Macro-financial implications of public debt in South Africa

The role of financial regimes

Theshne Kisten*

June 2023

United Nations University World Institute for Development Economics Research

wider.unu.edu

Abstract: This paper examines the role of financial frictions in the public debt–growth nexus, documenting that a public debt shock has different macro-financial implications dependent on the state of financial markets in South Africa. A non-linear vector autoregression model is estimated which allows the transmission mechanism to be characterized by two distinct financial regimes: stressful versus normal. The empirical results suggest that a public debt shock has a broadly insignificant impact on economic growth over the full sample, reflecting the ineffectiveness of government borrowing in stimulating the economy, and could suggest that the high and growing debt service costs faced by the government reduces funds available for investment purposes. Debt shocks are found to be deflationary in both regimes, lending support to the precautionary savings effect and the existence of a well-developed financial market, while interest rates decline with the immediate impact being moderately larger in the stress regime, providing evidence of the accommodative stance between fiscal policy and monetary policy. In response to a public debt shock, financial conditions show an immediate and transitory improvement in the high-stress regime; however, in the low-stress regime there is an immediate yet negligible improvement in financial conditions. Lastly, the responses evolve over time, with fiscal policy being less effective in stimulating the economy in the post-crisis period, but it has been effective in reducing financial stress in the high-stress regime.

Key words: public debt, financial regimes, South Africa, vector autoregression

JEL classification: C32, E62, G10, H63

1 Introduction

The global financial crisis of 2007–08 and the subsequent economic meltdown played a significant role in shaping the public debt trajectory of many countries. In particular, rising costs associated with stabilizing the economy after the recession fuelled the public debt surge. As such, there has been renewed interest in the relevance and extent of public debt in facilitating economic growth and development. While the macroeconomic impact of government debt continues to be an area of ongoing debate, recent studies have highlighted the significant role of financial markets in business cycle fluctuations (Ng and Wright 2013; Reinhart and Rogoff 2009). In particular, the pervasiveness of financial instability is thought to propagate shocks in a non-linear way, amplifying negative supply and demand shocks (Bernanke et al. 1999; Brunnermeier and Sannikov 2014; Brunnermeier et al. 2012; Gertler and Kiyotaki 2010).

Stress in financial markets is often characterized by a deterioration in the quality of assets held by financial institutions, as the combination of growing non-performing loans and negative sentiment in the markets depresses the value of other financial assets. In some cases financial market turmoil or issues with banks' balance sheets may hamper credit extension to other sectors and induce a recession. All of this poses a new challenge to the effectiveness of fiscal development and policies, as the state of financial markets may influence the macro-financial impact of public debt. Recent studies, albeit limited, have focused only on advanced and industrialized countries in emphasizing the critical role of financial markets in the debt–growth nexus (Afonso et al. 2018; Mittnik and Semmler 2013; Proano et al. 2014). Given this background and to narrow the gap in the literature, this paper examines whether and the extent to which the state of financial markets influences the transmission of public debt shocks within a small open emerging market economy, in this case South Africa.

To quantify the extent to which aggregate financial conditions influence the effectiveness of fiscal policy in South Africa, a non-linear (threshold) vector autoregression (VAR) model is estimated with quarterly fiscal, macro, and financial data covering the period 1995Q1 to 2020Q3. In addition, time variation is allowed in the estimation process, and to capture the potential change in dynamics based on the two distinct phases of the evolution of public debt the full sample is partitioned into two sub-samples which capture the pre- and post-crisis period (i.e. 1995Q1–2007Q4 and 2008Q1–2020Q3), and a model is estimated for each. The threshold VAR model proposed by Alessandri and Mumtaz (2017) is employed in this study, which allows the transmission mechanism to be characterized by two distinct financial regimes (i.e. financially stressful versus normal periods) based on a measure of financial instability, namely the South African Financial Stress Index (SAFSI) (Kisten 2021). In particular, the economy is in a stressful financial state when the estimated threshold variable represented by the lag of SAFSI rises beyond an endogenously estimated threshold value. As such, this paper contributes to the South African literature on the economic implications of public debt shocks by examining whether, and the extent to which, financial market conditions influence the debt–growth nexus and hence the effectiveness of fiscal policy.

Broadly, the empirical results reveal that a public debt shock has different implications for the South African economy based on the state of financial markets. In particular, following a one standard deviation increase in public debt: (1) output does not respond significantly in both regimes; (2) prices fall in both regimes, lending support to the precautionary savings effect; (3) interest rates decline, with the immediate impact being moderately larger in the stress regime; (4) there is an immediate and transitory improvement in financial conditions in the high-stress regime and a negligible improvement in financial conditions in the low-stress regime; (5) the responses evolve over time, with fiscal policy being less effective in stimulating the economy in the post-crisis period, but being effective in reducing financial stress in the high-stress regime.

The remainder of the paper is organized as follows: Section 2 provides a review of the literature on the economic impact of public debt; Section 3 briefs the evolution of public debt and economic growth in South Africa; Sections 4 and 5 respectively outline the data and model specifications, while the empirical findings are reported and discussed in Section 6. Section 7 concludes.

2   Literature review

Theoretically, divergent views are discussed regarding the economic effects of public indebtedness. While classical economists are of the view that a rise in public borrowing has an adverse impact on the economy based on the crowding-out effect, Keynesian economists oppose this view in support of public debt induced by bond-financed fiscal policy potentially stimulating domestic economic activity by boosting income levels, investment, and output. According to the traditional or classical view, fiscal intervention is justifiable only in extreme circumstances such as natural disasters or wars, emphasizing the otherwise unproductive role of government in economic development due to the diversion of resources from productive private sector activities to non-productive uses, thus adversely affecting the accumulation of capital and the growth and development of the economy (Tsoulfidis 2007). However, the ideas of the classical doctrine were considered inappropriate for a modern capitalist economy and hence often ignored in the history of economic thought. Since the Great Recession of 1936, the Keynesian school of thought that favours demand-driven government intervention has gained popularity. In particular, the positive relationship between national debt and economic growth depends on the extent to which debt-financed government spending is directed towards productive activities such as public infrastructure, subject to a debt sustainability constraint. According to the Keynesian approach, public borrowing is justified on the basis of public authorities correcting for economic and social imbalances and fostering the upward evolution of the economy. Furthermore, conventional theory suggests that foreign borrowing is necessary to fill the gap between domestic savings and investment, and will stimulate aggregate demand in the short run and encourage increased national output (Saungweme and Odhiambo 2018).

The Ricardian equivalence theory, revitalized by Barro (1989), departs from the standard paradigm in postulating that changes in government spending and hence public indebtedness have no real impact on economic growth, since an increase in government dissaving is matched by an increase in private saving. To the extent that public debt is sustainable, it has no detrimental economic consequences, as national debt is repaid through future taxation, so the shift between taxes and deficits does not produce aggregate wealth effects.[1] Hence the Ricardian hypothesis is based on the assumption that economic agents are rational and have perfect foresight about the future.

