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Can monetary and fiscal policy account for South Africa's economic stagnation?

Tumisang Loate* and Nicola Viegi†

Abstract

This paper examines the interaction between macroeconomic variables and the fiscal and monetary policy mix between 2012 and 2019, a period characterised by increases in public debt and the sovereign risk premium, and low economic growth. Using a large Bayesian vector autoregression, we find that monetary and fiscal policy fail to account for the observed lower real gross domestic product between 2012 and 2019. Based on the historical relationship between monetary and fiscal policy in South Africa, the results indicate that we should have observed much higher growth, especially during the 2015–2019 period. In addition, we find little evidence that low growth during the period can be explained by the much-criticised "anti-growth" monetary policy.

JEL classification

E63, F41, H68

Key words

Fiscal policy, monetary policy, government debt, risk premium, forecasting

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1. Introduction

At least up until 2014, the South African policy mix after the global financial crisis had been strongly countercyclical, with both monetary and fiscal policy being expansionary. Despite this policy mix and the continued accumulation of debt, economic growth has trended downward since 2011. There is a large debate around the real cause of these economic performances, including negative supply shocks – electricity supply constraints, increasing labour costs and strikes and lower education outcomes among others – and negative demand factors such as low government investment, which has crowded out private investment (Loewald, Faulkner and Makrelov 2020). All these factors resulted in low business and consumer confidence.

Another possibility is that fiscal expansions in emerging markets have a 'speed limit' determined by the accumulation of debt and its effect on the country risk premium and external volatility. When the speed limit is reached, any further expansion has a contractionary effect because the positive effect of increasing government expenditure is dominated by the negative effect of increasing the risk premium and increasing macroeconomic volatility. Thus, while expansionary fiscal policy can stimulate growth in the short run, sustained deficit-financed fiscal expansion over the long run can be contractionary through its effect on savings and investment (Gale and Orszag 2003). In fact, in circumstances where fiscal expansion fails to stimulate economic growth in the short run, the contractionary effects will be acute.

In this paper we investigate the interaction between macroeconomic variables and fiscal and monetary policy mix between 2012Q1 to 2019Q4, a period characterised by increases in public debt and the risk premium, and low economic growth. We divide this period into two sub-periods: 2012 to 2015 where, while debt was increasing and growth declining, the risk premium was still lower than its starting value for most of the period, indicating some level of debt sustainability. The yield on long-term bonds averaged 8%. The second sub-period, between 2015 and 2019, represents a period where the risk premium remained elevated, with the yield on long-term bonds averaging over 9%. In light of these changes in the three variables, we conduct two conditional scenario analyses to answer the following questions: (1) Can we explain the debt-growth dynamics between 2012 and 2019 based on the observed path of real gross domestic product (GDP) and consumer prices or fiscal policy and monetary policy? and (2) Can the high debt and low growth be explained by changes in monetary policy?

Since conditional forecasts are based on the pre-forecast period parameter estimates of the relationship between the variables as captured by the model, any deviation of the forecast from the actual indicates that either the parameters have changed or the economy has experienced bigger or different shocks not captured by the historical data

(Aastveit et al. 2017). More specifically, conditioning on output (alone or with other variables) helps in understanding the co-movement of variables with the business cycle – see Jarociński and Smets (2008), Bańbura, Giannone and Lenza (2015), Aastveit et al. (2017), Giannone, Lenza and Reichlin (2019) and Caruso, Reichlin and Ricco (2019). Jarociński and Smets (2008) look at the extent to which output and interest rate movements can account for the increase in house prices and investment; they also do a structural analysis of the effect of housing demand, monetary policy and term spread shocks on the United States (US) economy. Aastveit et al. (2017) use conditional forecasting to test for parameter instability around the 2008 global financial crisis.

In the second question, we specifically look at the role of monetary policy in explaining the high debt and low growth using counterfactual analysis. The main criticism is that monetary policy has not been accommodative.[1] To analyse this, we impose a hard condition on the policy rate while allowing it to still be endogenous, as argued in Waggoner and Zha (1999). In this regard, the paper is broadly related to the literature that looks at the role of both fiscal and monetary policy in achieving macroeconomic stability. The main argument in this literature is that neither policy exists in isolation. For example, Taylor (1995) argues that lack of fiscal discipline has implications for monetary policy. The author argues that a deterioration of the fiscal position poses credibility risk for the central bank by reducing the effectiveness of price stability policy. On the other hand, King (1995) argues that a shift in monetary policy regime to price stability, such as inflation targeting, has fiscal policy implications. King's argument is that during the transition to the new regime, the decline in inflation expectations lags that of actual inflation (as credibility still needs to be built) resulting in a higher real interest rate and thereby increasing government debt. Bonam and Lukkezen (2019) extend the work by Leeper and show how the crowding-out effect of the risk premium and the fiscal policy stance affects the coordination between monetary and fiscal policy.

We use the Bayesian vector autoregressive (BVAR) model to estimate the interrelationships between the variables.[2] The parameters of the model are estimated using quarterly data from 1990Q1 to 2011Q4. Using these estimated parameters, we conduct conditional forecasts, and observe the following from our results. The first and main observation is that conditioning on both the monetary policy instrument and government debt fails to account for the observed lower real GDP between 2012 and 2019, even when we incorporate more information in the second sub-period. In fact, the gap between the conditional and observed seems to widen. A possible reason for this forecast uncertainty, raised by Clements and Hendry (2008) and emphasised in Ericsson

[1] See Loewald, Faulkner and Makrelov (2019) on the discussion and counter-arguments of this criticism.

[2] Bańbura, Giannone and Lenza (2015) show that conducting scenario or conditional forecasting exercises with large BVAR produces similar results to employing dynamic factor models for the same exercises.

(2008), is a shift in the equilibrium mean of real GDP. The authors argue and show that this 'location shift' in the mean, whether abrupt and temporary or permanent, results in large and systematic forecast errors. This is the case in South Africa, where both supply and demand factors have contributed to the lower-than-expected estimates of output growth (Loewald, Faulkner and Makrelov 2020). In contrast, conditioning on other variables fails to capture the change in output even for the second sub-period where we have updated the conditioning years. The second observation is that we are able to account for the increase in debt from 2012 to 2015 when we condition on real GDP. However, the widening gap between the conditional forecast and actual debt after 2015 indicate that other factors, such as global shocks and political uncertainty, might be more important in explaining the increase in debt through their effects on long-term rates and the risk premium. The start of this forecast sub-period, 2015, coincides with an increase in political and fiscal policy uncertainty, as evidenced by an elevated sovereign risk premium, following the unexpected axing of the then-Finance Minister who was then replaced by an unknown candidate. Lastly, we observe that monetary policy also fails to account for observed low real GDP.

The remainder of the paper is organised as follows. In the next section, we look at some stylised facts before discussing the methodology and data used in Section 3. The results from our conditional forecasting scenario are presented in Section 4 before concluding in Section 5.

2. Economic growth, debt and the risk premium

The traditional view provides a simple framework to understand the direct effects of government debt or deficit on national savings, and income in both the short and the long run.[3] In the short run, expansionary fiscal policy increases disposable income by households and thereby increases consumption and national income. In contrast, in the long run the same fiscal expansion, financed by debt, will reduce national savings, causing interest rates to increase.[4] The increase in interest rates crowds out domestic investment but also attracts capital inflows, causing the local currency to appreciate – a textbook example of the Mundell-Fleming model.

Another possibility, typical of an emerging market, is that the increase in the deficit, and thus accumulation of debt, increases the sovereign risk premium which induces a contraction in output, capital outflow and the depreciation of the local currency, starting a vicious debt cycle. This negative effect of debt on output via the risk premium has been highlighted by Bonam and Lukkezen (2019), among others. The relationship between the risk premium, RP_t, and debt is defined by Equation 1 where the risk premium is a

[3] See Elmendorf and Mankiw (1999).

[4] See Blanchard (1985).

function of public debt and where b_t is the real government bond:

$$RP_t = \chi b_t + \mu_t \tag{1}$$

The parameter χ is the debt-elasticity of the risk premium. When $\chi > 0$, the risk premium is said to be debt-elastic. An increase in debt results in a higher risk premium and thereby an increase in the interest rate on government bonds which further increases debt. In addition, a high risk premium crowds out consumption. The reduction in consumption causes output to decrease and therefore inflation declines. Similar to the traditional view of the effects of government debt on the economy, the inclusion of the risk premium increases interest rates, reduces output either via consumption (Bonam and Lukkezen 2019) or investment (Corsetti et al. 2013) and thereby reduces inflation. On the other hand, when $\chi = 0$, the risk premium is debt-inelastic. We will show that at least after 2010, the relationship between the risk premium and debt became positive. Furthermore, since debt and output have a negative relationship during the same period, the relationship between the risk premium and debt stands irrespective of the causal direction between debt and growth. In contrast to the traditional view, Aktas, Kaya and Özlale (2010) argue that concerns about debt sustainability in an inflation-targeting emerging market can lead to capital outflows and not inflows. An increase in the interest rate still leads to concerns about debt sustainability and thus an increase in the risk premium. But according to the authors, if the risk premium channel dominates the uncovered interest parity condition, which dictates capital inflows, then tight monetary policy induces capital outflows and depreciation of the local currency. Depending on the exchange rate pass-through, there will be upward pressure on inflation, resulting in the 'price puzzle'.[5]

