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Abstract

South Africa's fiscal position has deteriorated considerably over the last 10 years, with debt levels reaching historical highs in the post-apartheid period. National Treasury's intentions for fiscal consolidation have again drawn attention to the fiscal multiplier literature. We use an econometric model to calculate the fiscal multipliers over the past decade. Our estimates take account of the specific fiscal conditions for each year, in particular the changing relationship between debt and the sovereign risk premia as well as the impact of tax increases. The model suggests that the fiscal multiplier declined from 1.5 in 2010 to around zero in 2019 as the debt levels became progressively more unsustainable and large tax increases muted the aggregate demand effects from higher government expenditure. The low fiscal multipliers suggest that fiscal consolidation will be less costly in terms of growth forgone than generally perceived.

JEL classification: C50, E62, H62, H63

Keywords: fiscal policy, fiscal multipliers, econometric model, South Africa

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1. Introduction[1]

Despite higher tax rates, South Africa's fiscal position has deteriorated considerably over the last 10 years. Large structural deficits have been accompanied by rising risk premia and slowing economic growth (Loewald, Faulkner and Makrelov 2020).

National Treasury's intentions for fiscal consolidation to stabilize debt and avoid a debt crisis have focused attention on the fiscal multiplier literature. The fiscal expenditure multiplier reflects what happens to the rest of the economy when government changes its spending. If a fiscal multiplier is 1, gross domestic product (GDP) changes by exactly R1 for every extra R1 of government spending. If it is more than 1, extra spending by government crowds in even more domestic output. If it is less than 1, activity does not rise as much as the spending increase, perhaps because of import leakage, capacity constraints or crowding-out effects.

The fiscal multiplier literature identifies a range of channels through which government spending can affect the economy. The simplest is that an increase in spending raises aggregate demand. This impact is reduced, however, if the extra expenditure pulls in more imports. Multipliers also vary depending on the composition of spending, with investment having the largest positive multiplier over the longer term. The size of the multiplier is further affected by the business cycle: if an economy is already operating at full capacity, multipliers will be smaller than when there is a negative output gap (Batini, Eyraud, and Weber 2014). Ghassibe and Zanetti (2019) show how the source of economic fluctuations determines the size of fiscal multipliers and the effectiveness of different fiscal instruments in supporting aggregate demand and supply. Policies that boost aggregate demand will be ineffective if the downturn is driven by supply factors such as electricity shortages.

Advanced economy estimates also show much larger multipliers when monetary policy is constrained by the zero lower bound (Christiano, Eichenbaum, and Rebelo 2011). Financing channels matter too. If government spending is paid for with higher taxes, the economic impact of higher government expenditure will tend to be small or even negative. The economic literature finds that the tax multipliers are larger than the expenditure multipliers.[2]

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1 We are grateful to anonymous referees and participants at the SARB Research Seminar series for their comments and suggestions.

2 For a review of the global literature see Alesina, Favero and Giavazzi (2018). Kemp (2020) finds that the tax multipliers for South Africa are much higher than the expenditure multipliers.

Funding through debt can support a higher multiplier when the increase in debt is perceived as sustainable. However, when sustainability is in doubt, higher debt burdens may reduce capital inflows, raise interest rates for the entire economy, reduce domestic demand and undermine confidence in the economic outlook, thereby lowering the multiplier (Bonam and Lukkezen 2019; Huidrom et al. 2019). This effect is stronger where there is a large financial sector that holds government bonds as safe assets: rising fiscal risk weakens these balance sheets, in turn negatively affecting the supply and pricing of loans (Dell'Ariccia et al. 2018). Even in the absence of large holdings of government debt, financial sector concerns regarding the fiscus and the economy can increase lending spreads (Borio and Zhu 2012). Rising risk aversion and risk premia also increase the neutral interest rate (Jaramillo and Weber 2013; Summers and Rachel 2019). The size of the multiplier also depends on whether the fiscal change is anticipated, its persistence and the country's economic characteristics such as the level of development and the exchange regime (Ramey 2019). Given these channels, we should expect multipliers to vary based on time and conditions.

The relationship between government debt and the risk premium is particularly important for our analysis. The economic literature suggests a strong non-linear relationship. At low debt levels, the risk premium remains unchanged and it can even decrease if the fiscal policy intervention is temporary and targeted. At high and rising debt levels, the risk premium starts to increase more exponentially.[3]

This study makes use of a small quarterly macro econometric model (QMM) that is specifically designed to capture the relationships between government and the real economy. Our model estimation methodology is similar to Akanbi (2013), but the structure of the model, the estimation period and the model simulations are different. We have chosen this approach due to its greater flexibility to incorporate different conditions/states compared to other large models. In our estimates, we take into account the specific fiscal conditions for each year, which are based on the changing relationship between debt and the sovereign risk premia over the last 10 years, the impact of tax increases on economic activity as well as the presence of certain supply constraints such as those in the electricity sector. Our results show that the fiscal multiplier declined from 1.5 in 2010 to almost zero in 2019 as taxes increased and the government debt levels became progressively more unsustainable.

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3 See, for example, Bayoumi, Goldstein and Woglom (1995) and Haugh, Ollivaud and Turner (2009).

In the next section, we provide previous estimates of fiscal multipliers in South Africa and discuss how these should be interpreted. Section 3 briefly presents the fiscal policy developments in South Africa over the last 10 years. This is followed by a description of our methodology and model. The results are presented in section 5 and section 6 outlines the conclusion.

2. Estimates of fiscal multipliers in South Africa

The recent South African literature presents a wide range of fiscal multipliers depending on the methodology used and the different impact channels incorporated in the estimates.[4] In one of the more comprehensive studies, Jooste, Liu and Naraidoo (2013) calculate expenditure multipliers for South Africa using a calibrated Dynamic Stochastic General Equilibrium (DSGE) model, a structural vector error correction model and a time-varying parameter Vector Autoregressive (VAR) model. They generate multipliers smaller and larger than 1 depending on the methodology and assumptions regarding the business cycle, the share of Ricardian households and the import intensity of the economy. Jooste and Naraidoo (2017) extend the DSGE approach further and show how labour dynamics affect the size of fiscal expenditure multipliers. They find that sticky wages, credit-constrained households and elastic labour supply increase the multiplier effects. Kemp and Hollander (2020) also employ a DSGE model, but with debt dynamics. Moving beyond a debt threshold level reduces the multiplier. Household and government consumption are substitutes in the calibrated model, causing the fiscal consumption expenditure multiplier to decline further.[5]

In the presence of supply and savings constraints, Mabugu et al. (2013) find small expenditure multipliers in a Computable General Equilibrium (CGE) framework. Similarly, Akanbi (2013) finds multipliers below 1 when the economy is supply constrained. In the absence of supply constraints and assuming that higher government expenditure does not increase imports, the multiplier can exceed 1.5 (Schröder and Storm 2020).

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[4] In a review of the US and EU literature, Ramey (2019) also finds a wide range for multipliers due to state dependency.

[5] While the economic literature suggests that this is a plausible assumption, it needs further investigation in the South Africa context. A large part of private consumption is based on the disposable income of government workers, which are a larger share of the working population. Their real wages have increased by more than 40% over the period and for a large part of this period government debt was sustainable.