During the mid-1980s the developing world was confronted by a debt crisis in which highly indebted developing countries were unable to repay their debts. This resulted in financial rescue operations facilitated by the World Bank, encouraging creditors to restructure the terms of the debts and/or engage in involuntary lending with debtor countries. This gave rise to the debt overhang theory proposed by Krugman (1988), and the resultant shift in international debt management.[2] Krugman (1988) argued that

---

[1] Studies that have focused on the sustainability of state debt include, for example, Bohn (1998), Afonso (2005), Burger et al. (2012), Calitz et al. (2014), and Pradhan (2016). Focusing on the South African economy, Burger et al. (2012) find that the government has achieved sustainable fiscal policy since 1946 through increasing surplus in response to rising debt or reducing the primary deficit. However, Calitz et al. (2014) postulate that South Africa's discretionary fiscal policy decisions post-global financial crisis might pose a serious threat to its fiscal policy sustainability, unless the authorities respond as they did in the past by promptly controlling the budget deficit and public debt burden.

[2] Debt overhang refers to a situation of an entity that has inherited debt so large that it cannot attract voluntary new lending to repay the debt.

a heavy debt burden acts as a tax on future output as well as a disincentive to savings and investments as the marginal benefit of investment will go to the creditor. Debt overhang theory was criticized by Hofman and Reisen (1991), who attributed the low levels of investment by highly indebted developing countries to liquidity constraints rather than debt overhang. They argue that debt service costs reduce funds available for investment purposes, hence restraining investment.

The late 1980s and 1990s witnessed considerable empirical literature predominantly analysing the impact of public debt on economic growth. The majority of these studies were initially focused on Latin American countries, following the debt crisis experienced by these countries during the 1980s, with a general consensus on the negative debt–growth relationship (Geiger 1990; Hojman 1986). These findings were later corroborated by studies for African countries, inclusive of South Africa, including Amoateng and Amoako-Adu (1996), Fosu (1999), Iyoha (1999), and more recently Hussain et al. (2015) and Akinkunmi (2017). For example, while Iyoha (1999) reveals evidence of debt overhang in Sub-Saharan African countries, specifically that rising external debt depressed investment, Fosu (1999) finds minimal evidence of a negative debt–growth relationship. Offering a different perspective for a panel of countries (including South Africa), Reinhart and Rogoff (2010) and Eberhardt and Presbitero (2015) find that public debt is harmful to economic growth only above a certain threshold, with the threshold estimated to be 90 per cent of GDP. More recently, Sanusi et al. (2019) documented that public debt has long-run expansionary effects in the Southern African Development Community (SADC) countries, but only below an estimated threshold of 57 per cent of GDP (much lower than the previous studies). Contrary to the above studies that employ a panel approach and fail to account for structural breaks such as the global financial crisis of 2007, Mhlaba and Phiri (2019) focus specifically on the South African economy, finding a negative relationship between national debt and economic growth, with the impact being stronger in the post-crisis period (i.e. 2007–16). These findings were also supported by Ncanywa and Masoga (2018), confirming the existence of a negative impact of public debt on investment and ultimately economic growth in the long run, aggravated by persistently high levels of debt.

A limitation of the previous emerging market studies is that they do not account for financial frictions in the transmission of a public debt shock on the economy. Financial markets play a significant role in business cycle fluctuations, as is evident from, for example, the financial crisis and subsequent Great Recession of 2008–09, which was accompanied by weaker recoveries (Ng and Wright 2013; Reinhart and Rogoff 2009).[3] Rising costs associated with stabilizing the economy post-crisis have played a significant role in shaping the public debt trajectory of many countries. This has revealed that financial markets, macro-dynamics, and the effects of public debt are strongly interrelated. The pervasiveness of financial instability, for instance credit frictions, is thought to propagate shocks in a non-linear way, amplifying negative supply and demand shocks (Bernanke et al. 1999; Brunnermeier and Sannikov 2014; Brunnermeier et al. 2012; Gertler and Kiyotaki 2010). Specifically, the 'financial view' of the transmission mechanism proposed by Bernanke et al. (1999), commonly known as the 'risk-premium effect', postulates that high financial stress which raises the probability of defaulting results in an increase in risk premium of external finance, raising the cost of borrowing and negatively impacting firms' investment, and through second-round effects reducing net worth. All of this poses a new challenge to the effectiveness of fiscal policies, as the state of financial markets may influence the macroeconomic impact of public debt.[4]

---

[3] Specifically examining the non-linear impact of financial shocks, Hollo et al. (2012), van Roye (2014), Hubrich and Tetlow (2015), Balcilar et al. (2016), Aboura and van Roye (2017), and Chatterjee et al. (2017) document differing economic dynamics during stressful and normal times in the financial system.

[4] Several structural New Keynesian dynamic stochastic general equilibrium (NK-DSGE) studies that have incorporated the financial accelerator mechanism proposed by Bernanke et al. (1999) have documented the role of financial stability in influencing fiscal policy. These studies (e.g., Carrillo and Poilly 2013; Fernández-Villaverde 2010) find that fiscal multipliers are higher under financial instability and the economic impact of fiscal stimulus is amplified by a fall in real interest rates and access to cheaper credit. Similar results for the South African economy were recently documented by Makrelov et al. (2018),

Recent studies, albeit limited, have focused on advanced and industrialized countries, in emphasizing the critical role of financial markets in the debt–growth nexus (Afonso et al. 2018; Mittnik and Semmler 2013; Proano et al. 2014). For example, Afonso et al. (2018) evaluate the non-linear impact of public debt on economic growth within a threshold vector autoregression (TVAR) framework on a panel of advanced countries. The authors find that in a high financial stress regime an increase in the debt–GDP ratio has a positive and larger impact on output growth, whereas a financial shock has a negative effect on output and worsens the fiscal situation. Contrary to Afonso et al. (2018), Proano et al. (2014) find that during times of high financial stress increasing debt impairs economic growth. The current paper contributes to this area of the literature, specifically focusing on a small open emerging market economy: South Africa. In particular, the role of financial frictions in the transmission of public debt shocks to the real economy is examined, which could potentially help policy-makers frame their debt management policy, dependent on the state of the economy.

3   Overview of public debt and economic growth in South Africa

In the immediate post-Apartheid period the South African government was confronted with a large national debt burden, driven mainly by extensive domestic borrowing and a foreign debt standstill since the 1980s. Following this, a number of economic growth strategies were implemented in the country, starting with the Reconstruction and Development Programme (RDP) in 1994, the Growth, Employment and Redistribution (GEAR) policy in 1996, the Accelerated and Shared Initiative for South Africa (ASGISA) in 2005, New Growth Path Framework in 2010, and the National Development Plan (NDP) in 2011 (for more detail, refer to Saungweme and Odhiambo (2018)). These large-scale expenditure programmes were accompanied by the government's commitment to reducing the high levels of public debt as well as increased private sector participation in national development, which contributed to the positive economic growth rates recorded in the country between 1995 and 2008.

Figure 1 displays the trends in public debt, proxied by two measures: total gross and net loan debt[5] of the national government, and economic growth over the period 1995Q1–2020Q3. Economic growth is reflected by the year-on-year growth rate of real gross domestic product, while debt is expressed as a percentage of the size of the economy or GDP, reflecting the sustainability of the country's debt burden. In particular, a rise in a country's debt burden as a percentage of GDP is reflective of the government's inability to consolidate the budget balance. This has been the case of South Africa following the 2008 global financial crisis, which saw a sharp and consistent increase in the debt–GDP ratio since 2009 (as shown in Figure 1).