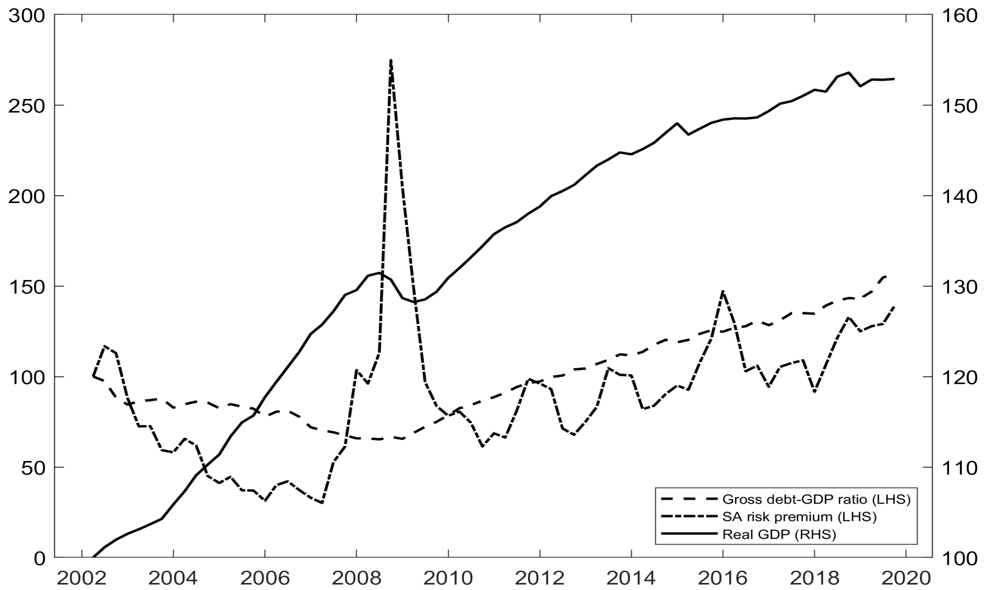
Figure 1 shows the evolution of real GDP, the debt-to-GDP ratio and the risk premium.[6] The start of the graph is dictated by the risk premium data, which only starts in 2002Q2. All variables are indexed to the start period. Before the 2008-09 global financial crisis there was strong economic growth, boosted by the commodity cycle, and both debt and the risk premium were decreasing. During the financial crisis, the risk premium records its first major spike. A decline in real GDP is also noticeable. Economic growth recovery was negatively affected by both local factors, especially power outages, and external factors such as the 2010 to 2012 euro debt crisis. According to government budget records, real economic growth slowed from 3.2% in 2011 to 1.7% and 1.3% in

[5] The price puzzle, which is the observed increase in prices following a contractionary monetary policy action, has been shown to be resolved by controlling for future information about inflation, such as commodity prices (Christiano, Eichenbaum and Evans 1996), or including a larger information set (Bańbura, Giannone and Reichlin 2010).

[6] The risk premium refers to the JP Morgan Emerging Market Bond Index (EMBI+) spread for South Africa which, as argued in Aktas, Kaya and Özlale (2010), is not only driven by local macroeconomic and fiscal fundamentals but also by political news and external factors.

2014 and 2015 respectively.[7]

Figure 1: Real economic growth vs debt-to-GDP vs risk premium



Source: South African Reserve Bank (SARB), JP Morgan, authors' calculations.
Note: All variables are indexed to 100 at the start of the sample period.

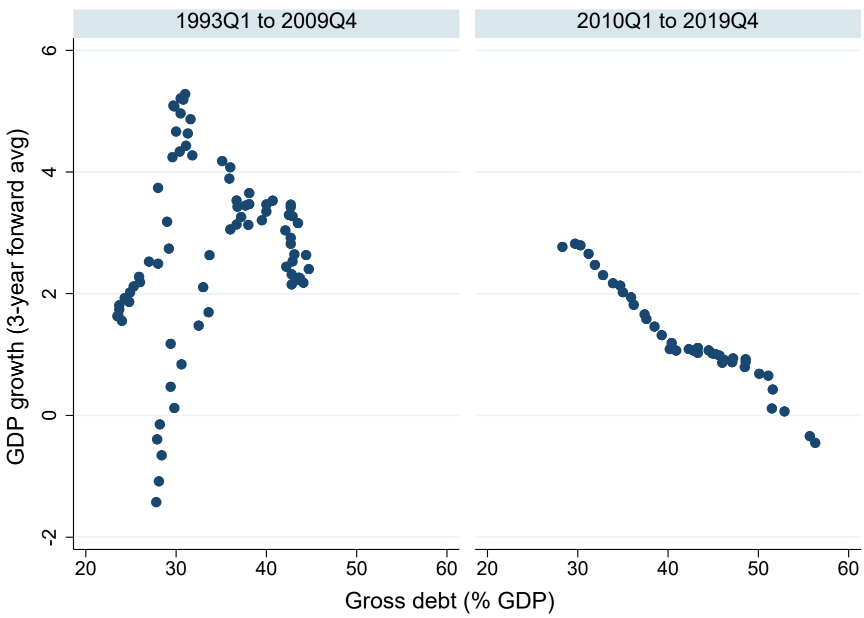
Historical records indicate that for the three years up until 2012, the widening current account was driven by the net dividend payment to non-resident investors and high domestic demand for imports while the trade balance benefited from higher commodity prices. This commodity boom, however, waned from 2012, resulting in lower terms of trade for South Africa. On the other hand, industrial action in the mining and manufacturing sectors together with electricity supply constraints became binding, in the midst of lower global export demand, thereby reversing the trade surplus in 2012 and keeping the trade balance negative during most of the remainder of the sample period. Between 2015 and 2019 the economy was barely growing, with economic growth averaging 0.9%. Electricity supply continued to be a strain on the economy, with economic growth consistently being revised down. Continued low growth resulted in the budget deficit rising as revenue fell while government spending continued to increase to meet social needs and support failing state-owned enterprises. As fiscal sustainability risk increased, borrowing costs also increased, followed by credit ratings downgrades. After years of declining, gross debt to GDP increased from 24% in 2009Q1 to 56% in 2019Q4, surpassing its 2002 ratio level in 2012. Similarly, the risk premium exhibited an upward trend after 2010, and remained elevated especially after 2015.

To further understand the relationship between government debt, economic growth and the risk premium, we evaluate their correlations. Of interest to us is whether there was a

[7] The real GDP data refers to revised figures as mentioned in subsequent *Budget Review* documents by National Treasury.

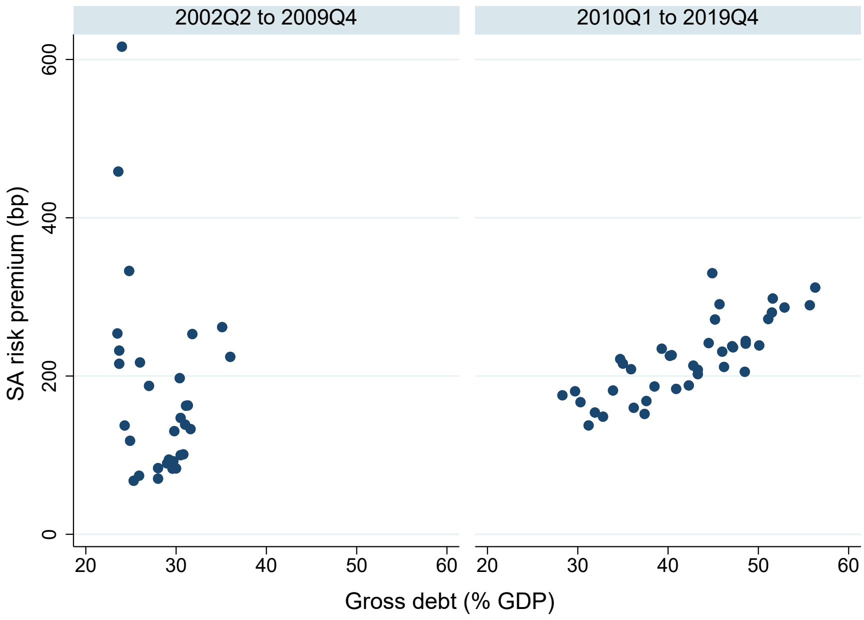
change in this relationship. Based on Figure 1 we consider the correlations before and after 2010, when government debt shifted to an upward trajectory. Figure 2 shows the correlation between real GDP and debt-to-GDP ratio for the period 1993Q1 to 2009Q4 on the left panel and for the 2010Q1 to 2019Q4 period on the right panel. To address the issue of bidirectional causality between debt and economic growth, we use the three-year forward average real GDP growth. The scatter plot for the debt-to-GDP ratio and risk premium in Figure 3 is dictated by the start date of the data for the risk premium. Again, the correlation is also shown for the periods before and after 2010 on the left and right panels respectively. Prior to 2010, the correlations between government debt and real GDP or the risk premium exhibited an unclear relationship. In contrast, there is a clear negative correlation between the debt-to-GDP ratio and real GDP post 2010. Similarly, the relationship between the government debt ratio and the risk premium also changed from unclear to positive after 2010.

Figure 2: Real economic growth and debt-to-GDP ratio



Source: SARB, authors' calculations.
Notes: This figure shows the scatter plot of the three-year forward rolling average for real economic growth and the government debt-to-GDP ratio.

Figure 3: Risk premium and debt-to-GDP ratio



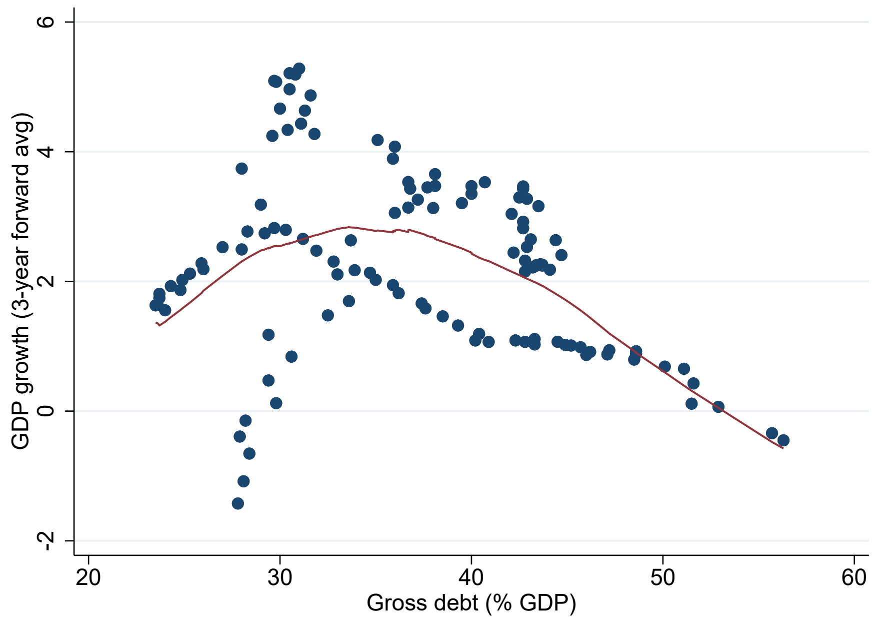
Source: SARB, JP Morgan, authors' calculations.
Notes: This figure shows the lowess regression of the risk premium on government debt-to-GDP ratio. The risk premium is expressed in basis points (bp).