Kemp (2020) provides empirical estimates of expenditure multipliers using a VAR approach. The expenditure multiplier over the period 1970 to 2019 is small, but also highly dependent on the identification approach. In line with the global literature, the tax multiplier is larger than 1. A similar long-term estimation approach is employed by Nuru (2020), who finds small multipliers. The results suggest that government expenditure causes inflation to decrease, while an increase in the repo rate decreases growth, but has a very small impact on inflation and revenue collections.

None of these studies considers the role of the financial sector in amplifying fiscal shocks even though the global literature suggests that this is an important channel. For example, Fernández-Villaverde (2010) and Carrillo and Poilly (2010) find that the size of the fiscal multiplier increases significantly in the presence of financial frictions, which work through the balance sheet of a representative firm. The only South African study that incorporates financial sector dynamics is Makrelov et al. (2020). They employ a stock and flow consistent model in the tradition of Backus et al. (1980) with bounded rationality for households. The expenditure multiplier exceeds 2, but under very specific conditions of large capital inflows, a large and negative output gap, and sustainable government debt. Under these conditions, the financial sector positively amplifies the initial government expenditure shocks. Under different conditions, the financial sector's amplification effect is weaker and it can work in the opposite direction.

Understanding the limitations and assumptions of each approach supports the appropriate use of the different estimates. Results, which assume that South Africa is a closed economy, are clearly inappropriate for policy use as the country is a small open economy. Using multiplier estimates generated under conditions of sustainable government debt is not useful when the government debt trajectory is perceived as unsustainable.

One needs to distinguish between empirical estimates often generated using a VAR model and estimates generated using large calibrated models such as CGE and DSGE models or econometric models. The empirical estimates should provide more accurate estimates of fiscal multipliers. However, the need for a certain number of observations or their sensitivity to the number of variables included in the VAR model or the identification strategy makes them a less reliable source of estimates. Presenting a fiscal multiplier over the period 1970 to 2018 is useful for long-term fiscal reviews, but it is less useful for policy decisions over the next three years or for reviews of fiscal policy over the last five years. Generating state-dependent multipliers in some emerging markets is also challenging. For example, South Africa has only one period after 1994 where the debt-to-GDP ratio exceeded 80%. This does not provide a sufficient number of observations to generate robust results under different debt regimes.

Large calibrated or econometric models provide estimates based on the assumed structure of the model. These are useful as laboratories to show how different channels and assumptions affect the size of fiscal multipliers. The estimates need to be interpreted in the context of the assumed model structure. For example, does it make sense to assume that government and household consumption are substitutes, as in Kemp and Hollander (2020)? How would the result change if this feature of the model was modified? How would different asset demand function parameters in the model of Makrelov et al. (2020) change the results? How would the multipliers change if the economy was not supply or savings constrained, as in the model developed by Mabugu et al. (2013)? Every model has limitations and no model will be able to incorporate all the channels; however, these models provide a useful platform to discuss and understand how different channels play out.

In some cases we do not need complicated models to have a view of the fiscal multiplier. When the risk premia are rising exponentially due to rapid accumulation of debt, the economy faces supply constraints, taxes keep increasing and the composition of government spending shifts away from investment and towards consumption, the economic experience tells us that the multiplier is likely to be small and even negative. It is exactly these conditions that have dominated the South African fiscal landscape for most of the past 10 years.

3. The changing fiscal dynamics

In 2008/09, South Africa's debt-to-GDP ratio stood at 26%, hardly unsustainable. The fiscal policy decisions in the 10 years prior to the global financial crisis created the space for a strong fiscal response. While the initial post-crisis response was justified, the stimulus deviated from two key conditions. It was not temporary and it was not well targeted as a rising portion of expenditure was spent on wages rather than on investment. Strong real growth in spending was achieved, with growth averaging almost 4% per year over the entire period, and increased by more than 7% in 2019/20. Attempts at fiscal consolidation were done through taxes rather than expenditure, which contributed to lower economic growth.[6]

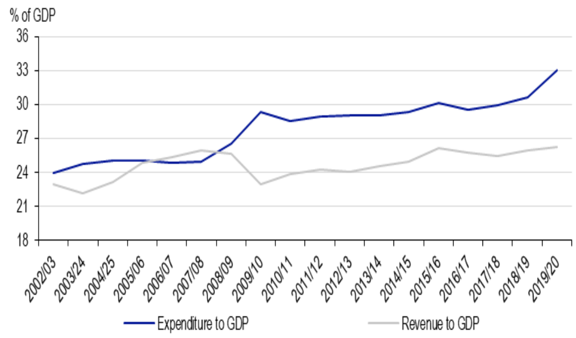
[6] For a review of fiscal policy see Loewald, Faulkner, and Makrelov (2020); Burger and Calitz (2020); and BER (2021).

Figure 1 indicates that the ratio of expenditure to GDP increased from 27% in 2008/09 to 33% in 2019/20. Initially, fiscal deficits were funded by debt issuance at very competitive rates as South Africa benefitted from the quantitative easing policies in advanced economies. This suggests that the expenditure multipliers were large. However, government started using tax increases to fund expenditure, which raised the tax-to-GDP ratio by 2 percentage points, from 23.9% in 2010/11 to 25.9% in 2016/17, muting the positive aggregate demand effects from higher government expenditure. Tax increases were also accompanied by large tax shortfalls, suggesting substantive negative impacts on GDP.

The South African risk premium, as measured by the Emerging Markets Bond Index Plus (EMBI+) measure, decreased in the period immediately after the global financial crisis (Figure 2). A large part of the decline was driven by domestic factors, suggesting that at the time fiscal policy was perceived as sustainable and having a positive impact on economic activity. However, over the period 2013 to 2019, the risk premium increased by 200 basis points, contributing to higher borrowing costs throughout the economy and generating large crowding-out effects (Loewald, Faulkner, and Makrelov 2020).

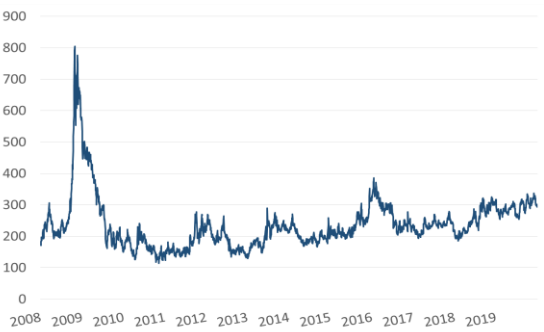
The later part of the period was also characterised by large supply shocks such as disruptive labour strikes in the mining and manufacturing sectors, drought conditions, rising levels of policy uncertainty and an increasingly binding electricity supply constraint. These factors decreased potential growth and the effectiveness of expansionary fiscal policy.