---

within a small general equilibrium model incorporating stock-and-flow-consistent dynamics and considering the balance sheets of all economic agents. They find that perceptions of risk, valuation, and the probability of default are an increasing function of government expenditure.

[5] National government debt is disclosed on a gross and net basis. Gross loan debt (which also includes inflation-linked and foreign debt) is the nominal value of government debt obligations, while net debt is simply the gross loan debt less cash balances. While gross loan debt includes debt that was incurred to accumulate cash balances, which help to increase official foreign exchange reserves and meet future cash flow requirements (National Treasury 2019), net loan debt basically reflects how much debt the government has once it has paid all its debt obligations with existing cash balances.

Figure 1: Debt of national government and economic growth, 1995–2020
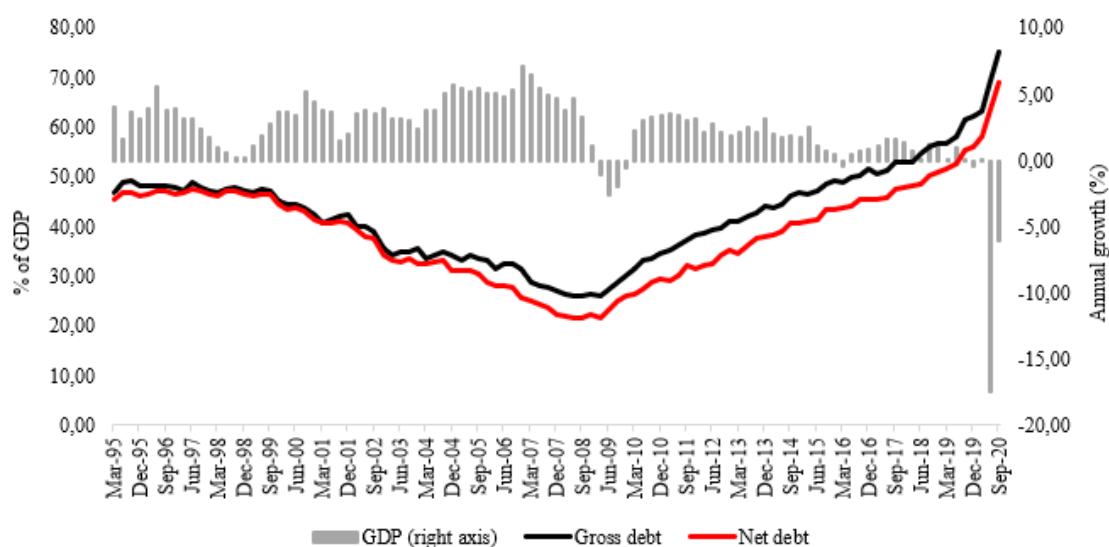
Source: author's compilation based on data from the South African Reserve Bank and Statistics South Africa.

As such, the evolution of public debt can be split into two distinct phases: the pre-recession (1995–2008) and post-recession (2009–20) period. The first phase shows an overall marked decrease in the public debt-to-GDP ratio. Over this period gross debt and net debt averaged 39.4 per cent and 37.4 per cent of GDP, respectively, while the economy recorded an average growth rate of 3.6 per cent. In the first phase, average gross and net debt were below their long-term averages (over the full sample) of 42.5 per cent and 38.9 per cent, respectively. During this phase the economy grew on average more than 1.5 times its long-term average of 2.3 per cent. The economy was confronted with public debt distress over the period 1995–2001, which brought about various economic and financial reforms. These reforms, which included the GEAR policy and ASGISA, facilitated the reduction in budget deficits and boosted economic growth rates, reducing gross and net public debt from a high of about 48 per cent and 47 per cent of GDP in 1997 to 26 per cent and 22 per cent in 2008, respectively. The decrease in the public debt–GDP ratios between 1995 and 2001 was driven by the overall growth of the economy. In the second phase, 2009–20, there has been a noticeable upward trend in the public debt–GDP ratio and a downward trend in economic growth attributed to the after effects of the 2008 global financial crisis, introduction of new government debt instruments, and more recently the COVID-19 pandemic and subsequent containment measures. Gross debt increased from a low of 26 per cent of GDP in the first quarter of 2009 to a high of 75 per cent of GDP in the third quarter of 2020, and net loan debt increased from 22 per cent to 69 per cent over the same period. Over the 2009–20 period gross and net debt were on average 3.7 per cent and 1.8 per cent, respectively, above their long-term average. Economic growth has been weak since the 2009 recession and has not recovered to pre-recession levels, with growth being about four times lower than its pre-recession level and three times lower than its long-term average rate. Of particular interest, the average negative growth in the first three months of 2020 was four times worse than the same period in 2009, reflecting the economic severity of the COVID-19 pandemic and the subsequent fiscal stimulus measures implemented by the government.

4   Data

Quarterly data spanning the period 1995Q1 to 2020Q3 is employed in this study. Data on economic growth, inflation, public debt (proxied by total net loan debt of the national government to remove the influence of movements in deposits on financing), interest rate, and financial stress is employed to gauge the state-dependent macroeconomic implications of public debt in South Africa. Data on public debt

5

(*DEBT*) and the three-month treasury bill rate (*R*) are sourced from the South African Reserve Bank, and real gross domestic product (*GDP*) and headline consumer price index (*CPI*) data are obtained from Statistics South Africa. Since the estimation uses growth rates for gross domestic product and the price index, these variables are expressed in log first difference terms. Quarter-on-quarter change of the debt variable is used, while the interest rate and the financial stress indicator remain untransformed. Including measures of inflation and the short-term interest rate allows us to account for monetary policy dynamics. To capture the state of financial markets in South Africa, the updated version of a recently constructed comprehensive financial stress index (called *SAFSI*) by Kisten (2021) is employed, which captures stress emanating from six major markets in South Africa: the equity market, credit market, foreign exchange market, money market, commodity market, and housing market. The novelty of *SAFSI* over past measures constructed for the economy—including those constructed by Gumata et al. (2012), Kasaï and Naraidoo (2013), Thompson et al. (2015), and Kabundi and Mbelu (2017)—lies in the selection and aggregation of financial indicators based on their incremental informational content rather than deemed relevance, thus achieving the best balance between parsimony and efficacy.[6]

Figure 2 displays the *SAFSI* along with the estimated threshold value over the period 1995Q1–2020Q3. The stress regimes estimated by the threshold VAR model are consistent with the benchmark episodes of financial stress identified in Kisten (2021) up to 2017. In particular, the estimated stress regimes (reflected by the shaded regions) capture the 1998 currency crisis experienced by the South African economy following: the East Asian financial crisis and the Russian financial crisis of 1997 and 1998, respectively; liquidity pressures experienced by smaller to mid-sized banks in 1999; the 2002 banking crisis following the imposition of curatorship over Saambou Bank Limited (the seventh largest bank in South Africa) in February 2002 and the subsequent takeover of BOE Bank Limited by Nedbank Limited; the financial and economic impact of the 2008–09 global financial crisis; and the financial turmoil at the beginning of 2016 following the axing of former finance minister Nhlanhla Nene. Furthermore, the estimated stress regimes capture recent events, including the instability and dislocation in financial markets towards the end of the first quarter of 2020 and the second quarter of 2020, following the COVID-19-imposed containment provisions and sovereign credit rating downgrades experienced by the country.