An alternative method to evaluating the correlation between the variables without imposing a structural break in the sample period is to use the lowess-smoothed regression model. The regression allows the scatter plots to be smoothed by giving weights to the closest local points, (Ash, Basu and Dube 2017). To address the issue of bidirectional causality between debt and economic growth, we use the three-year forward average real GDP growth. The correlations are presented in Figures 4 and 5 for real GDP and the risk premium respectively. Starting with economic growth and debt, the lowess-smoothed regression indicates that there is an inverted U-shape relationship between the two variables. We observe a positive relationship between the two variables when debt is below 35% and thereafter the relationship turns negative. Using the five-year forward rolling average yields similar results, as shown in Figure 10 in Annexure B. Additional visual presentation of the contemporaneous relationship between debt-to-GDP ratio and real GDP growth and between debt-to-GDP ratio and three-year lagged average real GDP growth is provided in Figure 11. Since contemporaneous debt cannot have any causal effect on past economic growth, Figure 11 suggests that the causality runs from economic growth to debt. Taken together with Figure 4, the visual presentation of the data indicates that the relationship between the two variables is non-linear and suggests that the causality is bidirectional. These results verify the non-linearity shown by the scatterplot.[8] Similar to economic growth, the results in Figure 5 show that

[8] An alternative way to look at the relationship between growth and debt is through the interest rate-growth differential. For South Africa, we observe an upward trend since 2011, indicating an increase in debt instability. We thank an anonymous referee for the suggestion to also look at the interest

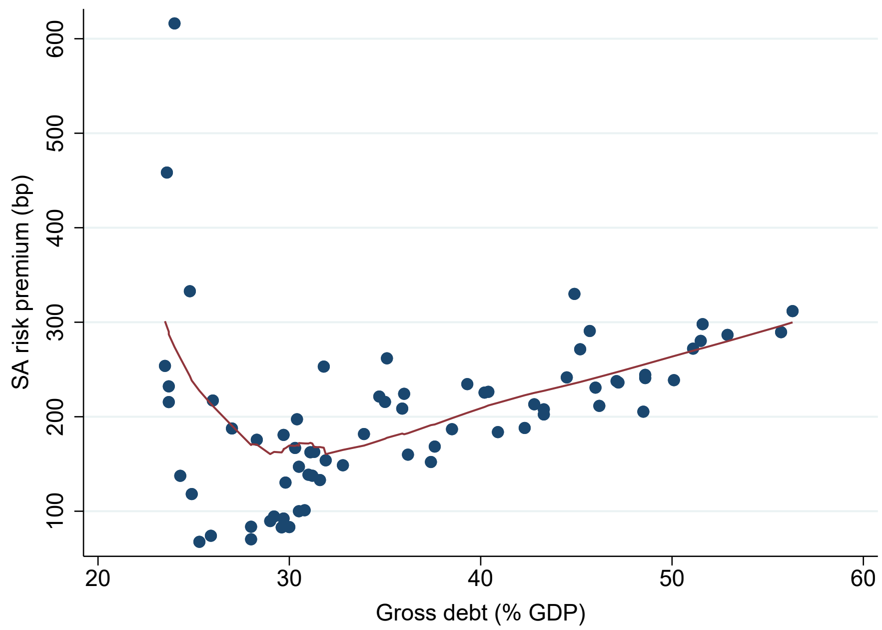
the correlation between government debt and the risk premium also changed from a somewhat negative relationship to a positive relationship.

Figure 4: Lowess plots for real GDP and debt-to-GDP ratio



Source: SARB, authors' calculations.

Figure 5: Lowess plots for risk premium and debt-to-GDP ratio



Source: SARB, JP Morgan, authors' calculations.
Notes: The risk premium is expressed in basis points (bp).

rate-growth differential.

3. Methodology and data

In this section we present the medium-scale BVAR model used by Bańbura, Giannone and Reichlin (2010), who show that it performs as well as the large model with hundreds of variables. We follow the authors and run a medium-sized model with 23 variables. Given our interest in the dynamics between macroeconomic variables and fiscal and monetary policy, we include real and nominal macroeconomic aggregates that proxy local macroeconomic conditions and instruments for fiscal and monetary policy. These variables are in line with those included in large BVAR models, such as in the paper by Ellahie and Ricco (2017), which includes 43 variables. Small fiscal VAR models, such as in Favero and Giavazzi (2007), only include output, inflation and interest rate and fiscal variables – such as total government spending and taxes. Ellahie and Ricco (2017) argue that these small VAR models suffer from fiscal policy foresight, omitted variable bias and heterogeneity in the components of total government spending.[9] Since our study is not concerned with disaggregating the different effects of government spending, we only address the first two issues in selecting our variables. According to Ellahie and Ricco (2017), the general solution to address fiscal foresight, which refers to the response of economic agents to anticipated changes in fiscal policy before the changes are actually implemented, is to include variables that proxy economic agents' expectations about future fiscal policy. Here, we rely on information about the country risk premium, yields on government bonds and inflation expectations to capture agents' expectations about the future of fiscal policy. Empirical work by Mello and Ponce (2020) and Coibion et al. (2023) find a positive relationship between current or future fiscal policy and inflation expectations. For example, Coibion et al. (2023) find that news about future government debt or budget deficits affects household inflation expectations more than current debt and deficits.[10] Lastly, to address the issue of omitting variables which might be important to the transmission of fiscal shocks, Ellahie and Ricco (2017) suggest including variables such as government debt, the budget deficit and financial and credit variables in the model's information set. Thus, in comparison to the model by Ellahie and Ricco (2017), our model can be viewed as a medium-scale fiscal BVAR model.

Real sector variables include real GDP, a measure of employment in the non-agricultural sector and private investment. Price variables include the consumer price index (CPI), inflation expectations for all surveyed participants for the two-year horizon and the following interest rates: monetary policy rate, yields on long-term government bonds for 0 to 3 years, 3 to 5 years, 5 to 10 years and 10+ years. We also include the South African risk premium and the exchange rate, proxied by the United States dollar and South African rand exchange rate. The South African risk premium is proxied by the JP

[9] See Yang (2005) for a detailed discussion of fiscal policy foresight.

[10] In the South African case, Loewald, Faulkner and Makrelov (2020) indicate that real bond yields increased by 2 percentage points despite a decline in inflation and inflation expectations.

Morgan Emerging Market Bond Index (EMBI+), which measures the yields of foreign-denominated government bonds for South Africa (Erb, Harvey and Viskanta 2000). Since South Africa is also a commodity exporter, we include the price indices for coal and precious metals as proxies for commodity prices. Financial and credit variables include South African share and house prices and credit extended to the non-financial sector by domestic banks. We include a measure of monetary aggregate, the M2 money supply. The fiscal variables are government expenditure and tax revenue. We also include government debt and the deficit. These are reconstructed using their respective components as defined in equations 3 and 4 respectively.

Favero and Giavazzi (2007) and Caruso, Reichlin and Ricco (2019) argue for the inclusion of the evolution of government debt in the fiscal VARs to ensure consistency of the empirical VAR model with the dynamic general equilibrium models that impose the government budget constraint. Favero and Giavazzi (2007) argue that the government budget constraint should enter the VAR model as a non-linear function of the variables already in the VAR, since it is a much slower moving variable than its components. According to the authors, failure to include the budget constraint will result in biased estimates if the data captures such constraints. However, the results for linear and non-linear feedback are not that different. Caruso, Reichlin and Ricco (2019) use a linear budget constraint. A multi-country study by Ilzetzki (2011), which also includes South Africa, finds that including the debt feedback equation when analysing fiscal shocks does dampen the effects of the initial shocks due to policy reversals, though the effect is not significant. We have explored both budget constraints and found that the non-linear version captures the dynamics of debt better. In fact, our non-linear debt feedback equation captures the path of actual debt better than in the paper by Ilzetzki (2011). This is because the authors focus on dollar-denominated debt, which is a small fraction of total government debt. All the nominal variables are deflated using the GDP deflator. A description of the variables is provided in Annexure A. The BVAR model is as follows:

$$Y_t = c + A(L)Y_{t-1} + D(L)d_{t-1} + \mu_t \tag{2}$$

where Y_t is a vector of our endogenous parameters, c is a vector of constant parameters and μ_t is the residual which is normally distributed with the covariance matrix Σ. $A(L)$ and $D(L)$ are the coefficient matrices of polynomial with lag order (L) of 4. To construct the counterfactuals for the government debt-to-GDP ratio of GDP (d), we define debt as:

$$d_t = \frac{1 + i_t}{(1 + \pi_t)(1 + \Delta y_t)} d_{t-1} + pd_t \tag{3}$$

where i_t, π_t and Δy_t are the long-term interest rate, proxied by the yields on 10-year+

government bonds, year-on-year inflation and year-on-year real GDP growth. pd_t is the government deficit (as a ratio of GDP) where the deficit, PD_t, is defined as government expenditure less tax revenue.[11]

$$PD_t = G - T \tag{4}$$

The BVAR model is estimated using the Minnesota prior and the sum-of-coefficients prior (see Robertson and Tallman (1999) and Blake and Mumtaz (2012) for a detailed discussion on the two priors). The Minnesota prior incorporates the belief that the endogenous variables in the BVAR follow a random walk process for variables that are stationary or an autoregressive process of order 1, AR(1), for variables that need to be differenced to be stationary. The prior is implemented using the normal inverse Wishart prior, which assumes the coefficients of the BVAR, A_l, are normally distributed while the covariance structure of the error terms, Σ, is inverse Wishart. This prior is incorporated by letting the mean of the BVAR coefficients equal one for stationary variables and zero for the variables that follow the AR(1) process:

$$E_t[(A_l)_{ij}|\Sigma] = \begin{cases} \delta_i & \text{for } i = j \text{ and } l = 1 \\ 0 & \text{otherwise} \end{cases} \qquad Var[(A_l)_{ij}|\Sigma] = \begin{cases} \frac{\lambda}{l} & \text{for } i = j, \forall l \\ \frac{\lambda}{l}\frac{\Sigma_{ij}}{\sigma_j^2} & \text{for } i \neq j, \forall l \end{cases} \tag{5}$$

where δ_i takes the value of 0 or 1. The ratio Σ_{ij}/σ_j^2 is included in the prior standard deviation to account for different measurement units of the variables. The hyper-parameter λ controls the tightness of the prior. For $\lambda \to \infty$ the prior is uninformative and for $\lambda \to 0$ the prior is implemented tightly. The hyper-parameter σ_i is the standard deviation of the error terms of the AR process for each variable on its own lags and is estimated from the sample via ordinary least squares (OLS). The Minnesota prior is implemented by creating dummy variables ${Y^1}_d$ and ${X^1}_d$, using the following equation:

$${Y^1}_d = \begin{pmatrix} diag(\delta_1\sigma_1, ..., \delta_N\sigma_N)/\lambda \\ 0_{N\times(P-1)\times N} \end{pmatrix} \qquad {X^1}_d = \begin{pmatrix} J_P \otimes diag(\sigma_1, ..., \sigma_N)/\lambda & 0_{NP\times 1} \end{pmatrix} \tag{6}$$

where $diag(\delta_1\sigma_1, ..., \delta_N\sigma_N)/\lambda$ and $J_P \otimes diag(\sigma_1, ..., \sigma_N)/\lambda$ governs the prior of the coefficients of the first lag of each variable where $\delta_i = 1$, where $i = 1, ..., N$ for the random walk process. The dummy variables that govern the prior on other lags $0_{N\times(P-1)\times N}$ and $0_{NP\times 1}$ imply a prior mean of 0 (Blake and Mumtaz 2012).