Figure 1: Expenditure and revenue



Source: National Treasury

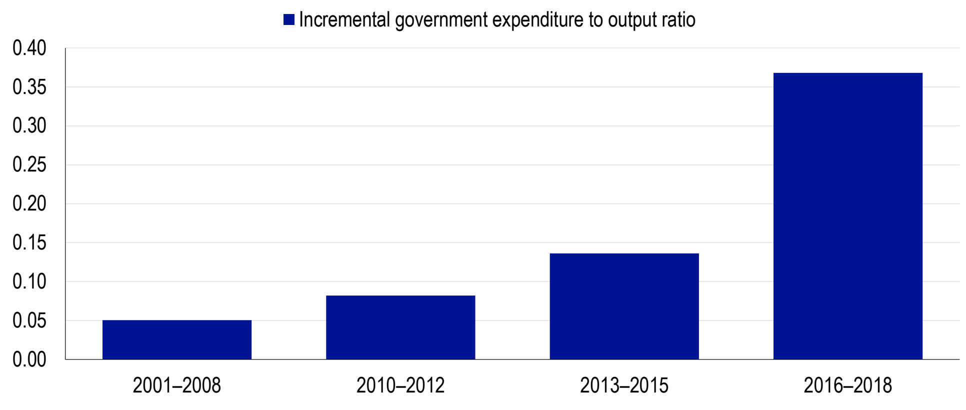
Figure 2: Risk premium (EMBI+)



Source: Bloomberg

Figure 3 presents a simple proxy indicator of the fiscal expenditure multiplier. It shows the incremental-government-expenditure-to-output ratio. This has more than doubled since 2015, indicating that the growth of government expenditure over the period saw a much smaller increase in output compared to previous periods.

Figure 3: Government spending to growth



Source: Loewald, Faulkner and Makrelov (2020)

4. Methodology

We employ a macro econometric model similar to the Reserve Bank's core econometric model and the Bureau for Economic Research (BER) econometric model.[7] The structure of the economy is represented by a set of econometric equations and identities based on economic theory and the relationships in the system of national accounts. Long-term dynamics are represented by a set of co-integrating relationships while the methodology also allows for deviations in the short-run from the long-run equilibrium.

The economy is continuously bombarded by a range of shocks, which are transmitted via changes in prices (exchange and interest rates and consumer prices) affecting income and in turn decisions to invest and consume. The adjustment by economic agents to these shocks occurs over several periods, depending on the particular shock and the specific characteristics of the sector. The model has more than 20 estimated equations and roughly 100 identities. The model incorporates five major tax rates, endogenous risk premia and a lending spread. These model characteristics are particularly important for our analysis.

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[7] For a description of the Reserve Bank's core econometric model see Smal, Pretorius, and Ehlers (2007), and for the BER model see Grobler and Smit (2015).

This type of model has been subject to the Lucas critique (Lucas 1976). Yet it has remained the workhorse of many central banks and ministries of finance due to its ability to incorporate more channels relevant to a particular policy question than other macroeconomic models, its better fit with the data and its flexibility to create different economic scenarios. It is for these reasons that we have chosen to develop and use an econometric model.

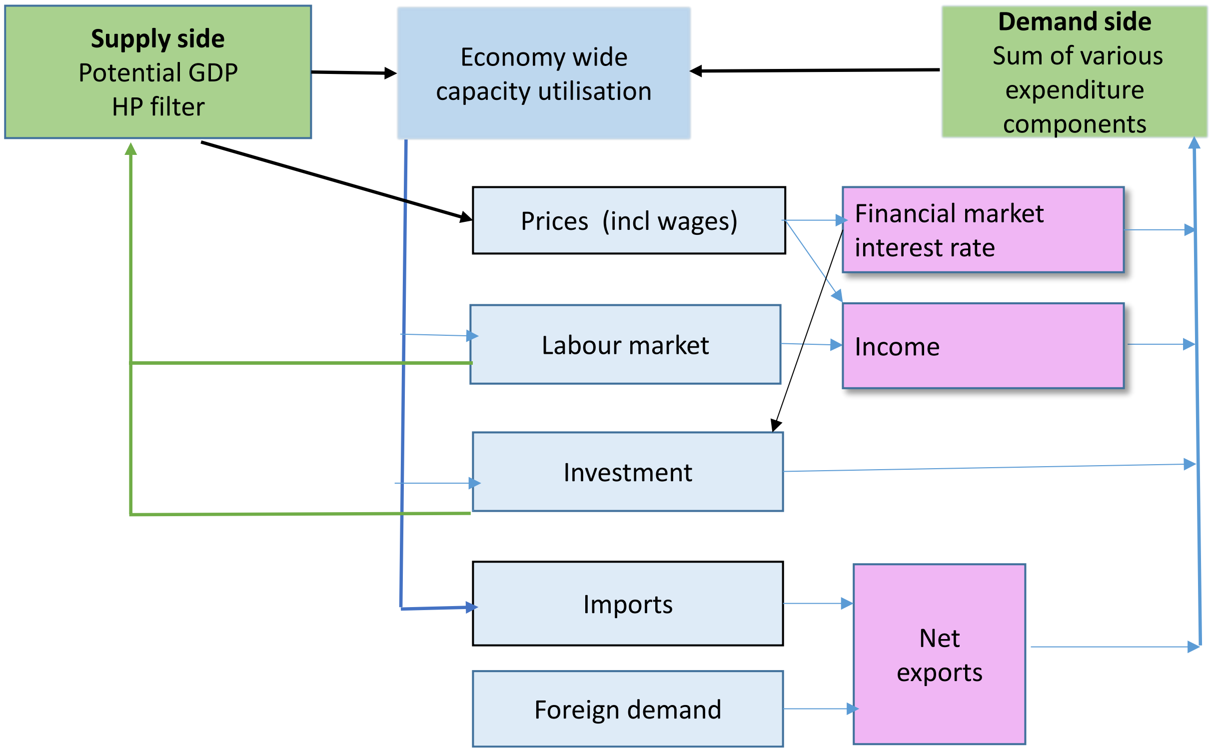
Next, we describe the model and its properties, followed by a discussion of our model simulations.

4.1 Non-technical model description

The QMM models the behaviour of firms, households, policymakers (both monetary and fiscal) and the rest of the world. The QMM structure captures the key expenditure and income relationships reported in the National Accounts. Figure 4 provides a diagrammatic representation of the model.

Firms hire labour and invest in capital to produce goods and services in the economy. Over the long run, the costs of additional workers are compensated by the extra revenue they generate, implying that the pace of growth in real wages cannot exceed the growth in labour productivity. There is a homogenous relationship between growth and employment such that employment growth only exceeds output if it is accompanied by reduced real wages. However, over the short(er) term, prices and wages are 'sticky' so labour can temporarily make relative gains (losses) against firms through higher (lower) real wages or employment. The growth in nominal wages is a function of real wage growth and inflation expectations.

Figure 4: Simplified model structure



Private investment follows the investment accelerator approach by modelling investment as a function of GDP (Jorgenson 1963). In addition, we capture the effects of higher borrowing costs on investment.

The household sector consumes imported and domestically produced goods and services. Household consumption spending is driven by permanent real after-tax income, consistent with the permanent income hypothesis. Monetary policy decisions affect household consumption via commercial banks' effective lending rate, which is a function of the repo rate.

The long-run equilibrium for real export volumes is determined by a foreign demand (income) variable and a competitiveness (price) indicator. Rand-denominated export commodity prices and domestic producer input prices determine export competitiveness in the model. Import volumes react to the equilibrium level of domestic demand as the income variable and a competitiveness indicator in the form of import prices (i.e. the rand equivalent of foreign inflation and oil prices) relative to the GDP deflator. Positive and negative output gaps also affect import volumes over the short term. When the output level is above potential, the import propensity to GDP increases.

Interest rate movements vis-à-vis the United States (interest parity condition) determine the exchange rate along with the balance of the current account. The exchange rate feeds into the export and import prices of South African goods and services.