---

[6] The construction of *SAFSI* is not covered in this paper. In brief, the index monitors financial stability in South Africa, focusing on the systemic dimension of financial stress since market sub-indices are weighted by time-varying cross-correlations among them. For more detail on the construction of the index, please refer to Kisten (2021).

Figure 2: South African Financial Stress Index (SAFSI)
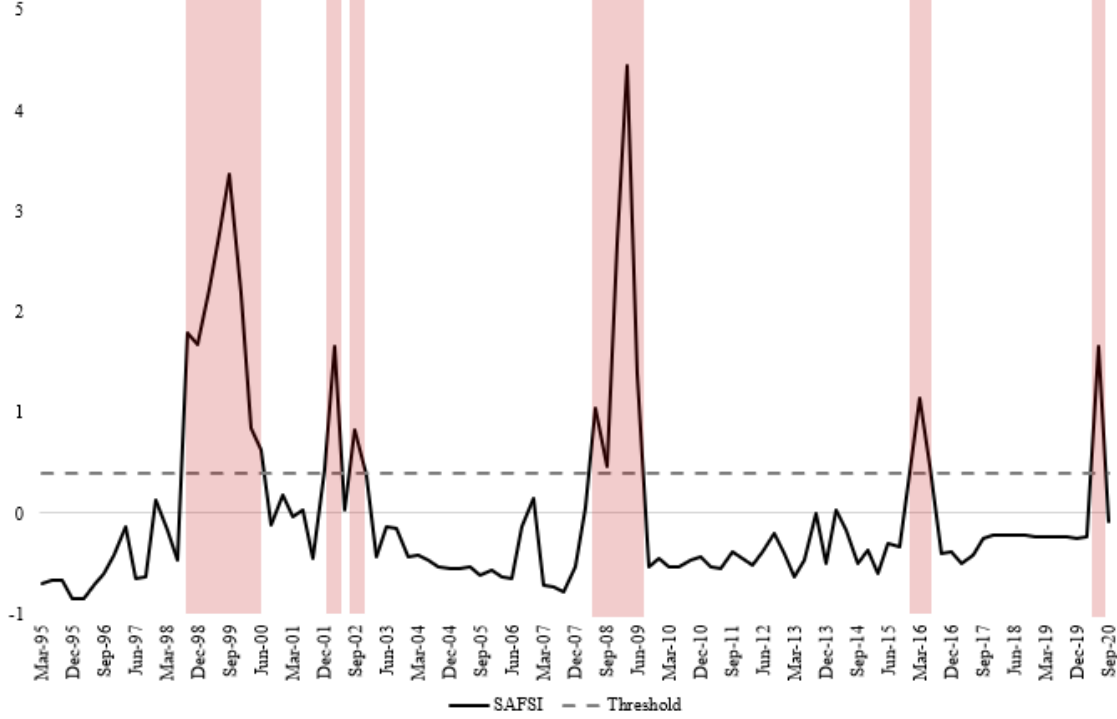
Note: the shaded regions represent the financial stress regimes (i.e. periods of high financial stress experienced by the South African economy) estimated by the threshold VAR model, and is defined as periods in which the threshold variable (which is the dth lag of the financial stress index denoted as Y_{t-d}) rises beyond an estimated critical threshold value Y^*. This threshold is represented by the dashed line and is estimated to be 0.4.

Source: author's construction.

5   Model specification

The impact of innovations on public debt on the South African economy during different financial states is quantified by estimating a TVAR model proposed by Alessandri and Mumtaz (2017). Such a model allows first moment dynamics of the system to be characterized by two distinct financial regimes (i.e. financially stressful versus tranquil/normal periods), and is specified as

$$Y_t = c_1 + \sum_{j=1}^{P} \beta_1 Y_{j,t-j} + v_t, \; if S_t \leq Y^* \tag{1}$$

$$Y_t = c_2 + \sum_{j=1}^{P} \beta_2 Y_{j,t-j} + v_t, \; if S_t > Y^*$$

where Y_t is a matrix of endogenous variables that includes *GDP*, *CPI*, *DEBT*, *R*, and *SAFSI*. The VAR parameters are represented by c_r, β_r, and $v_t \sim N(0, \Omega_{rt})$ for $r = 1, 2$, allowing us to capture the change in economic dynamics during stressful and normal financial conditions. Quarterly data over the period 1995–2020 is employed for the purpose of capturing the dynamics of gross domestic product (a measure of real economic activity). The variables employed allow us to capture the non-linear dynamics of a small open economy while maintaining a parsimonious model. The model is estimated for the full sample (i.e. 1995Q1–2020Q3); to allow for time variation in the estimation process and to capture the potential change in dynamics based on the two distinct phases of the evolution of public debt, the full sample is also partitioned into two sub-samples which capture the pre- and post-crisis period (i.e. 1995Q1–2007Q4 and 2008Q1–2020Q3), and a model is estimated for each. One lag is used for the estimation, which is selected based on the Bayesian information criterion (BIC). The threshold variable S_t, which is defined as $Y_{j,t-d}$, represents the lag of the financial stress index (with d reflecting the delay

7

parameter or threshold lag), and Y^* is the threshold level. The delay parameter is freely estimated and found to be equal to 1 at the posterior mode. Regimes are allowed to switch endogenously and abruptly through the dynamics of the threshold variable. As such, the model separates the data into two regimes based on the data: a financially normal or tranquil regime (Regime 1) occurs when $S_t \leq Y^*$, and a financial stress regime (Regime 2) if and only if the threshold variable rises beyond an estimated threshold value (i.e. $S_t > Y^*$). All parameters defined in Equation (1) are allowed to change across regimes, motivating the desire to capture changes in the transmission of national debt shocks between financially normal and stressful times, in line with Afonso et al. (2018), but applied to the South African economy.

A natural conjugate prior with dummy observations is imposed on the VAR parameters in the two regimes to account for the short sample during stressful regimes.[7] The hyperparameter that controls the overall tightness of the prior on the VAR coefficients τ is set to 0.2, and a loose prior on the constant with $c = 10^5$ is chosen, which are values that are typically used in the macroeconomic literature as reported by Canova (2007). The threshold variable Y^* is assumed to be normally distributed—that is, $Y^* \sim N(\bar{Y}, \bar{V})$ with $\bar{Y}$ representing the sample mean of the financial stress indicator and variance $\bar{V} = 10$. The procedure of Alessandri and Mumtaz (2017) is followed in estimating the model by employing Bayesian techniques using the Gibbs algorithm with a Metropolis Hastings step for drawing the threshold value from the random walk in each simulation.[8]

Convergence is ensured by running 30,000 iterations of the Gibbs sampler, of which the last 10,000 are used for inference, and the first 20,000 are discarded as burn-in. Generalized impulse response functions proposed by Koop et al. (1996) are used to portray the potential differences in the transmission of debt shocks under the specific financial regimes. The impulse responses are computed using Monte Carlo integration and defined as

$$IRF_t^r = E(Y_{t+h}|\theta_t, Y_{t-1}^r, \mu) - E(Y_{t+h}|\theta_t, Y_{t-1}^r) \tag{2}$$

where θ_t includes all hyperparameters and parameters of the VAR system, the horizon is represented by h, μ is the shock, and $r = 1, 2$ denotes the regime. Equation (2) states that the impulse responses are computed as the difference between two conditional expectations: the first term is the forecast of the endogenous variables conditional on one of the structural shocks μ; the second term is the baseline forecast (i.e. where the shock equals zero). The impulse responses are conditioned on observations in each regime and the conditional expectations are approximated via a stochastic simulation of the VAR model (Alessandri and Mumtaz 2017). Structural shocks are identified via Cholesky decomposition by ordering slower-moving variables first, followed by faster-moving variables. In line with this and following Afonso et al. (2018), *GDP* is ordered first followed by *CPI*, *DEBT*, *R*, and then *SAFSI*.

