted. The level primary balance, in turn, is evaluated in terms of its implications for the stock of national debt.

4. Testing for fiscal and/or monetary dominance

Most literature that focusses on policy rules is based on structural models. However, as Davig and Leeper (2005) suggest, monetary and fiscal rules can be examined separately. We therefore estimate two individual Markov Switching models for a monetary policy and fiscal policy rule. Our aim is to distinguish between regimes in which monetary policy and fiscal policy is either passive or active.

An active monetary policy implies that monetary authorities would raise the nominal policy rate by more than one-for-one in response to higher inflation, which as Taylor (1993) notes is a necessary condition for stability in the economy. A passive monetary policy then implies that the response to inflation of the policy rate is less than one-to-one.

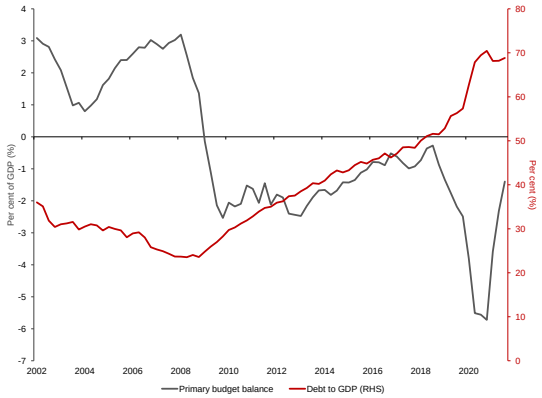
A passive fiscal policy suggests fiscal policy aims to stabilise the debt to GDP ratio, so for example by running primary surpluses in order to bring this ratio down if it is too high. An

active fiscal policy is one in which debt is not stabilised.[2]

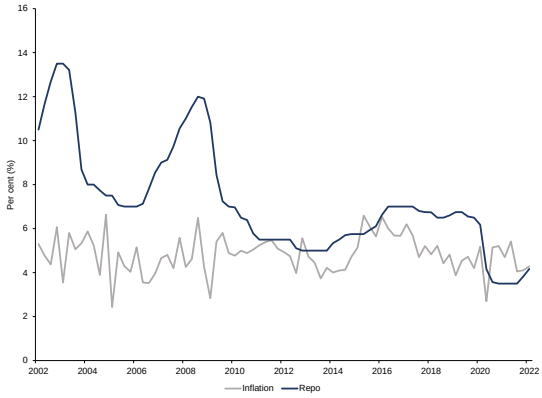
Figure 1 below shows the trend of debt to gross domestic product (GDP) and the primary budget balance, as well as the repurchase (repo) rate which is the policy rate and headline inflation. Post the global financial crisis (GFC), the debt to GDP ratio has been on an upward trend, reflecting persistent budget deficits. The repo rate has been on a downward trend since 2002 and headline inflation has remained within the target band for most of the period.

Figure 1: Trends in key variables

Debt to GDP vs primary budget balance



Repo rate vs headline inflation



Source: SARB

4.1 Fiscal policy rule

There is no widely accepted fiscal rule, and therefore we rely on the budget balance rule below as the fiscal rule which we estimate. This suggests that the primary budget balance in the current period is a function of deviation of debt from a target in the previous period, and a persistence term which is the budget balance in the previous period and an output gap measure. Like most reaction functions estimated, it is just an approximation of what the monetary or fiscal authority follows. It's a parsimonious way to represent the main drivers used to inform decisions. The fiscal rule we estimate is given below:

$$S_t = \delta(S_{t-1}) + \beta(D_t - D^*) + \gamma(y_t - y^*) \tag{1}$$

Such that:

$\beta < 1$ *or* $i + \rho \rightarrow$ *active fiscal policy; and*

[2] We define an active monetary policy to imply that the monetary authority explicitly follows a Taylor Rule or is an inflation targeter, whereas a passive monetary policy implies that inflation does not matter. On the other hand, an active fiscal policy implies that the National Treasury does not consider the debt level or need for stabilising the debt to GDP ratio, whereas a passive fiscal policy suggests that the fiscal authority adjusts the primary budget balance so as to stabilise debt to GDP.

$\beta > 1$ *or* $i + \rho \rightarrow$ *passive fiscal policy*

Where S_t and S_{t-1} is the primary budget balance to GDP at time t and t-1; D_t is the debt to GDP at time t; D^* is the debt to GDP target; and $(y_t - y^*)$ represents the output gap. The output gap and debt deviation from target is defined as in the QPM (Pirozhkova et al, Forthcoming).[3]

Therefore this suggests that the primary budget balance should adjust as the debt deviation changes so as to maintain debt stabilisation. Therefore, we are interested in β which represents the response of the budget balance to changes in debt. If this is positive then the fiscal authority cares about debt stabilization and adjusts the budget balance to achieve this. In this case fiscal policy is passive or what we will refer to as responsive (for ease of understanding). The opposite is true for negative values of beta and in this case fiscal policy is active/unresponsive or less responsive whereby debt is not stabilised.

And in addition we have the following constraints:

$$S_t = D_t(i + \rho) \tag{2}$$

Or

$$S_t / Y_t = [(i + g + \rho) / Y_{t-1}] * (Y_{t-1} / Y_t) \tag{3}$$

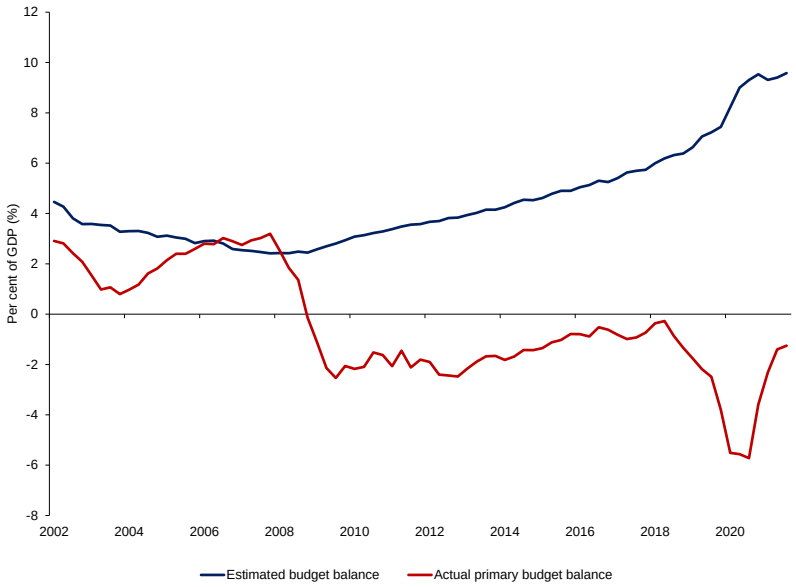
Where ρ is the risk premium (either proxied by VIX or the EMBI plus) and g is the growth rate.