The second prior used in the model is the sum-of-coefficients prior, also known as the no cointegration prior. This prior is used to reflect the belief that the variables in the model follow a random walk process, sometimes with a drift. It is useful especially

[11] While we use constructed data for debt and the deficit, the results are robust to using actual published data for the two variables.

when modeling a relationship between variables with different frequencies, such as macrovariables and financial variables, or stock and flow variables (Caruso, Reichlin and Ricco 2019). The prior is implemented by creating N dummy observations, one for each variable, centered around 1 for the sum-of-coefficients for own lags for each variable and 0 for other variables (Giannone, Lenza and Primiceri 2015). The dummy variables are constructed as follows:

$$Y^2{}_d = \left(\; diag(\frac{\bar{y}_{0,1}}{\tau}, ..., \frac{\bar{y}_{0,N}}{\tau}) \; \right) \qquad X^2{}_d = \left(\; y_d, ..., y_d, 0 \; \right) \tag{7}$$

where $\bar{y}_{0,i}$ where $i = 1, ..., N$ is the mean for each variable calculated using the first p variables. We set $p = 4$. The hyper-parameter τ controls the variance of the prior with $\tau \to \infty$ indicating an uninformative prior and $\tau \to 0$ indicating a tight prior of no cointegration. In order to assign high probability to models in which the variance of the series is explained by the stochastic trend more than it is explained by the deterministic trend (i.e. $c = 0$), the sum-of-coefficients prior is supplemented with dummy variables $Y^3{}_d$ and $X^3{}_d$:

$$Y^3{}_d = \left(\; 0_{1\times N} \; \right) \qquad X^3{}_d = \left(\; 0_{1\times Np} \quad \epsilon \; \right) \tag{8}$$

where the hyper-parameter ϵ is set to a loose prior of 10^6 (Caruso, Reichlin and Ricco 2019). The VAR is estimated in log-levels with the exception of variables in percentages. We use quarterly data from 1990Q1 to 2019Q4. For any conditional forecast starting from period $T + 1$, the forecast is based on parameters estimated using data from 1990Q1 to T.

3.1 Conditional forecasting

So far, we have established the following stylised facts:

1. There was a change in the trend of real GDP growth following the 2008 global financial crisis. At the same time, debt started to increase.

2. The relationship between government debt and real GDP growth changed from positive to negative once debt reached about 35% of GDP, which happened around 2012.

3. The relationship between debt and the risk premium became positive around the same time as the change in the relationship between debt and real GDP growth.

A natural way to proceed, given these stylised facts, is to employ an empirical methodology that would capture these non-linear relationships between the variables – such as a time-varying VAR model, a Markov-switching model with high and low debt states or a threshold-VAR model – and evaluate the effects of monetary and fiscal policy on economic growth. Given the large number of variables in our model, a time-varying approach would ‘aggravate the curse of dimensionality’, as argued in Giannone, Lenza and Reichlin (2019). An alternative way to look at the stability of the relationship between the two policies and economic growth is to use conditional forecasting, following the work by Bańbura, Giannone and Lenza (2015), Giannone, Lenza and Reichlin (2019) and Caruso, Reichlin and Ricco (2019) among others. Conditional forecasting allows the econometrician to project the path of some variables (conditioning variables) on other variables (conditioned variables) in order to see how much the conditioned variables co-move with the conditioning variables (Bańbura, Giannone and Lenza 2015).

We are interested in conducting two out-of-sample conditional scenario analyses to answer the following questions: (1) Can we explain the debt-growth dynamics during the 2012 to 2019 period based on the observed path of real GDP and consumer prices or fiscal policy and monetary policy? And (2) Can the high debt and low growth be explained by changes in monetary policy? Since conditional forecasts are based on the pre-forecast period parameter estimates of the relationship between the variables as captured by the model, any deviation of the forecast from the actual implies that either the parameters have changed or the economy has experienced bigger or different shocks not captured by the historical data. More specifically, conditioning on output (alone or with other variables), as in Bańbura, Giannone and Lenza (2015), Aastveit et al. (2017) and Caruso, Reichlin and Ricco (2019), helps in understanding the co-movement of variables with the business cycle.

On the other hand, using the actual paths of the fiscal variables and monetary policy rate as our conditioning variables helps explain how much of the movement in other endogenous variables can be explained by fiscal and monetary policy. In the second question, we specifically look at the role of monetary policy in explaining the high debt and low growth using counterfactual analysis. The main criticism is that monetary policy has not been accommodative. To analyse this, we impose a hard condition on the policy rate while allowing it to still be endogenous, as argued in Waggoner and Zha (1999). We start the conditional forecast from 2012Q1, the period when the correlation between the debt-to-GDP ratio and real GDP growth changed from positive to negative.

The main limitation of using the conditional-on-observation forecast exercise as opposed to the structural scenario analysis is that it does not allow us to pinpoint or analyse the transmission mechanism of the conditioning variables (Antolin-Diaz, Petrella and Rubio-Ramírez 2021). Nonetheless, we still see this as a valuable exercise which is not complicated by the issue of identifying monetary and fiscal shocks, as is the case for the structural scenario analysis.

4. Results

We start the results with the out-of-sample unconditional forecasts. Since unconditional forecasts extrapolate the trend of the variables based on the estimated model's parameters, a comparison with the realised paths of the variables provides an analysis of how well the model is able to track the data (Bańbura, Giannone and Lenza 2015). We then proceed with our analysis of the conditional forecast to evaluate if the observed path of our variables of interest can be explained by changes in real GDP and consumer prices, our measures of the business cycle. The latter exercise is similar to the work by Caruso, Reichlin and Ricco (2019), Giannone, Lenza and Reichlin (2019) and Bańbura, Giannone and Lenza (2015), although in the latter paper the authors also include a monetary policy instrument as a conditioning variable. We complete our analysis with conditioning on variables used as proxies for monetary policy and fiscal policies – the bank rate and government debt.[12]

For ease of comparison and also to make our results compact, we present the unconditional and conditional forecasts together. In addition, according to Caruso, Reichlin and Ricco (2019), the comparison of the unconditional and conditional forecasts provides an indirect analysis of the co-movement of the conditioned variables with the conditioning variables. We divide our analysis into two periods, 2012Q1 to 2015Q4 and 2015Q1 to 2019Q4. Because we look at the two periods separately, instead of forecasting from 2012 to 2019, the coverage intervals are not as wide. Salient differences between the two forecast periods include the following: much lower growth during the latter, as discussed in Section 2, and higher deficit and yields on long-term government bonds – with yields averaging 8 and 9 percentage points in the first and second sub-periods respectively. Lastly, tax policy and monetary policy were also contractionary during the second sub-period.

4.1 Unconditional forecasts

Figure 6 shows the forecast results for the 2012Q1–2015Q4 period. The solid line shows the actual data, while the dotted line shows the median of the conditional forecast with the 68%, in light shade, and 90%, in dark shade, coverage intervals. The dashed line shows the median of the unconditional forecast. Starting with the conditioning variables, real GDP and consumer prices, the unconditional forecast for consumer prices is very close to its actual path. Similarly, the model tracks the realised path of the two-year ahead inflation expectations. On the other hand, the unconditional forecast for real GDP is higher than the actual. This is unsurprising given the change in the trend of actual real GDP observed in Figure 1. The failure of the model to track actual data is acute for the exchange rate. Unconditional forecasts for the fiscal variables are

[12] We would like to thank an anonymous referee for the suggestion on model validation and general comments on restructuring the results.

higher than their actual paths, especially for debt. For the interest rates, medium-term rates are better forecast than short- and long-term rates.

Figure 7 shows the forecast results for the 2015Q1–2019Q4 period. As in Figure 6, we include both the unconditional and conditional forecasts. Relative to the first forecast period, we observe a widening gap between the forecasts for real GDP and consumer prices and their respective actual paths. Thus, despite the inclusion of more years in the estimation of the model's parameters, which include the decline in real GDP, the model still fails to track actual data. In fact, this persistent deviation of the actual paths from their pre-2015 trends is also observable for inflation expectations, fiscal variables and medium- to long-term rates.