6   Empirical results

This section reports the change in macroeconomic and financial dynamics during normal financial times (Regime 1) and stressful financial times (Regime 2), following a public debt shock. As mentioned previously, Regime 2 occurs when the threshold variable (which is the dth lag of the financial stress index (SAFSI)) exceeds the estimated threshold value (reported in Section 4). Regime change is abrupt in this framework, with the economy being in either a normal period (Regime 1) or stressful period (Regime 2) at any point in time.

---

[7] The reader is referred to Banbura et al. (2010) for technicalities regarding appending the data with dummy or artificial observations.

[8] For more detail pertaining to the implementation of each step in the algorithm, refer to Alessandri and Mumtaz (2017), as this is beyond the scope of the current paper. The empirical results rather than the technicalities are the main focus here.

Figure 3 reports the impulse responses of the South African economy following a positive one standard deviation shock to national government debt proxied by net loan debt of the national government. Column 1 in the figure shows that real output (*GDP*) does not respond significantly to a positive government debt shock in both the low- and high-stress regime. This finding reflects the ineffectiveness of government borrowing in stimulating the economy and could suggest that the high and growing debt service costs faced by government reduces the funds available for investment purposes (Hofman and Reisen 1991). The results of the output impact of a public debt shock lends support to the Ricardian equivalence theory that postulates that changes in government spending and hence public indebtedness have no real impact on economic growth, contradicting the Keynesian view of increased government borrowing directed towards productive activities. The high levels of government debt in South Africa, in excess of 60 per cent of GDP, have increased the probability of fiscal imbalances, weakened fiscal credibility, and heightened fiscal sustainability risks, underpinning the insignificant impact of increases in government borrowing on economic growth (Ndou et al. 2019).

Figure 3: Impulse responses to a public debt shock
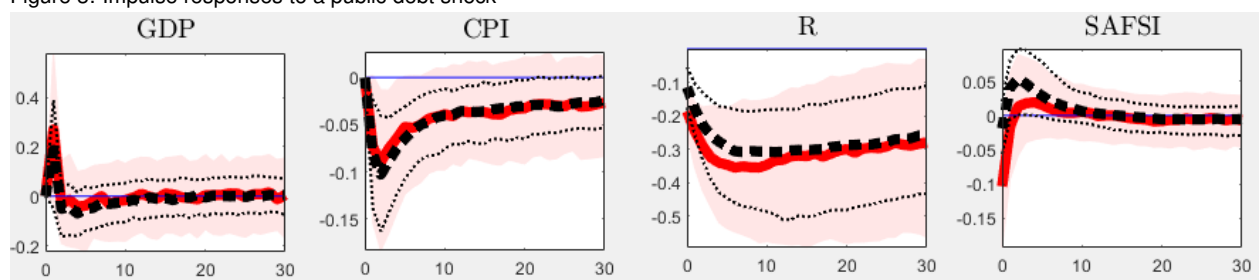
Note: median responses of the variables are reported in the figure in response to a positive one standard deviation public debt shock during normal financial times (Regime 1; dashed black line) and stressful financial times (Regime 2; solid red line). Median responses are reported within 68 per cent confidence bands (according to Sims and Zha (1999), bands that correspond to 68 per cent posterior probability are often more useful than 95 per cent or 99 per cent bands for characterizing likelihood shape, and confidence intervals with such low coverage probabilities do not generally have posterior probabilities close to their coverage probabilities) and are shown by the dotted line for Regime 1 and shaded region for Regime 2. The estimation period is 1995Q1–2020Q3, and time measured in quarters is reported on the horizontal axis.

Source: author's compilation.

However, the estimation reveals that a debt shock is deflationary in both regimes, as illustrated in column 2 of Figure 3. There is evidence of non-linearity as the impact of a net debt shock on inflation is slightly larger in the low-stress regime than in the high-stress regime. While the resulting deflationary impact of a debt shock contradicts the aggregate demand effect of a debt shock, it lends support to the precautionary savings effect whereby economic agents accumulate savings as a precautionary measure against labour-income eventualities. In this case, economic agents postpone their consumption (which reduces demand and induces firms to reduce prices) as the accumulation of public debt might result in higher policy uncertainty,[9] and consequently uncertainty regarding employment and their future income stream (Redl 2018).[10] The well-developed financial markets characterizing the South African economy could be another reason for the resultant significant negative impact of government debt on inflation, suggesting non-existence of inflationary pressures (Karakaplan 2009).

Given that one of the main goals of monetary policy in South Africa is to ensure price stability, it is therefore imperative to gain an understanding of which propagation mechanism holds in the data. In line with this, column 3 reveals that a debt shock negatively impacts interest rates, with the response being

---

[9] In particular, the larger the debt of government, the higher the probability of default which represents a net loss to the holders of government debt.

[10] According to Mohanty and Panda (2020), a moderate and stable inflation rate enhances economic growth by boosting investment, creating a favourable business environment, and increasing an economy's export competitiveness, among other things, while a persistent inflationary environment may lead to uncertainty about the future profitability of investment projects.

moderately larger in Regime 2 than in Regime 1. The decline in interest rates reflects the procyclical behaviour of monetary policy as prices fall. The results are in line with Fernández-Villaverde (2010), Carrillo and Poilly (2013), and Makrelov et al. (2018), who document the larger economic impact of fiscal shocks under higher financial instability, which is amplified by a fall in interest rates and access to cheaper credit. The negative impact of an increase in public borrowing on interest rates provides evidence of the accommodative stance between fiscal policy and monetary policy, whereby government spending is followed by an increase in the growth rate of the monetary aggregate, in an attempt to support fiscal policy (Jawadi et al. 2016). This linkage between fiscal and monetary policy is crucial for economic and political decision-making.

The last column in Figure 3 shows the impact of a positive debt shock on financial stress in the South African economy proxied by SAFSI. In response to a debt shock, there is an immediate and transitory improvement in financial conditions in the high-stress regime, indicated by an immediate drop in the SAFSI; however, in the low-stress regime there is an immediate yet negligible improvement in financial conditions. The immediate decline in financial stress in the high-stress regime points to the temporary appropriateness of government debt accumulation as part of counter-cyclical fiscal policy, to stimulate demand and activity in economic downturns. On the other hand, fiscal expansion during periods of low financial stress or expansions worsens financial conditions in the economy due to concerns about the sustainability of government debt and sovereign debt credibility. Broadly similar results were documented by Afonso et al. (2018) for a panel of advanced economies, including the United States, United Kingdom, Germany, and Italy.