Figure 4 shows the actual primary balance and the balance that is estimated by the rule above. We see that the budget balance as per the rule above that aims to stabilise debt, is on an upward trend since 2008. Whereas, the actual primary budget balance has been in a deficit since 2008. [4]

[3] Refer to Botha and Steinbach (2017) on the output gap estimates, and the debt deviation from target is the difference between the actual debt to GDP ratio and the debt to GDP projected or forecast by NT at each budget.

[4] The estimated budget balance as per the rule is the debt to GDP ratio multiplied by the sum of the trend of long-term interest rate and risk premium which is proxied by VIX.

Figure 2: Deviation of primary budget balance from what the fiscal rule suggests



Estimating a Markov switching regression for the fiscal policy rule in equation (1) produce the results shown below:

Table 1: Markov switching regression results for fiscal policy rule

	(1)	(2)	(3)	(4)
LESS RESPONSIVE				
Lagged Budget balance	0.71***	0.72***	0.83***	
Output gap	1.09***	0.29**	0.19*	-0.48***
Lagged debt deviation from projection	0.16***			
Lagged debt deviation from mean		-0.02		-0.05***
Lagged change in debt			-0.54**	
RESPONSIVE				
Lagged Budget balance	-0.01	0.79***	0.59***	
Output gap	1.09***	0.29**	0.19*	-0.48***
Lagged debt deviation from projection	0.26***			
Lagged debt deviation from mean		0.04***		0.03*
Lagged change in debt			-0.01	

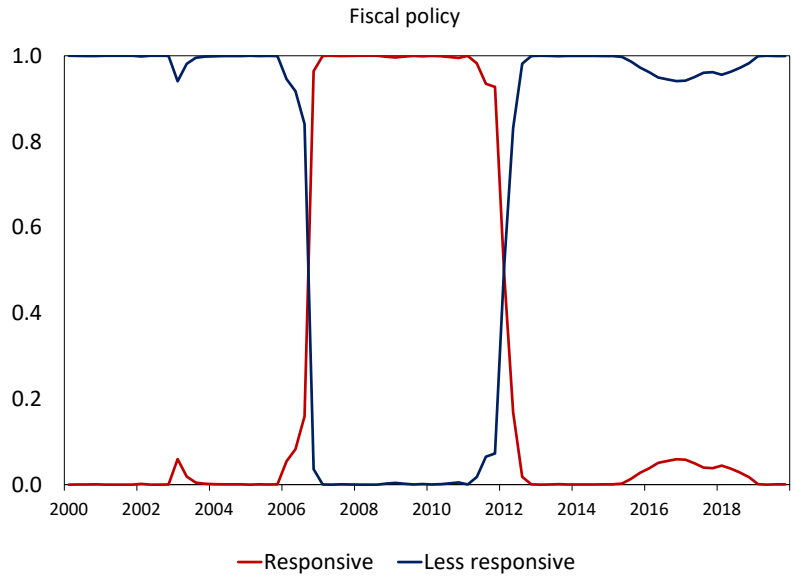
The independent variable in the regression equations (1) - (3) is the primary budget balance; in equation (4) it is the debt to GDP ratio.
The debt deviation from projection is the deviation from the NT projected debt to GDP at each budget; the debt deviation from mean is the debt to GDP deviation from a mean of 45%; the change in debt is the change in the debt to GDP ratio.
*, ** and *** indicate 10, 5 and 1 percent level of significance.

Equations (1)-(3) are based on the budget balance rule (as we have indicated in equation (1) above). There are three different equations and results and this is because, even as the literature suggests, there is no common view on what D* is. The first equation uses a debt deviation from projected debt (that is projected by NT at each budget), the second one uses a deviation from a mean, which we set at 45% (which is the mean over the last decade), and the third equation uses the change in the debt to GDP ratio. The fourth equation is based on the debt rule (Davoodi and Paulo (2022)) whereby the difference in the debt to GDP ratio is the dependent variable and the explanatory variable is the output gap and the deviation of debt to GDP from its mean in the previous period.

The results are split into the two regimes/states and we labelled them according to whether it represents a passive or what we will refer to going forward as a responsive fiscal policy and an active or unresponsive (or less responsive) fiscal policy. However, since the results are quite mixed, we focused on equation (1) and (4), and hence we have the top part of the results table as the less responsive regime (since $\beta > 0$ but less than in the other regime). The bottom section of the table is the responsive regime with a higher β.

The transition probabilities are shown in figure 3:

Figure 3: Regime probabilities



Up until 2006, fiscal policy was less responsive and this could have been due to increased revenue collections in the period and therefore not much reaction was needed as debt was coming down. It then became more responsive from around 2007 until 2012 suggesting that the budget balance was adjusting in response to the accumulation of debt. From 2012, when debt started rising sharply, until recently, fiscal policy has been less responsive. This was also the time when the expenditure ceiling was introduced which suggests that this rule is very discretionary and doesn't seem to have been strongly determined by a debt stabilisation. The states/regimes are also very persistent with the probability of staying in one regime being very strong (over 90 per cent). This implies that once fiscal policy moves into either a responsive (passive) or less responsive (active) policy, the probability of staying in that regime is high and therefore suggests that since the most recent period whereby fiscal policy is less responsive (or what we believe to be a fiscal dominant regime), the likelihood of it remaining in this regime is high and could be for some time unless significant fiscal reforms or consolidation is implemented so that the debt ration is stabilised. This has implications for monetary policy going forward in that a fiscal dominant regime will require more from monetary policy than otherwise needed in order to achieve stabilisation in the economy.