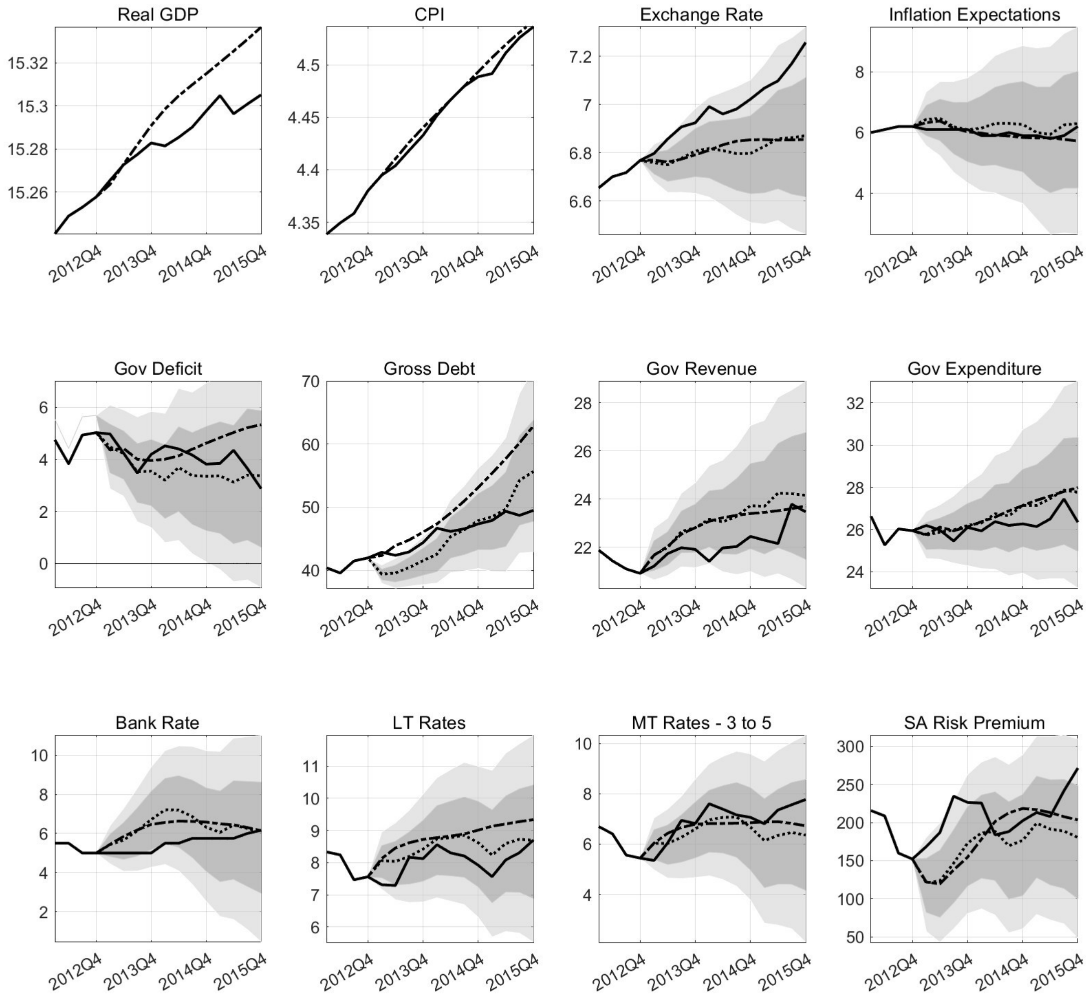
4.2 Conditioning on real GDP and CPI

In this section we focus on the conditional forecasts to establish whether the observed low economic growth can account for the increase in government debt. To answer this question, we condition the forecast of our variables on the realised paths of real GDP and consumer prices, as proxies for the business cycle.

The results for the 2012Q1–2015Q4 sub-period are presented in Figure 6. The results show that conditioning on observed real GDP and consumer prices does not change the forecast for inflation expectations or the exchange rate, relative to the unconditional forecasts. Both the unconditional and conditional forecasts for the exchange rate do not track the actual data well whereas, in the case of inflation expectations, the two forecasts are well predicted by the model. The close movement of both forecasts for these variables indicates that the two variables co-moved with real GDP and CPI during this period. However, the persistent deviation of the exchange rate forecast from its actual path indicates that real GDP and consumer prices cannot account for the depreciation of the local currency during this period. In contrast with the exchange rate, developments in inflation expectations can be explained by changes in real GDP and consumer prices, as evidenced by how well the forecasts track the actual data. The pre-2012 relationship between the conditioning variables and revenue and expenditure seems to continue during this forecast period, as shown by the close movement of both forecasts. However, the conditioning variables account better for the changes in expenditure than in revenue. Real GDP and consumer prices can also account for the increase in debt, at least until mid-2015. Even though the medium- and long-term rates, bank rate and the risk premium co-move with real GDP and CPI, medium- and long-term rates are better explained by real GDP and CPI.

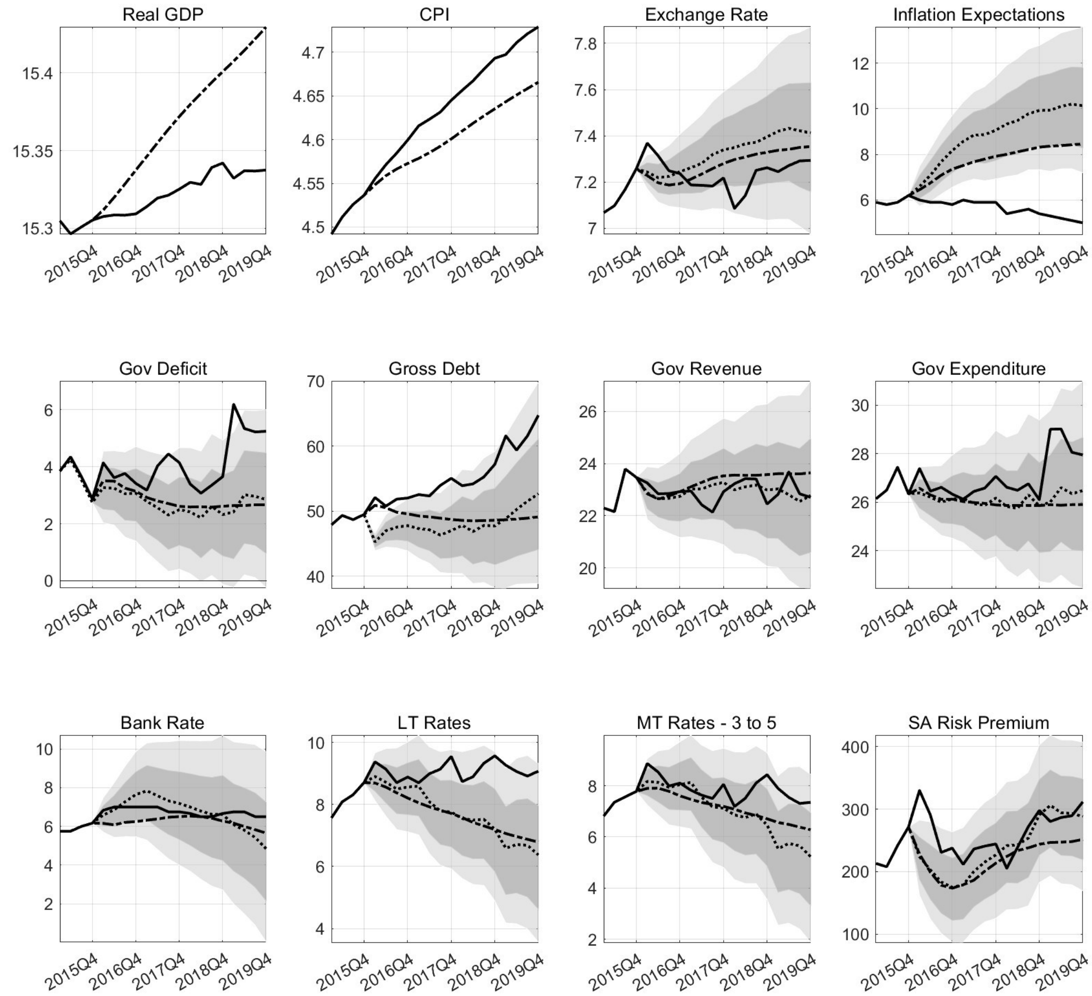
The results for the 2015Q1–2019Q4 sub-period are presented in Figure 7. Starting with the conditional results for the exchange rate and inflation expectations, both variables still co-moves with the conditioning variables, though not as strongly as in the first forecasting period. Unlike in the first forecasting period, the conditioning variables can account for the exchange rate movement, as indicated by the smaller difference between the forecasts and the actual path. Similar results are also obtained for the bank rate and the risk premium. The risk premium, a variable that is easily affected by both local and global shocks, not only co-moves with the conditioning variables but is also better accounted for, especially from 2017 onwards. On the other hand, the deviation of inflation expectations from both forecasts indicates that the variable seems to have decoupled from the conditioning variables. Global and local factors such as the moderation in core and global inflation, weaker exchange rate pass-through, and improved monetary policy credibility have been attributed to the observed decline in inflation expectations during this forecast period (Loewald, Faulkner and Makrelov 2019). The results for medium- and long-term rates indicate that the two variables also co-move with the conditioning variables, more so for the long-term rates. However, actual movement of the long-term rates is not well accounted for by real GDP and consumer prices. In fact, the widening gap between the forecasts and the actual long-term rates from 2017 onwards coincides with similar movements in government debt and the deficit. Do these results suggest that the observed path of government debt can account for the observed long-term rates? We return to this point in the next section. Government revenue is better forecast when we take into account real GDP and consumer prices during this period.

Figure 6: Conditional forecasting on output and prices – 2012Q1 to 2015Q4



Source: Authors' calculations.
Note: This figure shows the conditional forecast for the 2012Q1 to 2015Q4 period. The solid line shows the actual data, and the dotted line (. . .) the median of the conditional forecast with 90%, in light shade, and 68%, in dark shade, coverage intervals. The dashed line (- -) shows the median of the unconditional forecast. Fiscal variables are expressed as percentages of GDP.

Figure 7: Conditional forecasting on output and prices – 2015Q1 to 2019Q4



Source: Authors' calculations.
Note: This figure shows the conditional forecast for the 2015Q1 to 2019Q4 period. The solid line shows the actual data, and the dotted line (. . .) the median of the conditional forecast with 90%, in light shade, and 68%, in dark shade, coverage intervals. The dashed line (- -) shows the median of the unconditional forecast. Fiscal variables are expressed as percentages of GDP.

4.3 Conditioning on interest rate and debt

We repeat the conditional exercise above with the monetary policy rate and government debt as our conditioning set of variables for the two sub-samples. As already indicated, monetary policy was accommodative until 2013, when a hiking cycle started while government debt continued to increase. Similar to the above results, we compare the conditional forecasts to the unconditional forecasts. Even though we condition on government debt, we still estimate the counterfactual based on the conditional forecasts of its sub-components.