Time variation in the estimation process is allowed to capture the potential change in dynamics based on the two distinct phases of the evolution of public debt, by partitioning the full sample into two sub-samples which capture the pre- and post-crisis period (i.e. 1995Q1–2007Q4 and 2008Q1–2020Q3) and estimating the model for each. Figure 4 presents the results, and reports the impulse responses of output growth (*GDP*), consumer price inflation (*CPI*), short-term interest rate (*R*), and financial stress (*SAFSI*) to a positive one standard deviation shock to net loan debt of the national government before and after the global financial crisis. Overall, the findings reveal that fiscal policy is less effective in stimulating the economy in the post-crisis period, but has been effective in reducing financial stress in the high-stress Regime 2. The positive output response is significant but short-lived in the pre-crisis period, but insignificant in the post-crisis period. There is no evidence of non-linearity in the response of output growth following a net debt shock. The ineffectiveness of rising public borrowing in stimulating economic activity in the post-crisis period seems to suggest that government borrowing is directed more towards reducing debt service costs rather than being directed towards productive uses—that is, investment in infrastructure to generate jobs and facilitate the growth and development of the South African economy. Furthermore, the influence of debt-financed public spending on economic growth depends on the quality of institutions, the composition of expenditures, and fiscal architecture.

Interestingly, the results suggest that public debt was more directed towards stimulating economic growth rather than reducing financial stress in the pre-crisis period; however, this has changed in the post-crisis period, with public debt directed more towards improving financial conditions than stimulating economic growth. In both periods public debt does not significantly influence financial conditions in the low-stress regime, but is found to have a significant impact on financial conditions in the high-stress regime. While financial conditions immediately deteriorate in the pre-crisis period, they improve following a debt shock in the post-crisis period. A public debt shock is followed by a reduction in consumer inflation and interest rates in both regimes and periods; however, the responses are insignificant in the low-stress regime in the pre-crisis period. There is no evidence of non-linearity in the responses of inflation and interest rates in the post-crisis period, and the inflation impact is found to be larger and more significant in the aforementioned period. As mentioned previously and in addition to the economy's well-developed financial market, the resulting deflationary impact of a debt shock supports the precautionary savings channel whereby economic agents accumulate savings as a precautionary mea-

sure against labour-income eventualities (Redl 2018). In this case, economic agents postpone their consumption (which reduces demand and induces firms to reduce prices) as the accumulation of public debt results in higher policy uncertainty, which is more evident in the post-crisis period. The reduction in interest rates following a debt shock in both periods reflects the procyclical behaviour of monetary policy as prices fall and suggests some degree of fiscal and monetary policy coordination. However, the results seem to suggest that the highly accommodative monetary policy stance following the deficit-financed spending approach post-2009 have performed poorly as policy interventions to increase output growth. As such, there is a case to explore a wider range of potent policy tools and interventions that will propagate and amplify the effects of the current policy mix (Gumata 2021).

Figure 4: Responses pre- and post-global financial crisis
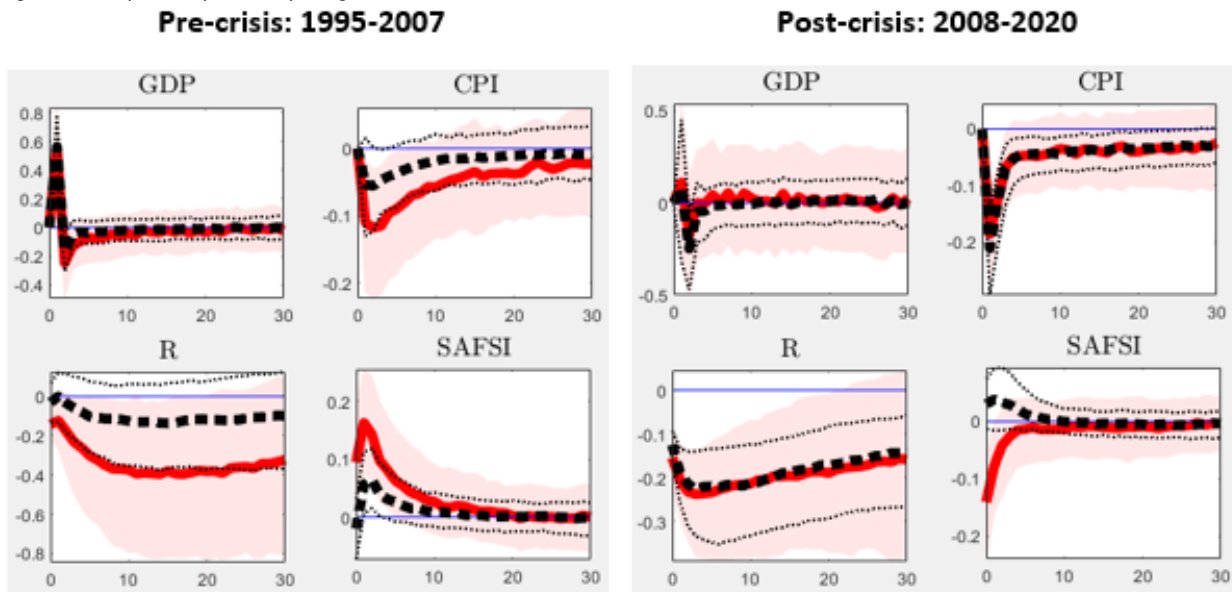
Note: the figure shows the pre- and post-crisis median responses of output growth (GDP), consumer price inflation (CPI), short-term interest rate (R), and financial stress ($SAFSI$) to a positive one standard deviation public debt shock during normal financial times (Regime 1; dashed black line) and stressful financial times (Regime 2; solid red line). Median responses are reported within 68 per cent confidence bands and are shown by the dotted line for Regime 1 and shaded region for Regime 2. The pre-crisis estimation period is 1995Q1–2007Q4, and the post-crisis estimation period is 2008Q1–2020Q3. Time measured in quarters is reported in the horizontal axis

Source: author's compilation.

7 Concluding remarks

This paper documents the role of financial frictions in the public debt–growth nexus, specifically that the macro-financial implications of a public debt shock differs across financial regimes. Using quarterly data over the period 1995–2020, a TVAR model is estimated which allows the first moment dynamics of the system to be characterized by two distinct financial regimes, dependent on an endogenously estimated threshold value. In particular, the economy is in a high-stress regime characterized by tight financial conditions when the financial stress indicator exceeds the estimated threshold value; otherwise the economy is in a low-stress or normal regime.