QMM distinguishes between government consumption (split into wages and non-wages), transfers (mostly to households), subsidies and the interest payments on government debt. These are all exogenously determined and subject to discretionary fiscal policy. Government expenditure is financed by tax revenues and/or issuing of bonds. The model provides for five major taxes, namely personal and corporate income taxes, value-added tax (VAT), fuel levies and custom receipts, which are modelled as exogenous effective rates on the relevant tax base.

The role of monetary policy is to anchor prices at the mid-point of the target range. Headline inflation is modelled as a function of demand pressures captured by the output gap and the producer price index (PPI). The latter captures both demand and supply factors affecting the cost structures of firms. These factors include unit labour costs and import prices. The QMM uses a calibrated Taylor rule, with the policy interest (repo) rate reacting to changes in the foreign equilibrium real interest rate (referenced by the US Fed rate), South Africa's risk premium, the output gap and the deviation of inflation from the target. The risk premium is measured by the JP Morgan EMBI+ measure[8] for emerging markets. The real repo rate in the model increases in response to a higher risk premium, a more positive output gap or inflation expectations exceeding the target level.
Inflation expectations are adaptive in the model. This specification is supported by Kabundi and Schaling (2013) and Crowther-Ehlers (2019), who find that expectations formation tends to be more adaptive in South Africa.[9]

Real long-term interest rates reflect the trend in the real short-term policy (repo) rates and the fiscal balance (as % of GDP). The risk premium enters the long-run interest rate equation via the repo rate. By affecting output and the cost of borrowing, fiscal and monetary policy decisions impact income and the real cost of capital, which in turn affects economic activity.

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8 The measure is a weighted spread of South Africa's long bonds to the matched risk-free (US) rates.

9 The presence of empirical evidence supporting adaptive expectations suggests that some elements of the Lucas critique are less applicable to our analysis.

In QMM the output gap is derived from the difference between actual and potential GDP – with the latter informed by a Hodrick–Prescott filter. This is in contrast to the SARB core model where the output gap for all periods is calibrated to the estimates generated by Botha, Ruch, and Steinbach (2018). For the most recent years, we use estimates produced for the Monetary Policy Committee.

The model framework tries to capture how the financial sector tends to amplify economic shocks through changes in the aggregate lending spread. We define the lending spread as the banks' weighted effective lending rate minus the repo rate. The spread is driven by changes in the JSE All-Share Index and South Africa's risk premium. A deterioration in the global and domestic environment affects equity prices and risk premia, increasing the risk aversion of the financial sector and leading to a higher lending spread. This mechanism captures some elements of the theoretical models of Borio and Zhu (2012) and Woodford (2010).

4.2 Key model equations

In this section we present some of the key equations in the model and their diagnostic statistics.[10] Table A in the annexure lists the remaining equations and the explanatory variables.

4.2.1 Real fixed investment in the private sector

Similar to the SARB's core model, real private-sector fixed-investment spending is primarily based on the growth accelerator specification (Jorgenson 1963). Higher economic activity, as measured by GDP, leads to more investment and capital accumulation in the long run. Our econometric estimation imposes a homogenous relationship between investment and output. Other drivers include the cost of capital measured by the real yield on long-term bonds as well as output gap dynamics, which tend to generate more investment as the output gap becomes more positive.

$$\Delta\log(\text{PrivInv1}) = \begin{bmatrix} -\beta_1*(\log(\text{PrivInv1}_{(-1)}) - \log(\text{Gdp1}_{(-1)})) + \beta_2*(\frac{\text{RealGLR}_{(-3)}}{100}) \\ + \beta_3*(\frac{\text{GdpGap}_{(-1)}}{100}) \end{bmatrix}$$

10 As part of our equation robustness checks, we also calculated the t-stats adjusted for heteroscedasticity. The significance of the various coefficients remains unchanged, except the β_1 coefficient in the risk premium equation, which is significant only at the 10% level.

$$+ \beta_4 + \beta_5 * \Delta \log(PrivInv1_{(-1)}) + \beta_6 * \Delta \log(RealRDol_{(-1)})$$

$$+ \beta_7 * Dum09q1 + \beta_8 * Dum15q4 + \varepsilon_{PrivInv1}$$

(1)

$R^2 = 0.69$

DW = 1.88

(Breusch-Godfrey (LM) tests do not reject H_0 of no serial correlation in residuals up to 4th order)

β_1 = 0.346 ; β_2 = -0.330 ; β_3 = 0.524 ; β_4 = -0.683 ; β_5 = 0.199 ; β_6 = 0.152 ; β_7 = -0.088 ; β_8 = -0.065

(-3.67) (-2.60) (1.67) (-3.60) (2.36) (3.97) (-4.15) (-3.69)

Sample = 2005Q1 – 2020Q1

Where:

- $PrivInv1$ = Private sector investment spending (seasonally adjusted : constant 2010 prices)
- $Gdp1$ = Gross domestic product (seasonally adjusted : constant 2010 prices)
- $RealGLR$ = Real yield on government stock with a maturity of 10 years less expected consumer price index (CPI) inflation
- $GdpGap$ = Real GDP "output" gap (seasonally adjusted : constant 2010 prices)
- $RealRdol$ = Real effective exchange rate (index 2010 = 100)

4.2.2 Real yield on long-term government bonds

We model the term premium spread as the difference between the real long bond rate and the real repo rate. The main driver of the term premium in the long run is the government-deficit-to-GDP ratio, while in the short run it is the lagged risk premium. The risk premium specification captures short-term volatility caused by both domestic and international events. A change in South Africa's risk premium has a direct impact on long rates, that is, over and above the change working indirectly via the repo rate.

$$\Delta(RealGLR - RealRepo) = [- \beta_1 * (RealGLR_{(-1)} - RealRepo_{(-1)}) + \beta_2 * (GovDefr_{(-1)})]$$

$$+ \beta_3 + \beta_4 * \Delta(RealGLR_{(-1)} - RealRepo_{(-1)}) + \beta_5 * \Delta SARisk_{(-1)} + \beta_6 * Dum19q1_{(-4)} + \varepsilon_{RealGLR}$$

(2)

$R^2 = 0.48$

DW = 2.09

(Breusch-Godfrey (LM) tests do not reject H_0 of no serial correlation in residuals up to 4th order)

$\beta_1 = 0.2653$; $\beta_2 = -0.2114$; $\beta_3 = -0.2819$; $\beta_4 = 0.4100$; $\beta_5 = 0.2342$; $\beta_6 = 1.4242$

(-5.16) (-5.02) (-2.55) (4.48) (1.99) (2.45)

Sample = 2000Q3 – 2020Q1

Where:

- $RealGLR$ = Real yield on government stock with a maturity of 10 years less expected CPI inflation
- $RealRepo$ = SARB repo rate in real terms (CPI adjusted)
- $GovDefr$ = Government deficit as a ratio to nominal GDP
- $SARisk$ = South Africa's risk premium