The results for the 2012Q1 to 2015Q4 period are shown in Figure 8. The first and main observation is that conditioning on both the monetary policy instrument and government debt fails to account for the observed lower real GDP. In contrast to the results for real GDP, the narrow gaps between the forecasts and actual consumer prices indicate that not only did consumer prices co-move with the conditioning variables, but the two variables can also account for the observed movement in this variable. We also observe that the conditional forecast for the exchange rate is close to its actual path, suggesting that exchange rate movement can be rationalised better, relative to real GDP and CPI, by a combination of the two policies. The conditional forecast for inflation expectations is similar to when we condition on real GDP and consumer prices. For the risk premium and long-term rates, the two variables co-move more with real GDP and consumer prices, as evidenced by the narrower gaps between the unconditional and the conditional forecasts in Figure 6 than in Figure 7. However, while both sets of conditioning variables are able to account for actual movements in the long-term rates, as evidenced by the narrow gaps between the conditional forecasts and actual path, it is conditioning on real GDP and consumer prices that produces results that better capture the actual movements in the risk premium. This is also the case with government revenue and the deficit whereas for government expenditure, both sets of the conditioning variables can account for its actual path.

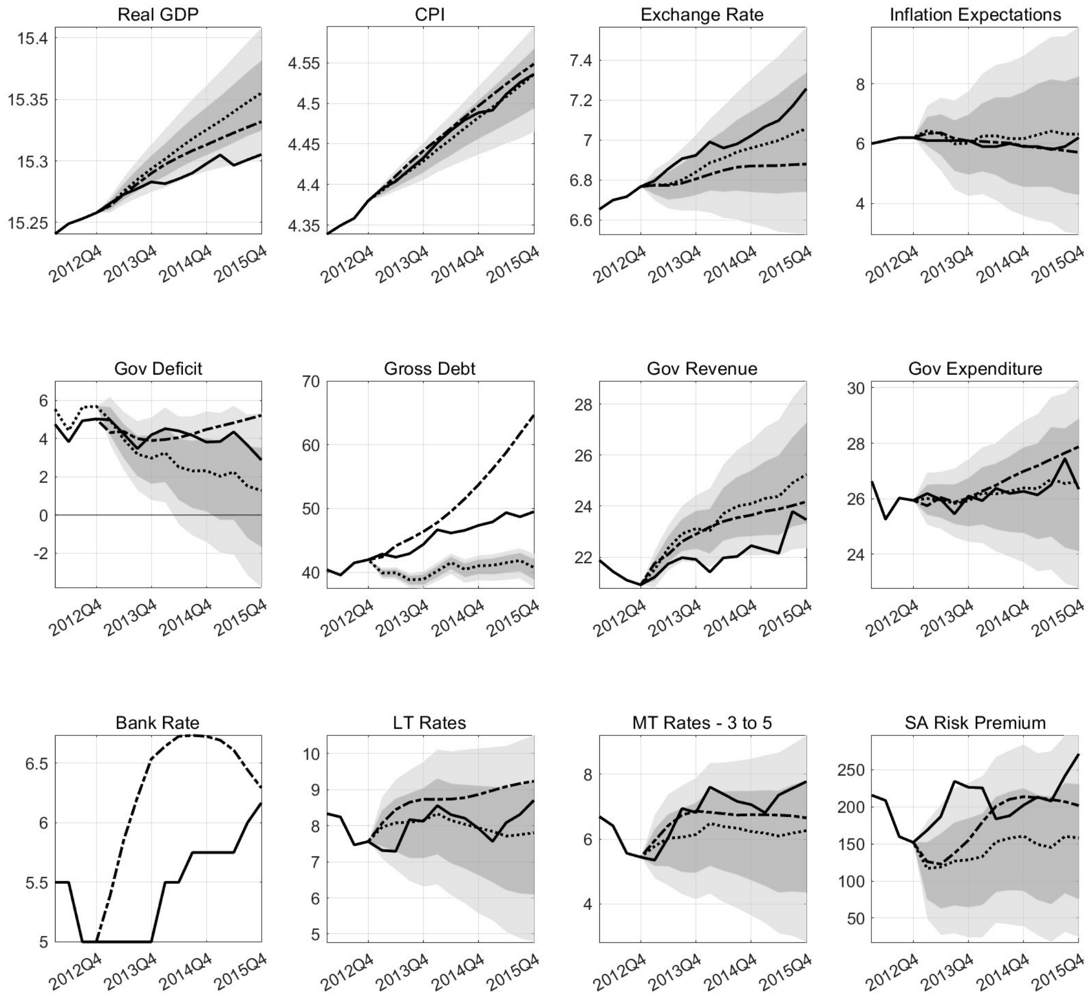
Next, we look at the conditional forecasts for the short-term rate and government debt for the 2015 to 2019 period, proceeding as before with the comparison to unconditional forecasts. The results are presented in Figure 9. Similar to the first forecast period, conditioning on the two variables fails to account for the observed lower real GDP. In fact, the gap between the conditional and the actual path for real GDP widens. The conditioning variables also fail to account for actual consumer prices, a feature of the model that was not present in the first forecast period. The results for the exchange rate, inflation expectations, government debt and revenue and the risk premium are generally similar to those in Figure 7 where we condition on real GDP and consumer prices. Lastly, compared to the conditional forecasts for real GDP and consumer prices, medium- and long-term rates are also better forecast when we condition on short-term rates and debt. However, the persistent gap between the conditional and the actual long-term rates indicate that other factors are important in explaining movements in the long-term rates. According to Soobyah and Steenkamp (2020), the long-term maturity of South African government debt together with the large local currency proportion of the same debt means that global shocks are likely to have a bigger effect on long-term yields as investors seek compensation for the term and exchange rate risk.

What if monetary policy remained expansionary? Lastly, we look at a forecast scenario where we mute monetary policy. We leave the monetary policy rate at 5.5%, the level at the start of the forecast period. This is similar to the scenario forecast analysis by Bańbura, Giannone and Lenza (2015). Keeping interest rates constant directly answers our second empirical question of whether tighter monetary policy, especially after 2014, contributed to the increase in debt. If monetary policy is to blame, then we would expect lower forecasts for government debt and higher forecasts for output. We find that the results remain largely unchanged, as shown in Annexure C. The main conclusion is that imposing a hard condition of a fixed policy rate does not yield better output results nor does it change the forecast for debt.

Overall, our results can be summarised as follows. The first and main observation is that conditioning on both the monetary policy instrument and government debt fails to account for the observed lower real GDP between 2012 and 2019, even when we incorporate more information in the second sub-period. In fact, the gap between the conditional and observed seems to worsen. A possible reason for this forecast uncertainty, put forward by Clements and Hendry (2008) and emphasised in Ericsson (2008), is a shift in the equilibrium mean of real GDP. The authors argue and show that this 'location shift' in the mean, whether abrupt and temporary or permanent, results in large and systematic forecast errors. In contrast, conditioning on other variables fails to capture the change in output even for the latter forecast period where we have updated the conditioning years. This is the case in South Africa, where, both supply and demand factors have contributed to the lower-than-expected estimates of output growth (Loewald, Faulkner and Makrelov 2020). The second observation is that we are able to account for the increase in debt from 2012 to 2015 when we condition on real GDP. However, the widening gap between the conditional forecast and actual debt post-2015 indicates that other factors, such as global shocks and political uncertainty, might be more important in explaining the increase in debt through their effects on long-term rates and the risk premium. The start of this forecast period, 2015, coincides with a period where we observed an increase in political and fiscal policy uncertainty, as evidenced by the elevated sovereign risk premium, following the unexpected axing of the then-Finance Minister who was then replaced by an unknown candidate. The last observation of our results is that monetary policy also fails to account for observed low real GDP.

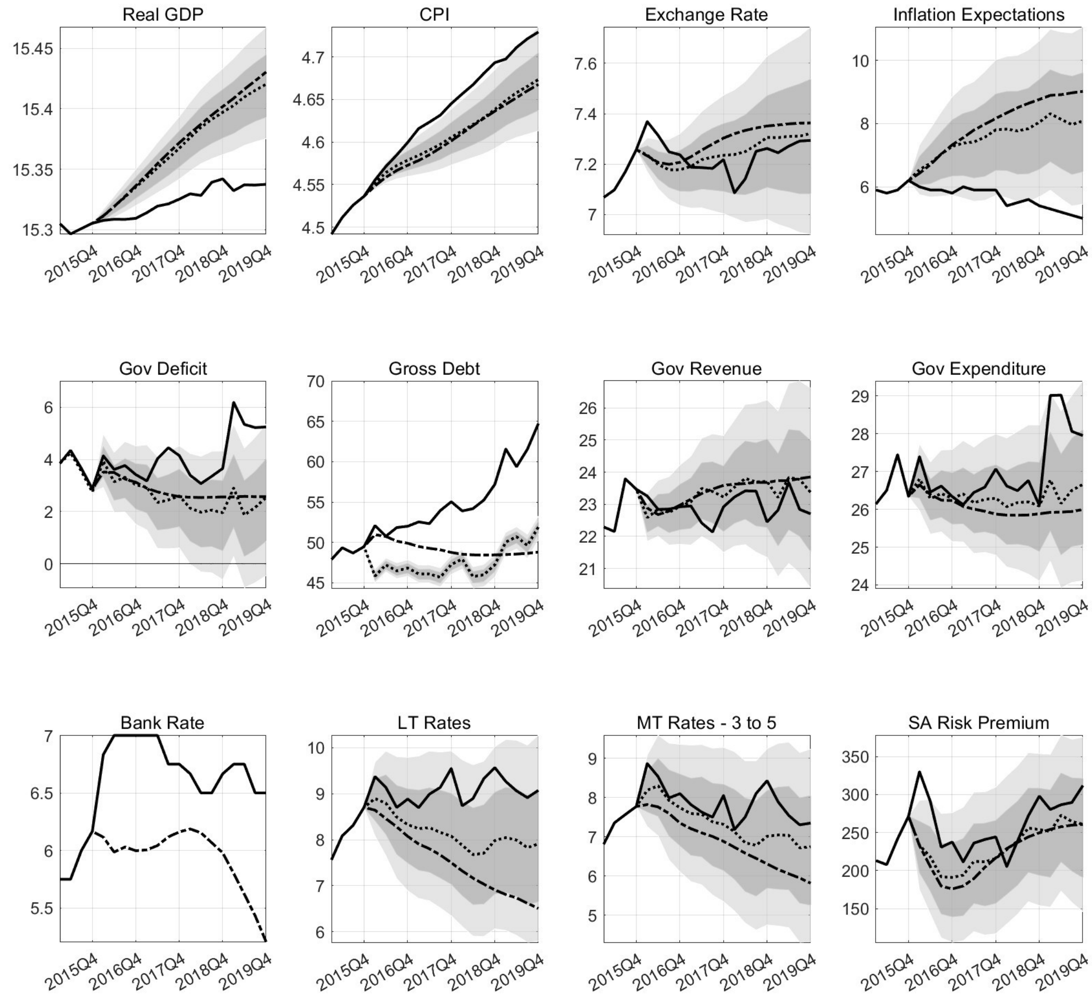
While we do observe some co-movement between the conditioned variables and the observed real GDP and consumer prices, and policy rate and government debt, the conditioning sets fail to account for the observed high government debt or low real GDP growth respectively. This is because correlation does not mean causation, as the conditioning variables can co-move with the conditioned variables due to a response to a common shock. Understanding these correlation versus causation dynamics between our variables of interest would require the use of a structural model or structural scenario analysis as in Antolin-Diaz, Petrella and Rubio-Ramírez (2021). We leave this for future research.