4.2 Monetary policy rule

Our model follows the monetary policy rule as defined in the South African Reserve Bank (SARB) Quarterly Projection Model (QPM) which corresponds to the Taylor rule that is widely used by central bankers (Taylor, 1993). [5]. This rule implies that the interest rate decision at a particular meeting is a function of the previous interest rate going into the meeting (i.e., the lagged repo rate or persistence term), the neutral rate, the inflation deviation from target where

[5] The SARB Quarterly Projection Model (QPM) is the official forecasting model used by the SARB and we follow the Taylor Rule specification as per the QPM - refer to Botha and Steinbach (2017) for explanantions and details of the QPM

we again use the QPM definition of this which is an average of the 3, 4, and 5-quarter-ahead forecast of headline inflation's deviation from the target, and the output gap.

$$i_t = \alpha(i_{t-1}) + (1-\alpha)[i^N + \gamma_\pi(\pi - \pi^*) + \gamma_y(y_t - y^*)] \tag{4}$$

Such that:
$\gamma_\pi < 1 \rightarrow$ *passive monetary policy; and*
$\gamma_\pi > 1 \rightarrow$ *active monetary policy*

Where i_t and i_{t-1} is the nominal policy rate or repo rate at time t and t-1; i^N is the neutral interest rate; $\pi - \pi^*$ is the deviation of inflation from its steady state target; and $(y_t - y^*)$ represents the output gap. [6]

Using real-time data obtained from the core model and QPM, we estimate the equation below[7]:

$$i_t = \beta_1 i_{t-1} + \beta_2 \pi *_t + \beta^*_{3\,t} + \beta_4 \pi^N \tag{5}$$

The key parameter that we're interested in is γ_π in equation (4) – as this represents how responsive interest rate decisions (or monetary policy) were to deviations in inflation from its target. It can be shown that since $\beta_2 = (1-\alpha) * \gamma_\pi$ in equation (5) above, then $\gamma_\pi = \beta_2 / (1-\beta_1)$. When this is greater than one, we have an active or responsive monetary policy where monetary policy responds more than one-to-one to changes in inflation from its target. When this is less than one, then we have a passive or unresponsive monetary policy.

Estimating a Markov switching regression on equation (5) (where all the parameters of each rule evolve according to a Markov process) is given in the figure below. The estimation is over the period 2005-2022, using real-time data, and a taylor rule specification as per the QPM. The results are split into two parts or the two regimes which we have labelled as 'less responsive' and 'responsive'. This reflects regimes in which monetary policy is less responsive (or 'passive') to changes in inflation deviation (i.e. when γ_π > 1 but smaller than in the other regime) and one when monetary policy is responsive (i.e. when γ_π > 1).[8]

[6] The neutral rate and output gap is obtained from the QPM (Botha and Steinbach (2017)). The deviation of inflation from it's target is the average of the 3,4, and 5 quarter ahead inflation forecast from the QPM, but instead of the constant target of 4.5% as is used in the QPM, we use a time-varying target prior to 2017 when the midpoint 4.5% was announced as the target.

[7] The Core Model was the official forecasting model until 2017, and thereafter the QPM was the official model. We therefore obtain real-time forecasts from the core model up until 2017, and thereafter from the QPM.

[8] Refer to the coefficient of variable name inflation deviation which is the inflation deviation from target in the Taylor Rule specified in equation (5).

Table 2: Markov switching regression results for monetary policy rule

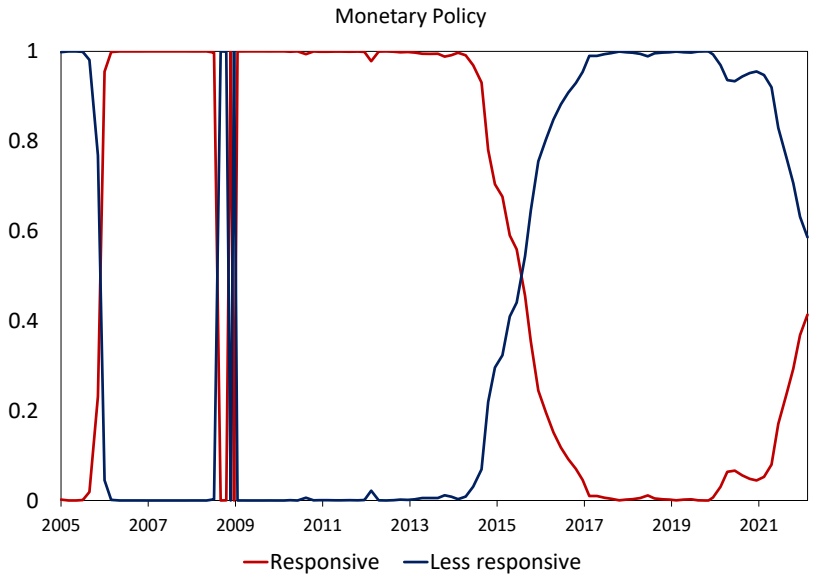
	(1)	(2)	(3)	(4)	(5)	(6)
LESS RESPONSIVE						
Lagged repo	0.85***	0.91***	0.86***	0.84***	0.88***	0.86***
Inflation deviation	0.35***	0.33***	0.33***	0.37***	0.32***	0.37***
Neutral interest rate	0.38***	-0.12	0.34***	0.26**	0.35***	0.37***
Output gap	0.06***	0.01	0.06***	0.06***	0.05***	0.06***
US 1 year rate		0.29***				
US 1 year rate change			0.34***			
US 10 year rate				0.12*		
VIX					-0.008***	
Exchange rate change						-0.12**
RESPONSIVE						
Lagged repo	0.96***	0.97***	0.96***	0.95***	0.99***	0.97***
Inflation deviation	0.10**	0.11***	0.11**	0.11***	0.11***	0.01*
Neutral interest rate	0.28***	0.10**	0.29***	0.15**	0.25***	0.25**
Output gap	0.06***	0.01	0.06***	0.06***	0.05***	0.06***
US 1 year rate		0.14***				
US 1 year rate change			-0.02			
US 10 year rate				0.11**		
VIX					-0.008***	
Exchange rate change						0.01

The independent variable in each regression is the repo rate (or policy rate).
The rate changes are the changes in rates between each MPC meeting (i.e. the day preceding current MPC meeting - day after previous MPC meeting)
*, ** and *** indicate 10, 5 and 1 percent level of significance.