Overall, public debt has no impact on economic growth in both regimes over the full sample, reflecting the ineffectiveness of government borrowing in stimulating the economy, and could suggest that the high and growing debt service costs faced by government reduces funds available for investment purposes (Hofman and Reisen 1991). The results of the output impact of a public debt shock lends support to the Ricardian equivalence theory that postulates that changes in government spending and

hence public indebtedness have no real impact on economic growth, contradicting the Keynesian view of increased government borrowing directed towards productive activities. Contrary to the aggregate demand effect of a public debt shock, the estimation reveals that a debt shock is deflationary in both regimes, lending support to the precautionary savings effect and the existence of a well-developed financial market. Similarly, a debt shock negatively impacts interest rates, with the immediate impact being moderately larger in the stress regime. The decline in interest rates reflects the procyclical behaviour of monetary policy as prices fall and provides evidence of the accommodative stance between fiscal policy and monetary policy. In response to a debt shock, there is an immediate and transitory improvement in financial conditions in the high-stress regime; however, in the low-stress regime there is an immediate yet negligible improvement in financial conditions. The immediate decline in financial stress in the high-stress regime points to the temporary appropriateness of government debt accumulation as part of counter-cyclical fiscal policy, to stimulate demand and activity in economic downturns. Furthermore, it is found that fiscal policy is less effective in stimulating the economy in the post-crisis period, but has been effective in reducing financial stress in the high-stress regime. The results suggest that public debt was more directed towards stimulating economic growth rather than reducing financial stress in the pre-crisis period; however, this has changed in the post-crisis period, with public debt directed more towards improving financial conditions than stimulating economic growth.

The results suggest that policy-makers could enhance the effectiveness of public borrowing by implementing appropriate fiscal policy in line with the state of financial markets. However, to achieve long-term sustainable growth, public debt should be directed more towards productive uses rather than non-productive uses (i.e. financing debt service costs). To achieve the desired economic growth outcomes, a wider range of potent policy tools and interventions should be explored that will propagate and amplify the effects of the current fiscal–monetary policy mix (Gumata 2021). It is worth mentioning that since the SAFSI captures financial stress of different forms emanating from different markets, it is possible that propagation of public debt shocks may differ depending on the form of stress.

References

Aboura, S., and B. van Roye (2017). 'Financial Stress and Economic Dynamics: The Case of France'. *International Economics*, 149: 57–73. https://doi.org/10.1016/j.inteco.2016.11.001

Afonso, A. (2005). 'Fiscal Sustainability: The Unpleasant European Case'. *FinanzArchiv/Public Finance Analysis*, 61: 19–44. https://doi.org/10.1628/0015221053722532

Afonso, A., J. Baxa, and M. Slavík (2018). 'Fiscal Developments and Financial Stress: A Threshold VAR Analysis'. *Empirical Economics*, 54(2): 395–423. https://doi.org/10.1007/s00181-016-1210-5

Akinkunmi, M.A. (2017). 'Empirical Investigation of External Debt—-Growth Nexus in Sub-Saharan Africa'. *African Research Review*, 11(3): 142–52. https://doi.org/10.4314/afrrev.v11i3.14

Alessandri, P., and H. Mumtaz (2017). 'Financial Conditions and Density Forecasts for US Output and Inflation'. *Review of Economic Dynamics*, 24: 66–78. https://doi.org/10.1016/j.red.2017.01.003

Amoateng, K., and B. Amoako-Adu (1996). 'Economic Growth, Export and External Debt Causality: The Case of African Countries'. *Applied Economics*, 28(1): 21–27. https://doi.org/10.1080/00036849600000003

Balcilar, M., K. Thompson, R. Gupta, and R. Van Eyden (2016). 'Testing the Asymmetric Effects of Financial Conditions in South Africa: A Nonlinear Vector Autoregression Approach'. *Journal of International Financial Markets, Institutions and Money*, 43: 30–43. https://doi.org/10.1016/j.intfin.2016.03.005

Banbura, M., D. Giannone, and L. Reichlin (2010). 'Large Bayesian Vector Auto Regressions'. *Journal of Applied Econometrics*, 25(1): 71–92. https://doi.org/10.1002/jae.1137

Barro, R.J. (1989). 'The Ricardian Approach to Budget Deficits'. *Journal of Economic perspectives*, 3(2): 37–54. https://doi.org/10.1257/jep.3.2.37

Bernanke, B.S., M. Gertler, and S. Gilchrist (1999). 'The Financial Accelerator in a Quantitative Business Cycle Framework'. *Handbook of Macroeconomics*, 1: 1341–93. https://doi.org/10.1016/S1574-0048(99)10034-X

Bohn, H. (1998). 'The Behavior of US Public Debt and Deficits'. *Quarterly Journal of Economics*, 113(3): 949–63. https://doi.org/10.1162/003355398555793

Brunnermeier, M.K. and Y. Sannikov (2014). 'A Macroeconomic Model with a Financial Sector'. *American Economic Review*, 104(2): 379–421. https://doi.org/10.1257/aer.104.2.379

Brunnermeier, M.K., T.M. Eisenbach, and Y. Sannikov (2012). 'Macroeconomics with Financial Frictions: A Survey'. Working Paper 18102. Cambridge, MA: NBER. https://doi.org/10.3386/w18102

Burger, P., I. Stuart, C. Jooste, and A. Cuevas (2012). 'Fiscal Sustainability and the Fiscal Reaction Function for South Africa: Assessment of the Past and Future Policy Applications'. *South African Journal of Economics*, 80(2): 209–27. https://doi.org/10.1111/j.1813-6982.2012.01321.x

Calitz, E., S. Du Plessis, and F. Siebrits (2014). 'Fiscal Sustainability in South Africa: Will History Repeat Itself?' *Studies in Economics and Econometrics*, 38(3): 55–78. https://doi.org/10.1080/10800379.2014.12097272

Canova, F. (2007). *Methods for Applied Macroeconomic Research*. Princeton, NJ: Princeton University Press. https://doi.org/10.1515/9781400841028

Carrillo, J.A., and C. Poilly (2013). 'How Do Financial Frictions Affect the Spending Multiplier During a Liquidity Trap?'. *Review of Economic Dynamics*, 16(2): 296–311. https://doi.org/10.1016/j.red.2013.01.004

Chatterjee, S., C.-W.J. Chiu, S. Hacioglu Hoke, and T. Duprey (2017). 'A Financial Stress Index for the United Kingdom'. Staff Working Paper 697. London: Bank of England. https://doi.org/10.2139/ssrn.3085789

Eberhardt, M., and A.F. Presbitero (2015). 'Public Debt and Growth: Heterogeneity and Non-linearity'. *Journal of International Economics*, 97(1): 45–58. https://doi.org/10.1016/j.jinteco.2015.04.005

Fernández-Villaverde, J. (2010). 'Fiscal Policy in a Model with Financial Frictions'. *American Economic Review*, 100(2): 35–40. https://doi.org/10.1257/aer.100.2.35

Fosu, A.K. (1999). 'The External Debt Burden and Economic Growth in the 1980s: Evidence from Sub-Saharan Africa'. *Canadian Journal of Development Studies/Revue canadienne d'études du développement*, 20(2): 307–18. https://doi.org/10.1080/02255189.1999.9669833

Geiger, L.T. (1990). 'Debt and Economic Development in Latin America'. *Journal of Developing Areas*, 24(2): 181–94.

Gertler, M., and N. Kiyotaki (2010). 'Financial Intermediation and Credit Policy in Business Cycle Analysis'. In B. Friendman and M. Woodford (eds), *Handbook of Monetary Economics*, volume 3. Amsterdam: Elsevier. https://doi.org/10.1016/B978-0-444-53238-1.00011-9

Gumata, N. (2021). 'Monetary and Fiscal Policy Challenges Posed by South Africa's Deepening Economic Crisis and the COVID-19 Pandemic'. Policy Briefing. Johannesburg: Wits School of Governance, SA Future Economy.