Figure 8: Conditional forecasting on the policy rate and debt – 2012Q1 to 2015Q4



Source: Authors' calculations.
Note: This figure shows the conditional forecast for the 2012Q1 to 2015Q4 period. The solid line shows the actual data, and the dotted line (. . .) the median of the conditional forecast with 90%, in light shade, and 68%, in dark shade, coverage intervals. The dashed line (- -) shows the median of the unconditional forecast. Fiscal variables are expressed as percentages of GDP.

Figure 9: Conditional forecasting on the policy rate and debt – 2015Q1 to 2019Q4



Source: Authors' calculations.
Note: This figure shows the conditional forecast for the 2015Q1 to 2019Q4 period. The solid line shows the actual data, and the dotted line (. . .) the median of the conditional forecast with 90%, in light shade, and 68%, in dark shade, coverage intervals. The dashed line (- -) shows the median of the unconditional forecast. Fiscal variables are expressed as percentages of GDP.

5. Conclusion

In this paper we investigated the interaction between macroeconomic variables and the fiscal and monetary policy mix between 2012 and 2019, a period characterised by increases in public debt and the risk premium, and low economic growth. We applied the BVAR methodology, using data from 1990Q1 to 2011Q4, to conduct two out-of-sample conditional scenario analyses to answer the following questions: (1) Can we explain the debt-growth dynamics during the 2012 to 2019 period based on the observed path of real GDP and consumer prices or fiscal policy and monetary policy? And (2) Can the high debt and low growth be explained by changes in monetary policy?

We looked at two forecast periods, 2012 to 2015 and 2015 to 2019, and found the following. The first and main observation is that conditioning on both the monetary policy instrument and government debt fails to account for the observed lower real GDP between 2012 and 2019, even when we incorporate more information in the second sub-period. A possible reason in the literature for this forecast uncertainty is a shift in the equilibrium mean of real GDP, which, whether abrupt and temporary or permanent, can result in large and systematic forecast errors. In contrast, conditioning on other variables fails to capture the change in output even for the second sub-period where we updated the conditioning years. Secondly, we are able to account for the increase in debt in the first forecast period when we condition on real GDP. However, the widening gap between the conditional forecast and actual debt post-2015 indicates that other factors, such as global shocks and political uncertainty, might be more important in explaining the increase in debt through their effects on long-term rates and the risk premium. Lastly, monetary policy also fails to account for observed low real GDP. Understanding these correlation versus causation dynamics between our variables of interest would require the use of a structural model or structural scenario analysis. We leave this for future research.

Annexures

A. Data description

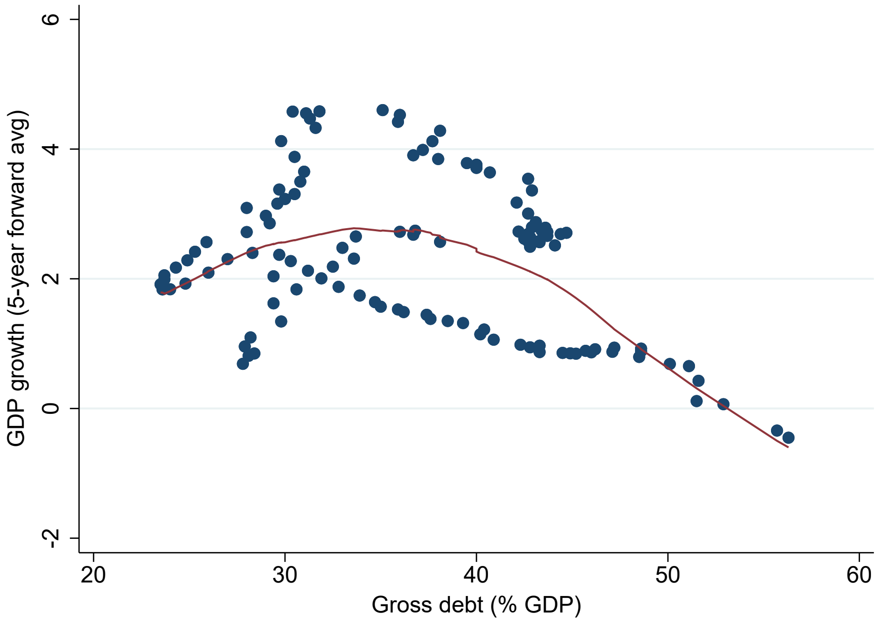
This section provides a description and transformation of the data used in the paper. All the data, except the GDP deflator, South African risk premium, precious metals and coal indices data, was obtained from the SARB. Nominal variables were deflated using the GDP deflator. Precious metals and coal indices are from the International Monetary Fund's external data indices file. The data for credit to the private sector, real house prices and share prices are obtained from the Federal Reserve Economic Data (FRED) by the Federal Reserve Bank of St. Louis. Where applicable, the mnemonic or identity of the data is provided in brackets as indicated by the source of the data. R million is millions in South African local currency (rand).

Inflation (KBP7170A): average of the monthly total consumer prices (all urban areas). The variable is measured in percentage. **Bank rate (KBP1401M)**: average of the monthly bank rate (lowest rediscount rate at SARB). The variable is measured in percentage. **Exchange rate (KBP5339M)**: average of monthly foreign exchange rate: SA cents per USA dollar middle rates (R1 = 100 South African cents). The variable is measured in South African cents. **Long-term rates (KBP2003M)**: average of the monthly yield on loan stock traded on the stock exchange: Government bonds - 10 years and over. The variable is measured in percentage. **Consumer price index (KBP7170N)**: average of the monthly total consumer prices (all urban areas). The variable is an index. **Gross debt-to-GDP ratio (KBP4116K)**: total gross loan debt of national government as percentage of GDP. **Government deficit (KBP4420K)**: national government deficit/surplus as a percentage of GDP. **Government expenditure (KBP4434K)**: national government expenditure as percentage of GDP converted to R million using nominal GDP and then deflated. **Government revenue (KBP4433K)**: national government revenue as a percentage of GDP converted to R million using nominal GDP and then deflated. **South African risk premium**: South African JP Morgan Emerging Market Bond Index (EMBI+) strip spread – which is the difference in yields between dollar denominated South African debt and US debt of equal maturity – measured in basis points. **GDP deflator**: Calculated using nominal and real GDP and re-indexed to 2015Q1. **Real gross domestic product (KBP6006D)**: GDP at constant 2015 prices measured in R million. **Nominal GDP (KBP6006L)**: GDP at market prices, current prices. Seasonally adjusted at an annual rate and measured in R million. **Credit to private sector (CRDQZABPUBIS)**: credit to private non-financial sector by domestic banks and measured in R million. Seasonally adjusted. **Real house prices (QZAR628BIS)**: real residential property prices for South Africa, index 2010=100. Seasonally adjusted. **Share prices (SPASTT01ZAQ661N)**: total share prices for all shares for South Africa, index 2015=100. Seasonally adjusted. **M2 money supply (KBP1373M)**: average of the monthly M2 monetary aggregate and measured in R million. Seasonally adjusted.

Precious metals price index: precious metals price index, 2016 = 100, includes gold, silver, palladium and platinum price indices, averaged to quarterly. **Coal price index**: coal price index, 2016 = 100, includes Australian and South African coal, averaged to quarterly. **Inflation expectations - two years (KBP7125K)**: inflation expectations of all surveyed participants (business, professional forecasters and trade unions): two years ahead. Measured in percentages. **Employment index (KBP7009L)**: total employment in the non-agricultural sectors. **Private investment (KBP6109D)**: gross fixed capital formation: private business enterprises (investment) in 2015 prices and measured in R million. **Medium-term (MT) rates - 5 to 10 years (KBP2002M)**: average of the monthly yield on loan stock traded on the stock exchange: government bonds – 5 to 10 years and measured in percentage points. **MT rates - 3 to 5 years (KBP2000M)**: average of the monthly yield on loan stock traded on the stock exchange: government bonds – 0 to 3 years and measured in percentage points. **MT rates - 0 to 3 years (KBP2001M)**: average of the monthly yield on loan stock traded on the stock exchange: government bonds – 3 to 5 years and measured in percentage points.