It's clear that there is a strong response to inflation deviation in both regimes/states. The coefficient that we're interested in is the inflation deviation coefficient but in Table 2, this is β and needs to be adjusted to obtain γ_{pi} which is the response of monetary policy to inflation changes from its target. When we adjust β, the bottom part of the table shows a stronger response to inflation deviation (around 2.5 or higher) and therefore we have labelled it the responsive regime. The top part of the table is still responsive to inflation changes but less so than the other regime and hence we have labelled this as the 'less responsive regime'. This is not necessarily an unstable or passive regime but it is less responsive to inflation changes than the other regime. We have six different regression equations and results. This is because we have added some possible drivers to the reaction function since spillovers from global financial conditions, external shocks, and risk premia also affect the transmission of monetary policy and policy decisions. The results are robust across all six specifications. Long-term bond rates matter for the South African bond market. The US 1 year rate and 10 year rate, VIX and the exchange rate are all significant drivers of monetary policy. The persistence term is high in both regimes (in line with what that literature suggests), but it is greater in the responsive regime. These findings correspond to Taylor rule estimates of Naraidoo and Paya (2012) and Ndou et al. (2013) who find a positive and significant effect of financial indicators such as the exchange rate in the monetary policy rule for South Africa. However, Bold and Harris (2018) find that various measures of the exchange rate are not a significant in the Taylor rule for South Africa.

Below are the transition probabilities:

Figure 4: Regime probabilities

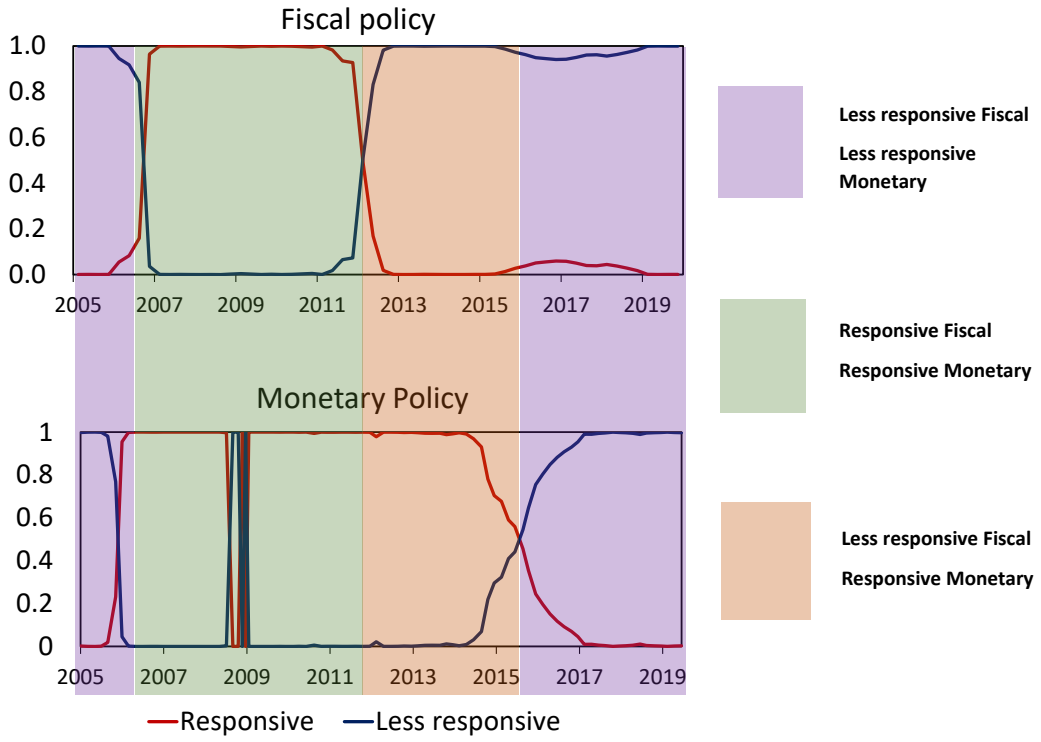


The regime probabilities show that monetary policy was responsive or active from 2006 until around 2014 (with the exception of the crisis period) and then became less responsive. However, the most recent period shows the possibility of a switch in the regime again. After the GFC, and taper tantrum period, there was heightened risk and inflation was at the upper-end of the target range, hence monetary policy was more responsive.[9] Thereafter inflation came down to within the target (except 2016-2017) and monetary policy was less responsive. Here again, the states/regimes are very persistent.

Below we show the fiscal and monetary policy regimes together:

[9] The taper tantrum period, which was a result of the Fed announcement that it would start tapering asset purchases at some future date and therefore causing a negative shock and reaction in the financial market (causing bond investors to start selling their bonds), occurred around 2013.

Figure 5: Regime probabilities



We have grouped these regimes into 4 distinct periods. The green shaded area is when monetary policy and fiscal policy was responsive. Following Leeper's definition of active and passive policy, we can say that this is active monetary policy and passive fiscal policy.[10] This implies that it is a monetary dominant regime as per Leeper (1991). The orange shaded area is when monetary policy was responsive and fiscal policy was less responsive. The purple shaded area is when monetary and fiscal policy was less responsive – or if we say that this is passive monetary policy and active fiscal policy then it is a fiscal dominant regime (Leeper 1991).[11] This therefore suggests that the most recent period reflects a somewhat fiscal dominant regime.