4.2.3 Risk premium

South Africa's risk premium is measured as a weighted maturity structure of long-term government bonds to the corresponding weighted structure of US bonds (JP Morgan EMBI+ measure for South Africa). Over the long run, the domestic risk premium is informed by the JP Morgan emerging markets bond index (EMBI), while the change in the Federal Reserve's balance sheet captures quantitative easing dynamics and serves as a proxy for risk on/off events in emerging markets. The risk premium is also affected by the domestic debt-to-GDP ratio. This specification ensures that long bond yields are directly affected by flow dynamics via the fiscal deficit and indirectly by stock dynamics captured by the debt-to-GDP ratio in the risk premium equation.

$$\Delta(\text{SARisk}) = \left[-\beta_1 * (\text{SARisk}_{(-1)} - \text{EMBI}_{(-1)}) + \beta_2 * \log(\text{USAFedL}_{(-3)}) + \beta_3 * \frac{\text{GovtDebtr}_{(-2)}}{100} \right] + \beta_4 + \beta_5 * \Delta(\text{EMBI}) + \beta_6 * \text{Dum09q1} + \beta_7 * \text{Dum09q2} + \varepsilon_{\text{SARisk}} \quad (3)$$

$R^2 = 0.89$

DW = 1.76

(Breusch-Godfrey (LM) tests do not reject H_0 of no serial correlation in residuals up to 4th order)

$\beta_1 = 0.0657$; $\beta_2 = -0.1284$; $\beta_3 = 0.8857$; $\beta_4 = 1.4769$; $\beta_5 = 0.6427$; $\beta_6 = 1.3211$; $\beta_7 = -1.3952$

(-1.91) (-1.82) (1.81) (1.63) (9.67) (4.19) (-6.49)

Sample = 2003Q1 – 2020Q1

Where:

- $SARisk$ = South Africa’s risk premium
- $EMBI$ = Emerging market risk premium as spread to weighetd US long bond maturities
- $USAFedl$ = Liabilities on US Federal Reserve bank balance sheet
- $GovtDebtr$ = Government-debt-to-nominal-GDP ratio

4.2.4 Effective lending spread

The nominal effective lending spread is calculated as the difference between the banks’ nominal weighted effective lending rates and the official SARB repo rate $(\text{Eflendrate} - \text{Repo})$. The spread is a function of the JSE All-Share Index and the risk premium. Deterioration in these variables increases the lending spread as valuations worsen and probabilities of default increase. This approach strives to capture the theoretical mechanisms identified by Borio and Zhu (2012) and Woodford (2010), but the framework is not able to generate financial accelerator effects. When economic conditions deteriorate, banks become more reluctant to extend credit to applicants as the threat of non-performing loans increases. Our approach is different to Grobler and Smit (2015). In their specification, the lending spread is affected by macro prudential ratios. In our specification, this relationship is assumed implicitly as higher risk premium and negative shocks to equity prices should require banks to hold more capital.

$$\Delta(\text{Eflendrate} - \text{Repo}) = [-\beta_1 * (\text{Eflendrate}_{(-1)} - \text{Repo}_{(-1)}) + \beta_2 * \log(\text{JseAlsi}) + \beta_3 * \text{SARisk}_{(-1)}]$$

$$+ \beta_4 + \beta_5 * \Delta(\text{SARisk}) + \beta_6 * \text{Dum09q1} + \beta_7 * \text{Dum09q2} + \beta_8 * \text{Dum09q2} + \varepsilon_{\text{Eflendrate}} \quad (4)$$

$R^2 = 0.59$

DW = 1.87

(Breusch-Godfrey (LM) tests do not reject H_0 of no serial correlation in residuals up to 4th order)

β_1 = 0.374 ; β_2 = -0.506 ; β_3 = 0.374 ; β_4 = 5.363 ; β_5 = 0.508 ; β_6 = -1.401 ; β_7 = 0.998 ; β_8 = 0.631

(-4.50) (-2.21) (5.33) (2.32) (5.87) (-3.41) (-2.54) (2.92)

Sample = 2005Q1 – 2020Q1

Where:

- $Eflendrate$ = South Africa's weighted effective lending rate in the banking sector
- $Repo$ = SARB's repo rate
- $JseAlsi$ = JSE All-Share Index
- $SaRisk$ = South Africa's risk premium

4.2.5 Real rand/US dollar exchange rate

The real rand/dollar exchange rate is modelled as a function of the real risk adjusted interest rate differential between the US and South Africa. Balassa Samuelson effects are captured via the current account balance. In addition, the real rand/dollar exchange rate is affected by the real US$/euro exchange rate to reflect the importance of the euro area as a major trading partner of South Africa.

$$\Delta(\text{RealRDol}) = \left[-\beta_1 * \log(\text{RealRDol}_{(-1)}) + \beta_2 * \log(\text{RealDEuro}_{(-1)}) + \beta_3 * \frac{(\text{Intdiff} - \text{SARisk})}{100} + \beta_4 * \left(\sum_{j=1}^{4} (\text{Cabopr}_{(-j)}/4) - \sum_{j=1}^{4} (\text{CabopEqr}_{(-j)}/4) \right) \right]$$

$$+ \beta_5 + \beta_6 * \Delta\log(\text{RealDEuro}) + \beta_7 * \text{Dum01q4} + \beta_8 * \text{Dum08q4}$$

$$+ \beta_9 * \text{Dum09q2} + \beta_{10} * \text{Dum16q1} + \varepsilon_{\text{RealRDol}}$$

(5)

$R^2 = 0.57$

DW = 1.80

(Breusch-Godfrey (LM) tests do not reject H_0 of no serial correlation in residuals up to 4th order)

β_1 = 0.1068 ; β_2 = -0.1169 ; β_3 = -0.5112 ; β_4 = -0.9917 ; β_5 = 0.2926 ; β_6 = -0.5626 ; β_7 = 0.1568

(-2.38) (-2.16) (-2.89) (-1.66) (2.46) (-4.03) (3.17)

β_8 = 0.1433 ; β_9 = -0.1560 ; β_{10} = 0.1011

(2.59) (-3.20) (2.10)

Sample = 2000Q1 – 2020Q1

Where:

- $RealRDol$ = Rand/US$ exchange rate in real terms
- $RealDEuro$ = US$/euro exchange rate in real terms

- $Intdiff$ = Interest rate differential between South Africa's repo rate and the US Fed rate
- $SARisk$ = South Africa's risk premium
- $Cabopr$ = Current account of the balance of payments as a ratio to nominal GDP
- $CabopEqr$ = Equilibrium level of the $Cabopr$

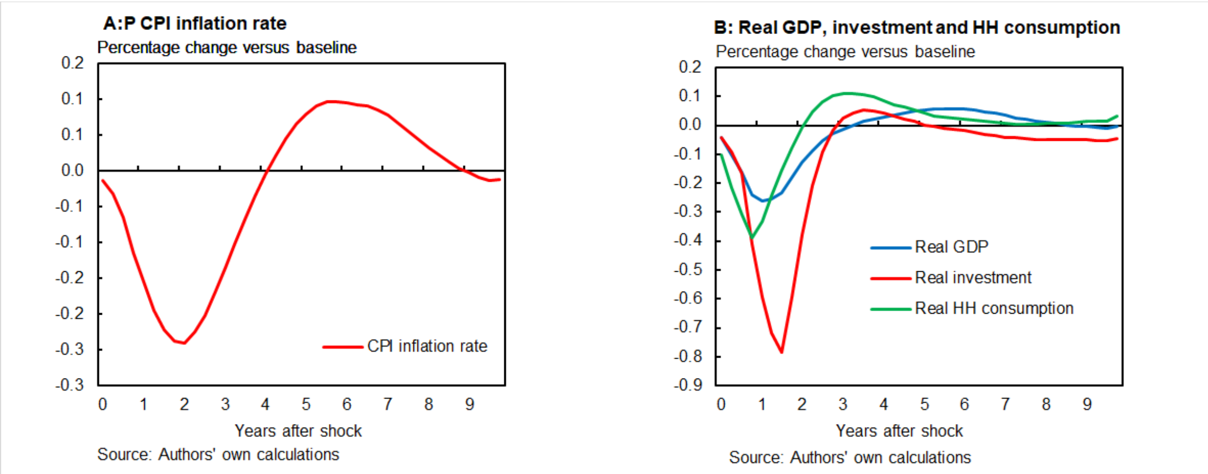
4.3 Model properties

In this section we illustrate the model properties by showing the response of the model to two exogenous shocks.