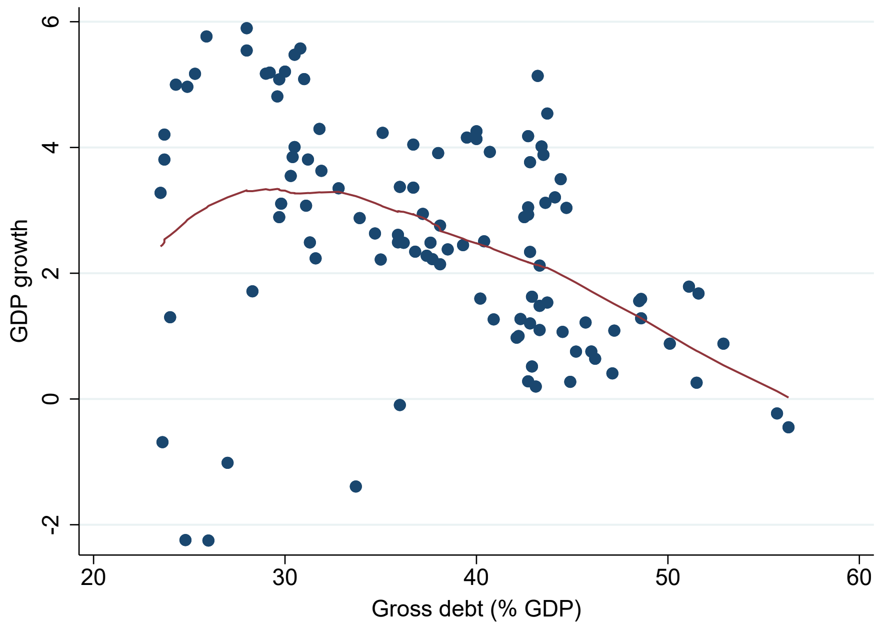
B. Additional figures

Figure 10: Lowess plots for real GDP and debt-to-GDP ratio

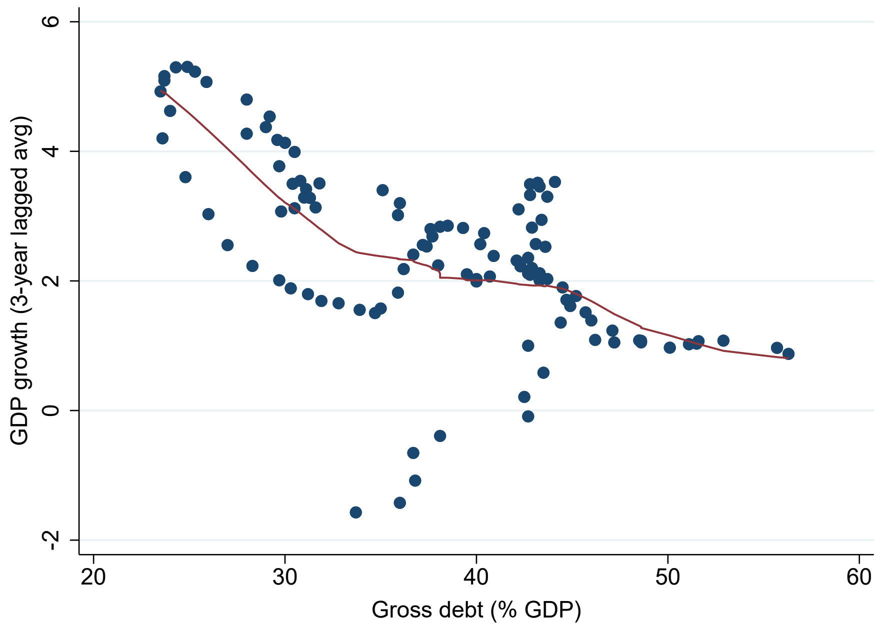


Source: Authors' calculations.
Note: The figure shows the lowess regression of the five-year forward rolling average for real economic growth on government debt-to-GDP ratio.

Figure 11: Real economic growth and debt-to-GDP ratio



(a) Contemporaneous real GDP growth

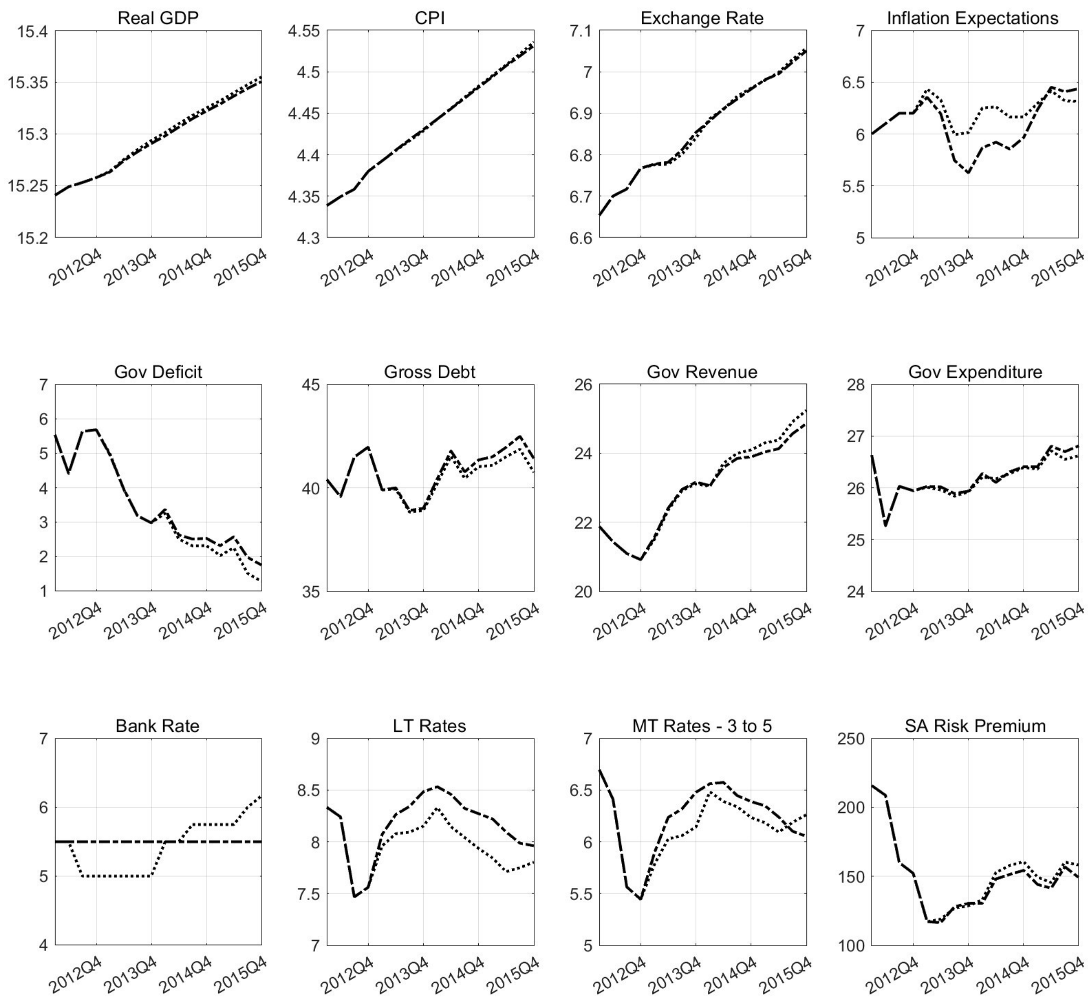


(b) Lagged real GDP growth

Source: Authors' calculations.
Note: The figure shows the lowess regression of the three-year forward rolling average for real economic growth on government debt-to-GDP ratio.

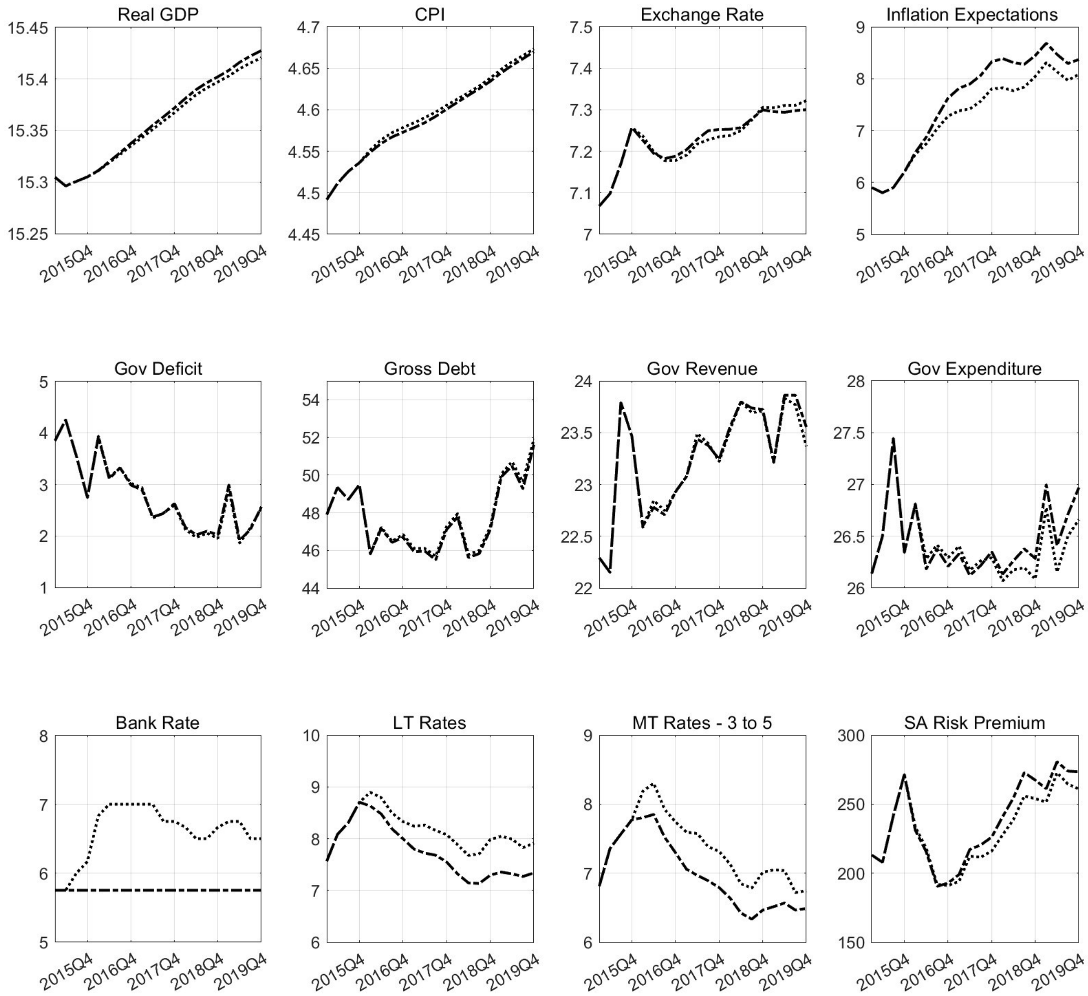
C. Additional results

Figure 12: Conditional forecasting on the policy rate and debt – 2012Q1 to 2015Q4



Source: Authors' calculations.
Note: This figure shows the conditional forecast for the 2012Q1 to 2015Q4 period. The dotted line shows the median of the conditional forecast as in Figure 8. The dashed line shows the median of the conditional forecast when we impose no change in monetary policy rate.

Figure 13: Conditional forecasting on the policy rate and debt – 2015Q1 to 2019Q4



Source: Authors' calculations.
Note: This figure shows the conditional forecast for the 2012Q1 to 2019Q4 period. The dotted line shows the median of the conditional forecast as in Figure 9. The dashed line shows the median of the conditional forecast when we impose no change in monetary policy rate.

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