4.3 VAR analysis

In the previous section, we analysed the behavior of monetary and fiscal policy separately by looking at each reaction function's regime using a markov process. We now test the macroeconomic effects in a Time-Varying Vector Autoregression (TV-VAR) setup to see the dynamic impulse response of output and inflation to each a fiscal and monetary policy shock. whether the responses are as we'd expect in each regime period. For the monetary policy VAR, we use quarterly data of output gap, the inflation deviation, repo rate and the exchange rate over

[10] Leeper describes fiscal policy that is responsive to changes in the debt ratio (by adjusting the primary balance) as a passive fiscal policy and monetary policy that is responsive to changes in the inflation rate (by adjusting the interest rate) as active monetary policy.

[11] Leeper describes fiscal policy that is not responsive to changes in the debt ratio or is not concerned with stabilising the debt ratio in its policy decisions as an active fiscal policy. Monetary policy that is not concerned with deviations in the inflation rate from its target is a passive monetary policy.

the period 2009 and 2015 and between 2015 and 2022, which was the responsive and less responsive regime periods respectively. See figures 6 and 7.

Similarly we estimate a fiscal VAR, using quarterly data of either the structural or primary budget balance, the change in debt to GDP ratio, the output gap and the interest rate.This is estimated over the two periods, 2006-2012 and 2012-2019, of responsive and less responsive fiscal policy regime periods respectively. See figures 8 and 9. The IRFs using cholesky decomposition are shown below:

Figure 6: Impulse response functions from a shock to Inflation: 2009 - 2015

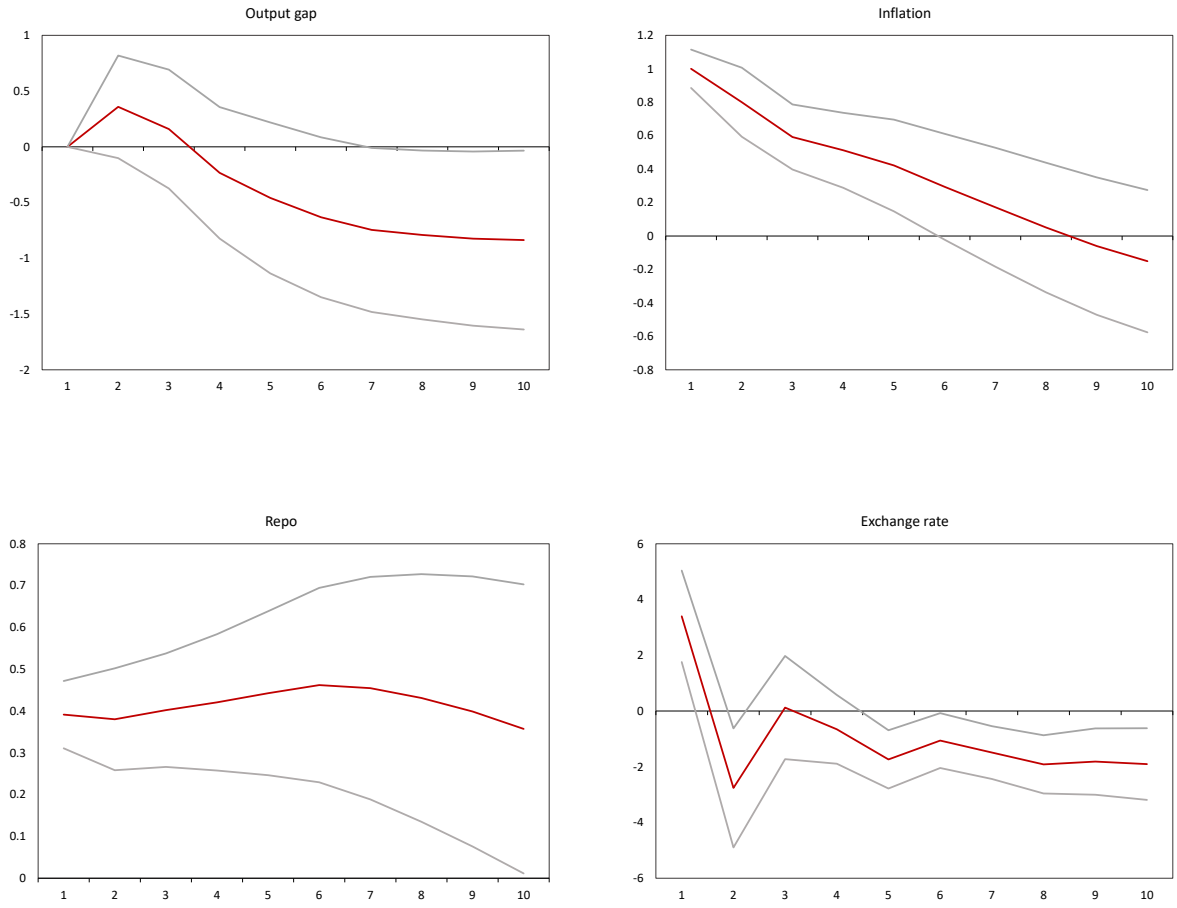
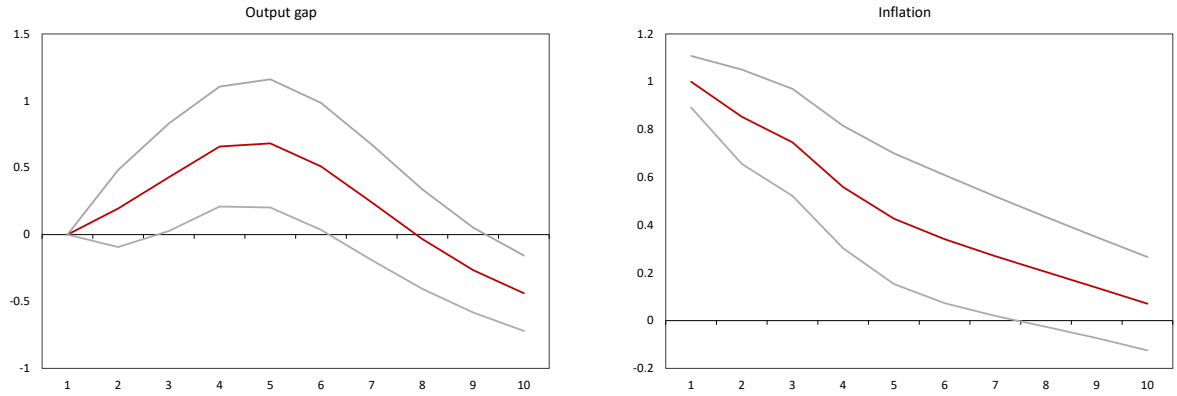