4.3.1 Repo rate shock

Figure 5 shows the effects of a 1 percentage point increase in the SARB repurchase interest rate for four quarters to illustrate the monetary policy transmission mechanism in QMM. The model dynamics capture the main channels via market rates, the exchange rate, asset prices, expectations and risk taking via the bank lending spread.[11] The model's response is in line with those generated by the SARB's quarterly projection model (de Jager, Johnston, and Steinbach 2015).

Figure 5: Model response to four-quarter real repo rate shock



Banks' effective lending rates increase by slightly more than 1 percentage point as lending spreads also increase due to the slowdown in economic activity and the moderation in share prices. Higher banking rates and lower share prices reduce household consumption. The repo rate also filters through to long-term interest rates, which, together with the reduced Keynesian

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11 See Borio and Zhu (2012) for a discussion of the monetary policy transmission mechanism.

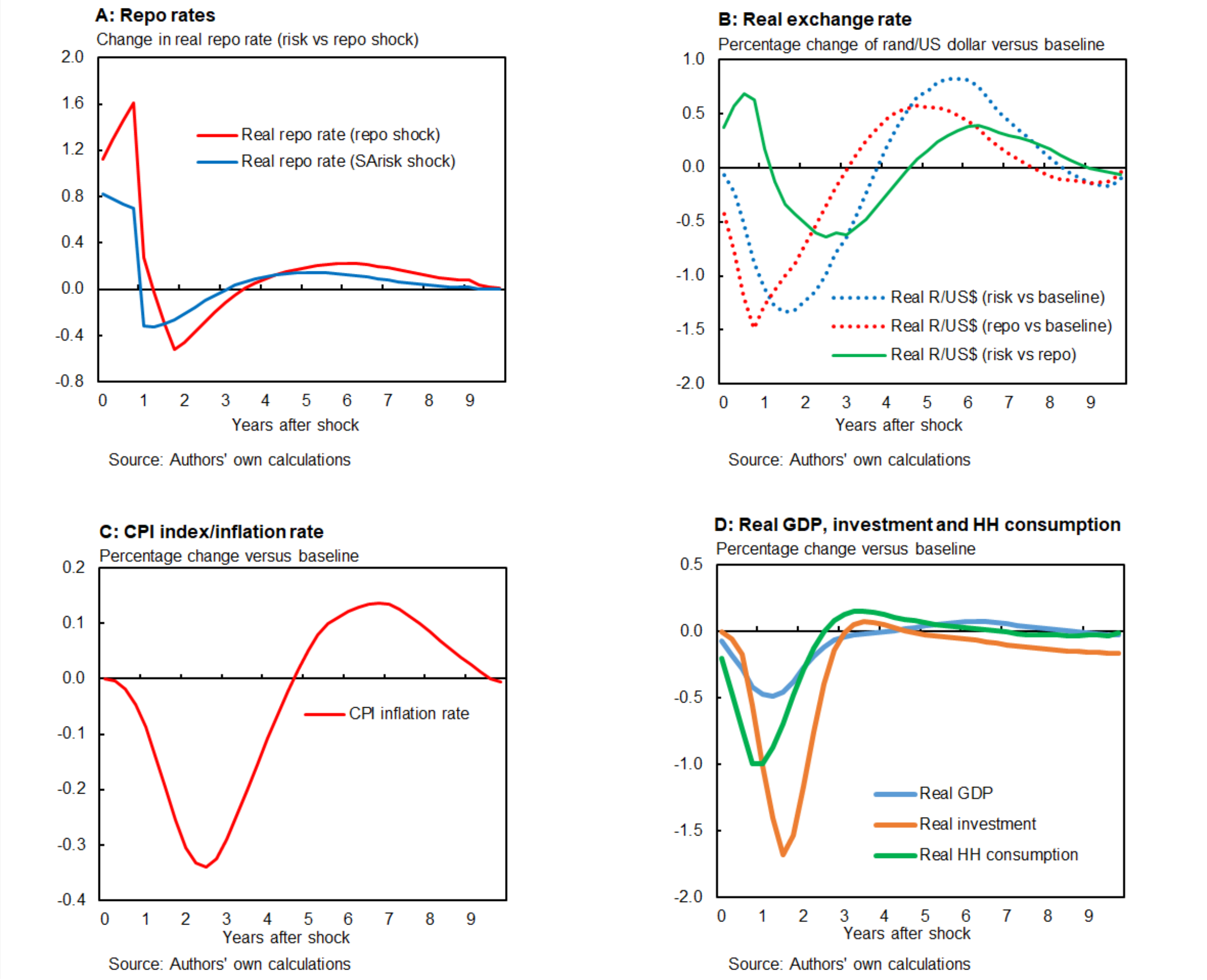
demand accelerator, cause investment to decline. Consequently, gross domestic expenditure and capacity utilisation fall and wage pressures moderate. Wages respond with a lag, indicating some degree of wage stickiness in the South African labour market.

The exchange rate appreciates as the balance on the current account improves and the favourable interest differential widens. This supports the steady reduction in headline inflation. The slowdown in inflation expectations is slower than the moderation in headline inflation, in line with our assumption of adaptive expectations. The maximum inflation impact of around 0.3 percentage points is reached in six to eight quarters after the initial change in interest rates. Real GDP declines by 0.25% some four to five quarters after the repo rate increase.

4.3.2 South African risk shock

Figure 6 depicts the impact of a four-quarter shock to South Africa's risk premium. The transmission mechanism is somewhat similar to the repo rate shock described earlier – as the risk premium raises the repo rate. However, the real economy impact is larger because the long rate is affected not only indirectly by the higher repo rate, but also directly via the risk premium increase. Consequently, the negative investment response is stronger than in the repo rate scenario, which in turn results in large and negative impacts on other demand components. The impact on the banks' effective lending rate is stronger as the higher risk premium also affects the lending spread directly. It is this channel that causes household consumption to decline by more than in the repo rate shock scenario. The higher risk premium causes the exchange rate to depreciate in real terms, which in turn supports export volumes and reduces the demand for imports.