Gumata, N., N. Klein, and E. Ndou (2012). 'A Financial Conditions Index for South Africa'. IMF Working Paper 12/196. Washington, DC: IMF. https://doi.org/10.5089/9781475505450.001

Hofman, B., and H. Reisen (1991). 'Some Evidence on Debt-Related Determinants of Investment and Consumption in Heavily Indebted Countries'. *Weltwirtschaftliches Archiv*, 127(2): 281–99. https://doi.org/10.1007/BF02707987

Hojman, D.E. (1986). 'The External Debt Contribution to Output, Employment, Productivity and Consumption: A Model and an Application to Chile'. *Economic Modelling*, 3(1): 53–68. https://doi.org/10.1016/0264-9993(86)90012-X

Hollo, D., M. Kremer, and M. Lo Duca (2012). 'CISS: A Composite Indicator of Systemic Stress in the Financial System'. ECB Working Paper 1426. Frankfurt: ECB.

Hubrich, K., and R.J. Tetlow (2015). 'Financial Stress and Economic Dynamics: The Transmission of Crises'. *Journal of Monetary Economics*, 70: 100–15. https://doi.org/10.1016/j.jmoneco.2014.09.005

Hussain, M.E., M. Haque, and R.S. Igwike (2015). 'Relationship Between Economic Growth and Debt: An Empirical Analysis for Sub-Saharan Africa'. *Journal of Economics and Political Economy*, 2(2): 262–75.

Iyoha, M.A. (1999). 'External Debt and Economic Growth in Sub-Saharan African Countries: An Econometric Study'. Brighton: Institute of Development Studies.

Jawadi, F., S.K. Mallick, and R.M. Sousa (2016). 'Fiscal and Monetary Policies in the BRICS: A Panel VAR Approach'. *Economic Modelling*, 58: 535–42. https://doi.org/10.1016/j.econmod.2015.06.001

Kabundi, A., and A. Mbelu (2017). 'Estimating a Time-Varying Financial Conditions Index for South Africa'. ERSA Working Paper 720. Cape Town: Economic Research Southern Africa.

Karakaplan, M.U. (2009). 'The Conditional Effects of External Debt on Inflation'. *Journal of Social and Economic Research*, 9: 203–17.

Kasaï, N., and R. Naraidoo (2013). 'The Opportunistic Approach to Monetary Policy and Financial Market Conditions'. *Applied Economics*, 45(18): 2537–45. https://doi.org/10.1080/00036846.2012.669464

Kisten, T. (2021). 'Monitoring Financial Stress in South Africa'. *Emerging Markets Finance and Trade*, 57(15): 4380–4397. https://doi.org/10.1080/1540496X.2020.1810014

Koop, G., M.H. Pesaran, and S.M. Potter (1996). 'Impulse Response Analysis in Nonlinear Multivariate Models'. *Journal of Econometrics*, 74(1): 119–47. https://doi.org/10.1016/0304-4076(95)01753-4

Krugman, P. (1988). 'Financing vs. Forgiving a Debt Overhang'. *Journal of Development Economics*, 29(3): 253–68. https://doi.org/10.1016/0304-3878(88)90044-2

Makrelov, K., C. Arndt, R.H. Davies, and L. Harris (2018). 'Fiscal Multipliers in South Africa: The Importance of Financial Sector Dynamics'. WIDER Working Paper 2018/6. Helsinki: UNU-WIDER.

Mhlaba, N., and A. Phiri (2019). 'Is Public Debt Harmful Towards Economic Growth? New Evidence from South Africa'. *Cogent Economics & Finance*, 7(1): 1603653. https://doi.org/10.1080/23322039.2019.1603653

Mittnik, S., and W. Semmler (2013). 'The Real Consequences of Financial Stress'. *Journal of Economic Dynamics and Control*, 37(8): 1479–99. https://doi.org/10.1016/j.jedc.2013.04.014

Mohanty, R.K., and S. Panda (2020). 'How Does Public Debt Affect the Indian Macroeconomy? A Structural VAR Approach'. *Margin: The Journal of Applied Economic Research*, 14(3): 253–84. https://doi.org/10.1177/0973801020920092

National Treasury (2019). Budget Review February 2019. Pretoria: National Treasury of South Africa.

Ncanywa, T., and M.M. Masoga (2018). 'Can Public Debt Stimulate Public Investment and Economic Growth in South Africa?'. *Cogent Economics & Finance*, 6(1): 1516483. https://doi.org/10.1080/23322039.2018.1516483

Ndou, E., N. Gumata, and M.M. Tshuma (2019). *Exchange Rate, Second Round Effects, and Inflation Process: Evidence from South Africa*. New York: Springer. https://doi.org/10.1007/978-3-030-13932-2

Ng, S., and J.H. Wright (2013). 'Facts and Challenges from the Great Recession for Forecasting and Macroeconomic Modeling'. *Journal of Economic Literature*, 51(4): 1120–54. https://doi.org/10.1257/jel.51.4.1120

Pradhan, K. (2016). 'Ricardian Approach to Fiscal Sustainability in India'. *Margin: The Journal of Applied Economic Research*, 10(4): 499–529. https://doi.org/10.1177/0973801016659799

Proano, C.R., C. Schoder, and W. Semmler (2014). 'Financial Stress, Sovereign Debt and Economic Activity in Industrialized Countries: Evidence from Dynamic Threshold Regressions'. *Journal of International Money and Finance*, 45: 17–37. https://doi.org/10.1016/j.jimonfin.2014.02.005

Redl, C. (2018). 'Macroeconomic Uncertainty in South Africa'. *South African Journal of Economics*, 86(3): 361–80. https://doi.org/10.1111/saje.12198

Reinhart, C.M., and K.S. Rogoff (2009). 'The Aftermath of Financial Crises'. *American Economic Review*, 99(2): 466–72. https://doi.org/10.1257/aer.99.2.466

Reinhart, C.M., and K.S. Rogoff (2010). 'Growth in a Time of Debt'. *American Economic Review*, 100(2): 573–78. https://doi.org/10.1257/aer.100.2.573

Sanusi, K.A., A. Hassan, and D. Meyer (2019). 'Non-linear Effects of Public Debt on Economic Growth in Southern Africa Development Community (SADC) Countries'. *International Journal of Economics & Management*, 13(1).

Saungweme, T., and N.M. Odhiambo (2018). 'Public Debt Dynamics in Emerging Market Economies: The Experience of South Africa'. *Acta Universitatis Danubius. Administratio*, 10(1): 39–59.

Sims, C.A., and T. Zha (1999). 'Error Bands for Impulse Responses'. *Econometrica*, 67(5): 1113–55. https://doi.org/10.1111/1468-0262.00071

Thompson, K., R. Van Eyden, and R. Gupta (2015). 'Identifying an Index of Financial Conditions for South Africa'. *Studies in Economics and Finance*, 32(2): 256–74. https://doi.org/10.1108/SEF-07-2013-0098

Tsoulfidis, L. (2007). 'Classical Economists and Public Debt'. *International Review of Economics*, 54(1): 35–40. https://doi.org/10.1007/s12232-007-0003-8

van Roye, B. (2014). 'Financial Stress and Economic Activity in Germany'. *Empirica*, 41(1): 101–26. https://doi.org/10.1007/s10663-013-9224-0