Figure 7: Impulse response functions from a shock to Inflation: 2015 - 2022



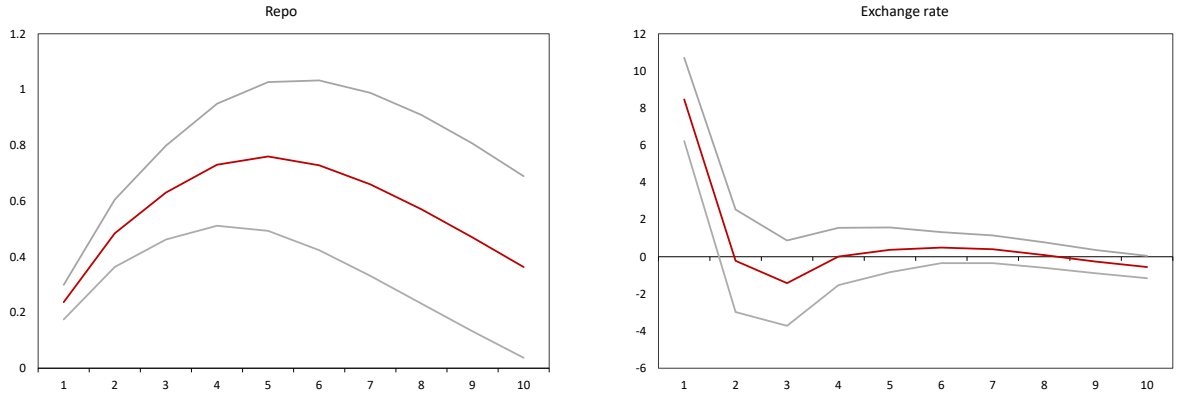


Figure 8: Impulse response functions from a shock to Debt: 2006 - 2012

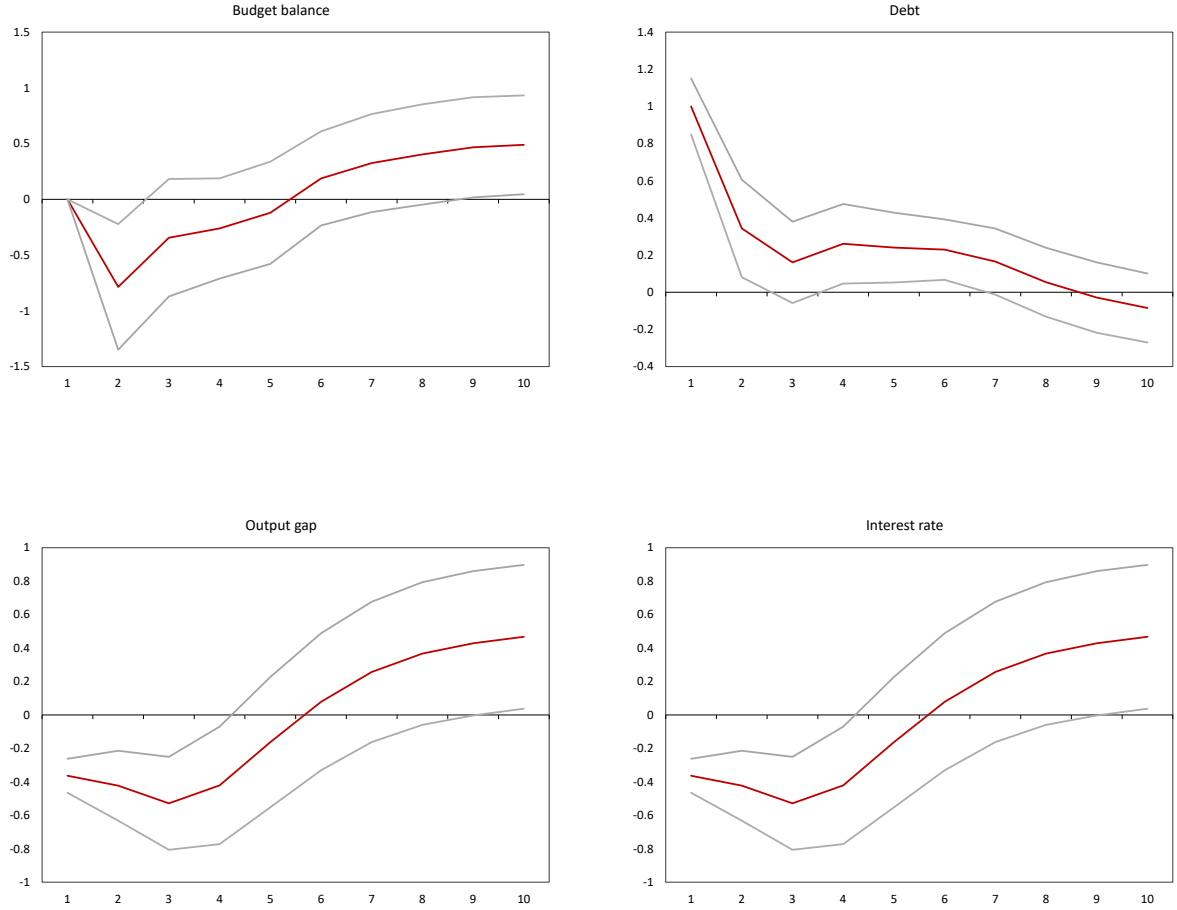
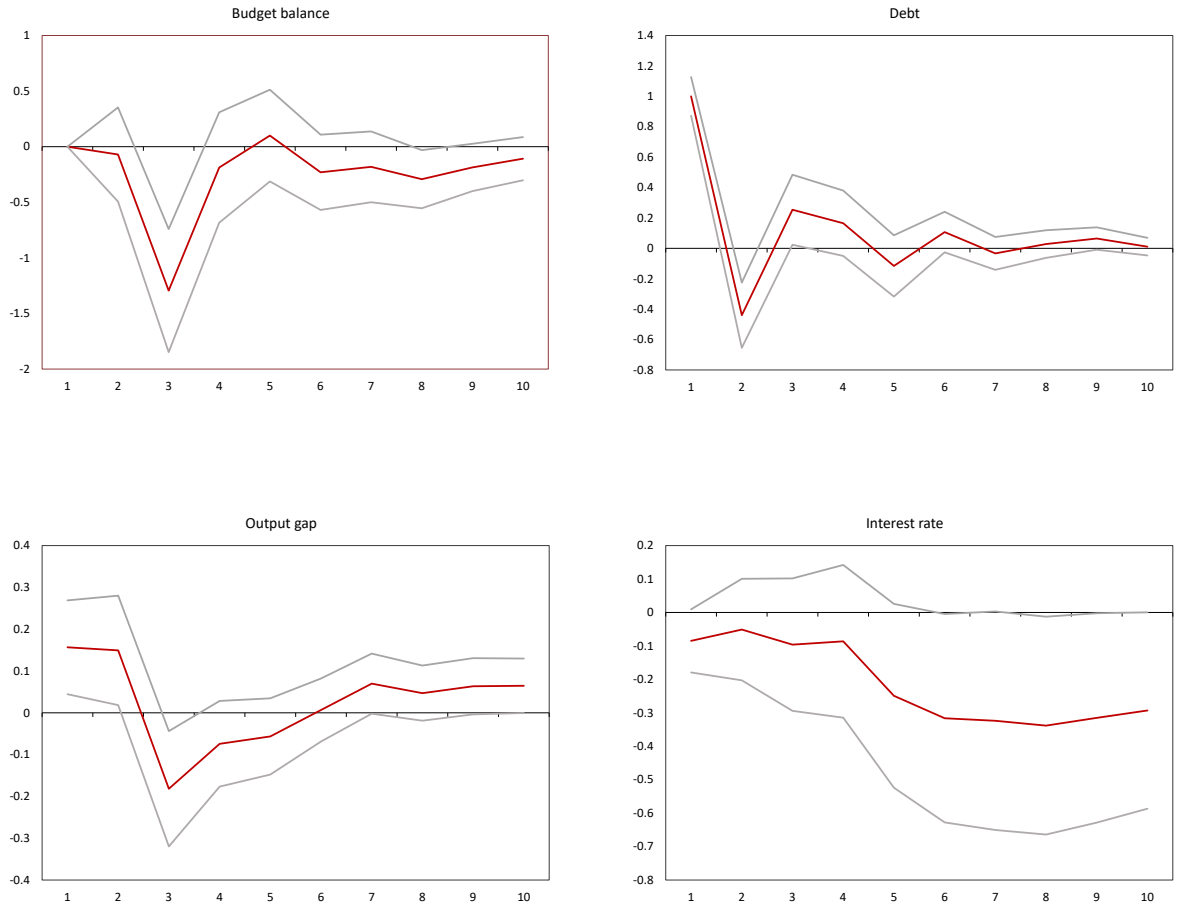


Figure 9: Impulse response functions from a shock to Debt: 2012 - 2019



The monetary policy VAR impulse response functions shows that both repo responses are greater than 0 but less than one. In the first period which is the responsive regime, the peak impact of repo is greater than that of the second period (which is the less responsive regime). However, the peak impact is greater in the latter period impulse responses.

For the fiscal policy VAR, the impulse responses show that the budget balance falls in response to a shock to debt. This suggests that the budget balance does not adjust (rise) in response to a positive debt shock. It therefore does not stabilise debt suggesting that fiscal policy is active in both regimes or periods analysed. However, in the earlier period (2006-2012), the deficit does later on move into a surplus (after about a year) which is consistent with the findings from the markov switch regression that suggests fiscal policy is passive over this period.

5. Conclusion

Since the GFC, the sovereign debt burden has increased in many advanced economies and emerging markets countries. While many countries have adopted fiscal rules to strengthen their fiscal policy, the low-interest rate environment that characterised the post-GFC era meant that much of the increased debt was sustainable since debt servicing costs remained at pre-crisis levels for many sovereign issuers. At the same time, the low inflation prevalent over the same period meant that any concerns regarding potential frictions between the conduct of fiscal and monetary policy respectively were not pertinent. That is until the COVID-induced inflation shock of the 2020s.

Domestically however, questions about the impact of fiscal policy on macroeconomic stability preceded the COVID era amid the steady increase in government debt since 2009. Fiscal policy appears to have attempted to stabilise debt until 2012, by running primary surpluses in order to bring the debt level down. Since then, however, fiscal policy appears to have been less responsive to changes in government debt, as fiscal deficits have persisted despite the rising sovereign debt stock. This change in the responsiveness to the debt level coincides with National Treasury's adoption of the real expenditure ceiling as a fiscal anchor.