Figure 6: Model response to four-quarter real South African risk shock



4.4 Model simulations

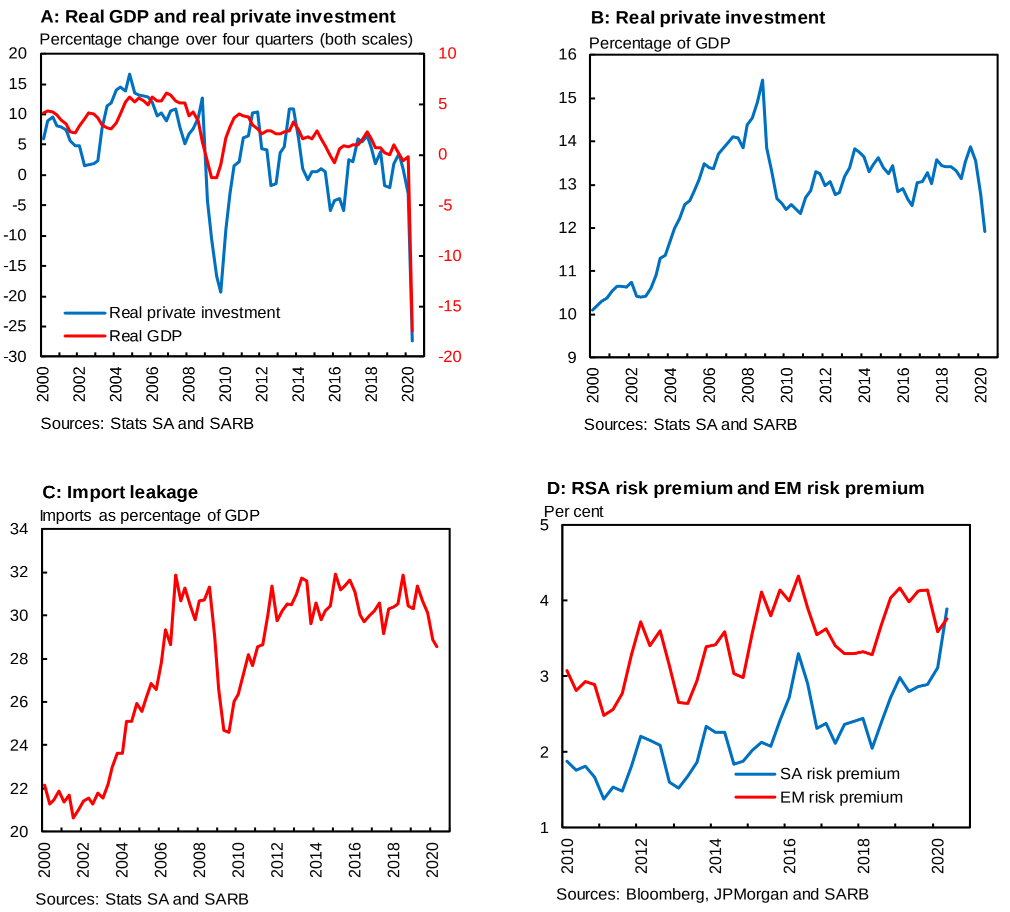
The model provides a laboratory to calculate the multipliers under different conditions. We identify three main periods:

- The first period is immediately after the global financial crisis, which is characterised by falling risk premia, large negative output gaps and large capital inflows.
- In the second period, post-2010, these conditions start to reverse and government starts to use tax increases to reduce the fiscal deficits. The economy also experiences several supply-side shocks such as protracted and disruptive strikes in the mining and manufacturing sectors, droughts as well as sporadic episodes of load-shedding.
- The last period, from 2014 onwards, is characterised by more rapid increases in the risk premia in response to rapidly deteriorating fiscal metrics and heightened policy uncertainty.

Each period is characterised by different assumptions regarding funding of expenditure, the relationship between risk premia and fiscal dynamics, and the size of the output gap. In period 1, for example, expenditure is debt funded, but it does not increase the risk premia as the fiscal risks are perceived as low and the country benefits from substantial capital inflows, which reduce the domestic savings constraint.

We have chosen this approach rather than generating time-variant coefficients as we do not have enough observations to generate robust results under our current estimation period. Extending the estimation period into the 1980s can provide observations covering a large fiscal deterioration, but at that time the structure and behaviour of the economy were very different to the post-apartheid period. Structural change is a major problem when analysing emerging and developing economies because it renders long estimation periods less useful for economic analysis.

Figure 7: Key drivers of underlying conditions



In periods 2 and 3, funding is a combination of tax and debt funding and the shares reflect the actual mix. The risk premium responds in these periods, pushing both the neutral interest rate and the lending spread up. We calibrate the elasticity of the risk premium to the debt-to-GDP ratio so that the model fits the actual data. The transition between the three periods is gradual. Shocks to expenditure reflect the actual compositional changes over the period.

Figure 7 outlines some of the structural changes that the model dynamics and shocks try to capture. These include recovery in investment and growth and a stronger growth accelerator effect in period 1 (Figure 7a and 7b). Both investment and growth declined in period 3, suggesting that the growth accelerator effect is smaller. The initial period is also characterised by smaller import leakage than in later periods. Figure 7d shows the steady increase in the risk premium since 2013.

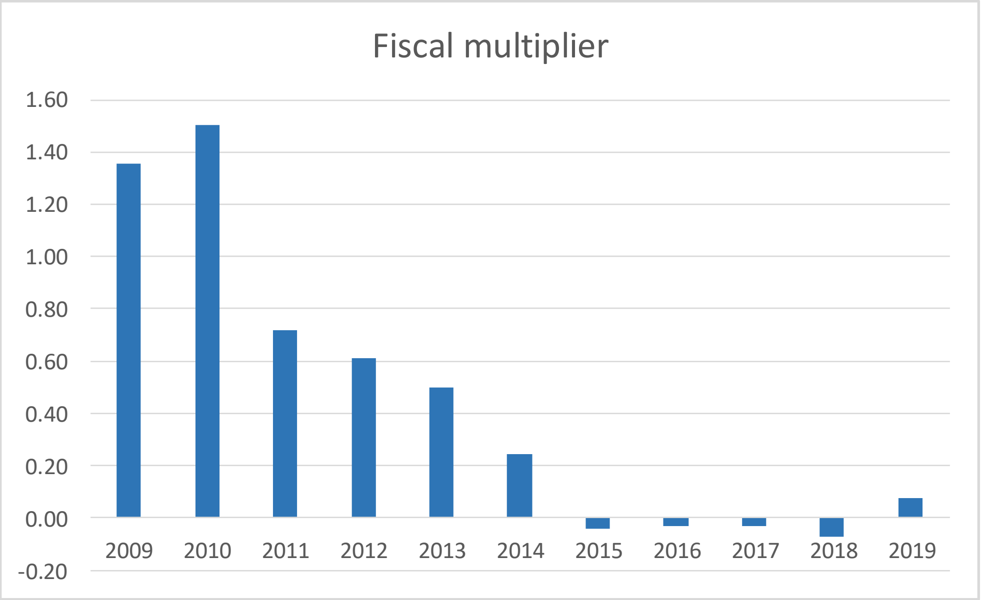
Table 1: Shocks to the model

Period 1 (2009 to 2010)	**1.** The risk premium does not respond to higher debt levels. Coefficient β_3 **in equation 1 is assumed to be zero.** **2.** No tax increases. **3.** Government consumption is shocked by 1%. **4.** Import leakage operates as in the baseline model.
Period 2 (2011 to 2013)	**1.** The risk premium responds as in equation 3. **2.** The increase in government consumption is partially funded by higher personal income tax (PIT). We assume the actual split between debt and tax financing. **3.** Government consumption is shocked by 1%. **4.** Import leakage operates as in the baseline model. However, the import leakage increases when the output gap becomes positive.
Period 3 (2014 to 2019)	**1.** The risk premium response is amplified compared to period 2. **2.** The increase in government consumption is partially funded by higher PIT and VAT. We assume the actual split between debt and tax financing. **3.** Government consumption is shocked by 1%. **4.** Import leakage operates as in the baseline model. However, the import leakage increases when the output gap becomes positive.