Results from estimating a markov switching model (which introduces time variation in the parameters or regime-specific values to capture changes in policy regimes) for a fiscal rule in South Africa, suggest the presence of a somewhat fiscal dominant regime in SA since 2016. Concerns about the emergence of fiscal dominance was around even earlier with studies such as Burger and Marinkov (2012), who also using a markov switching estimation, (but only up until 2010 (from 1972)) find that fiscal policy in SA was passive for most of the period studied. Similarly, a markov regression estimating a monetary policy rule (specifically the Taylor rule as used in the QPM), suggests that monetary policy was generally responsive to inflation over the entire period and appears to be more responsive in the most recent period, where higher inflation is a global challenge. Other studies such as Bold and Harris (2018) and Ajilore and Sylvanus (2013) who also estimate the Taylor rule find that monetary policy in SA has been predominantly active with the response in the policy rate to the deviation of inflation from the target being close to one or even greater than one.

The paper illustrates the importance of the joint determination of fiscal and monetary policy rules, in the spirit of Leeper (1991). Most of the research and analysis on the South African policy rules (Naraidoo and Paya, 2012) tend to focus on an individual policy maker (either monetary or fiscal) and cannot fully capture the macroeconomic effect of monetary and fiscal policy feedback. This paper instead, by using a Markov switching framework, gives a narrative of changes in fiscal and monetary policy rules that explain the different efficacy and effect of monetary and fiscal policy and their changing macroeconomic effects. The evidence of a fiscal dominant regime, suggests that monetary policy may be constrained in attaining its goal of inflation and macroeconomic stability (Blanchard (2004), Sargent et al. (1981)) even if it is itself quite active or responsive to changes in inflation. This analysis also suggests a way forward in defining the form that fiscal and monetary coordination should take. In the framework we have used in the paper, fiscal and monetary policy coordination is the calibration of the parameters of each policy reaction function to jointly minimize macroeconomic fluctuations. This form of coordination does not affect the individual policy goals, and can be achieved by independent policy makers as long as they agree on a common model and have full transparency on each long term policy reaction function.

References

2021. '2020/21 debt management review', *Technical report*, National Treasury of South Africa.

Bassetto, M. 2008. 'Fiscal theory of the price level'. *The New Palgrave Dictionary of Economics* .

Bianchi, F and Ilut, C. 2017. 'Monetary/fiscal policy mix and agents' beliefs'. *Review of economic Dynamics* 26: 113–139.

Blanchard, O J. 2004. 'Fiscal dominance and inflation targeting: lessons from brazil'.

Bold, S and Harris, L. 2018. 'Identifying monetary policy rules in south africa with inflation expectations and unemployment', *Technical report*, WIDER Working Paper.

Bonam, D and Lukkezen, J. 2019. 'Fiscal and monetary policy coordination, macroeconomic stability, and sovereign risk premia'. *Journal of Money, Credit and Banking* 51: 581–616.

Botha, D J S R F, Byron and Steinbach, R. 2017. 'The quarterly projection model of the sarb' .

Buiter, W H. 2002. 'The fiscal theory of the price level: A critique'. *The Economic Journal* 112: 459–480.

Cerutti, E, Claessens, S and Rose, A K. 2019. 'How important is the global financial cycle? evidence from capital flows'. *IMF Economic Review* 67: 24–60.

Cochrane, J H. 2005. 'Money as stock'. *Journal of Monetary Economics* 52: 501–528.

Davig, T and Leeper, E M. 2005. 'Fluctuating macro policies and the fiscal theory' .

Davoodi, E P F A G M D H X L A L W R, Hamid R. and Paulo, M. 2022. 'Fiscal rules and fiscal councils' .

Degasperi, R, Hong, S and Ricco, G. 2020. 'The global transmission of us monetary policy' .

Kalemli-Özcan, e. 2019. 'Us monetary policy and international risk spillovers', *Technical report*, National Bureau of Economic Research.

Leeper, E M. 1991. 'Equilibria under 'active'and 'passive'monetary and fiscal policies'. *Journal of monetary Economics* 27: 129–147.

McCallum, B T. 1984. 'Are bond-financed deficits inflationary? a ricardian analysis'. *Journal of political economy* 92: 123–135.

Naraidoo, R and Paya, I. 2012. 'Forecasting monetary policy rules in south africa'. *International Journal of forecasting* 28: 446–455.

Ndou, E, Gumata, N, Ncube, M and Olson, E. 2013. 'An empirical investigation of the taylor curve in south africa'. *African Development Bank, Tunisia* .

Penalver, A and Thwaites, G. 2006. 'Fiscal rules for debt sustainability in emerging markets: the impact of volatility and default risk' .

Rey, H. 2015. 'Dilemma not trilemma: the global financial cycle and monetary policy independence', *Technical report*, National Bureau of Economic Research.

Sargent, T J, Wallace, N et al. 1981. ‘Some unpleasant monetarist arithmetic’. *Federal reserve bank of minneapolis quarterly review* 5: 1–17.

Taylor, J B. 1993. ‘Discretion versus policy rules in practice’, in *Carnegie-Rochester conference series on public policy*, Elsevier, volume 39, 195–214.

Woodford, M. 2001. ‘Fiscal requirements for price stability’.

Zoli, E. 2005. ‘How does fiscal policy affect monetary policy in emerging market countries?’ .

A Appendix

A1 Markov switching regression results

Below are some additional results of the Markov switching regressions using different sample periods and different specifications.

Table 3: Markov switching regression results for monetary policy rule

Variable	Regime 1	Regime 2
Lagged repo	0.622***	0.972***
Inflation deviation	-1.159***	0.163***
Output gap	0.023	-0.049***
Neutral interest rate	0.617***	-0.016

The independent variable in this regression is the repo rate (or policy rate).
The time period is 2009 to 2021 (this spans the period over the last two governors appointments and when the headline inflation target was implemented.)
*, ** and *** indicate 10, 5 and 1 percent level of significance.

Table 4: Markov switching regression results for fiscal policy rule

Variable	Regime 1	Regime 2
Debt	1.074***	-0.863***
Lagged primary budget balance	0.247**	0.247**
Output gap	0.014	0.014

The independent variable in this regression is the primary budget balance.
The time period is 2014 to 2021 (this spans the period of Lesetja Kganyago's appointment as governor.)
*, ** and *** indicate 10, 5 and 1 percent level of significance.