5. Results

We calculate the fiscal multipliers for each calendar year. Figure 8 shows the impact multipliers, calculated as the change in GDP divided by the change in real government consumption expenditure. The fiscal expenditure multiplier is time-varying and 'state dependent'. It also takes into account how expenditure is funded. Initially, the expenditure multiplier increases to 1.5 after the global financial crisis, but then gradually declines towards zero as the fiscal situation deteriorates and South Africa is faced with a series of supply shocks. We now briefly explain how these results are generated in our framework. The first period is characterised by low government-debt-to-GDP ratios, large output gaps and significant capital inflows. During this period, an increase in government spending does not translate into higher risk premia or higher policy rates. There are no crowding-out effects and the higher levels of economic activity support the stock market, leading to lower lending spreads. This amplifies the initial positive impact on output. The growth response generates a stronger growth accelerator effect during the first period via the investment equation (equation 1). At the same time, government consumption expenditure does not crowd out government investment, which provides further support to the growth accelerator mechanism in the model. The import leakage is also relatively small due to the large output gap supporting a higher multiplier.

Figure 8: The fiscal multiplier over the last decade

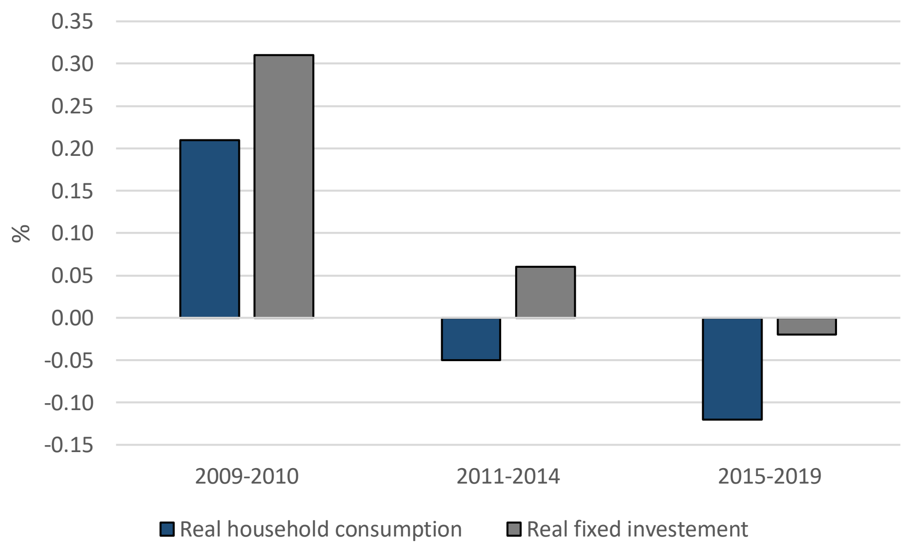


Source: Authors' own calculations

Figure 9 shows the impact on household consumption and investment. During the first period the response is strong and positive.

In the second period, post-2010, the dynamics change. The economy is hit by a series of transitory and permanent supply-side shocks. These include falling commodity prices and binding electricity constraints, particularly for export- and electricity-intensive sectors such as mining and manufacturing. The output gap is no longer large and negative. The structural factors from the first period have started to reverse. The import leakage is higher now as the supply constraints and the previous recovery in the economy require a greater degree of importation. The fiscal shock now leads to a higher policy rate and risk premium (equation 3). The real long-term yield and the lending spread increase, following the dynamics outlined in equations 2 and 4. The response of private investment relative to the first period is muted, reflecting a much smaller positive growth accelerator effect and also higher borrowing rates in the economy. Government spending is less efficient in its efforts to stimulate economic activity. In addition, the expenditure shock is accompanied by tax shocks that increase the effective PIT rate, negatively affecting household consumption. The tax-to-GDP ratio increased from 23.9% in 2010/11 to 25.9% in 2016/17. The average impact on investment is still positive but very small and on consumption it is negative (Figure 9).

Figure 9: Average response of key variables (1st year of impact % deviation from baseline)



Source: Authors' own calculations

In the last period, post-2014, the negative dynamics are exacerbated. The response of the risk premium to rising debt is now stronger. The tax increases are higher, including a VAT increase. The supply constraints become even more binding. Long rates and lending spreads increase by more than in period 2. Under these conditions, household consumption and investment decline relative to the baseline (Figure 9). These dynamics generate small and in some years even negative multipliers.

6. Conclusion

Our results show that the space for generating strong positive growth effects from a fiscal expansion has long gone. The multiplier was close to zero by 2015. Yet, government has been growing expenditure, increasing taxes and growing debt. The outcome of this policy has been declining growth and limited fiscal space to respond to the COVID-19 crisis. Our results suggest that the costs of fiscal consolidation will be less harmful to growth than generally perceived as the multiplier is currently very small.

Our results compare favourably to previous estimates.[12] Our multipliers are similar to those calculated by Schröder and Storm (2020) but also to Mabugu et al. (2013) and Jooste, Liu, and Naraidoo (2013). What we illustrate is that changing fiscal conditions as well as structural shifts in the economy can materially change the size of fiscal multipliers. Generating multipliers under one economic state and assuming that they apply under different economic states is an incorrect approach, which will generate large policy errors.

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12 Our framework does not have financial accelerator effects. These would have increased the positive multiplier at the beginning of the period but also the negative multipliers at the end.

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Table A: QMM key equations

Dependent variable	Explanatory variables
BER inflation expectations: current year	BER inflation expectations: current year (+); CPI index: total (% change y-o-y) (+)
BER inflation expectations: one year ahead	BER inflation expectations: one year ahead (+); BER inflation expectations: current year (+)
BER inflation expectations: two years ahead	BER inflation expectations: one year ahead (+); BER inflation expectations: two years ahead (+)
CPI index: food	CPI index: total (+); CPI index: electricity (+); CPI index: food (+); food index (rand) (+)
CPI index: fuel	CPI index: fuel (+); petrol price (pump price) (+)
CPI index: total	CPI index: total (+); CPI index: electricity (+); CPI index: food (+); CPI index: fuel (+); PPI index: (total) (+); unit labour cost (total) (+); VAT rate (+)
Deflator: exports (total)	Deflator: exports (total) (+); deflator: GDP (+); commodity prices (rand) (+); world PPI (rand) (+)
Deflator: fixed-capital formation (government)	Deflator: government consumption (+); deflator: fixed-capital formation (total) (+); deflator: fixed-capital formation (government) (+)
Deflator: fixed-capital formation (total)	CPI index: total (+); deflator: fixed-capital formation (total) (+); deflator: imports (total) (+)
Deflator: government consumption	Government consumption expenditure (real) (+); fixed-capital formation: government (real) (+); deflator: household consumption deflator (+); deflator: government consumption (+); wage bill: government (+)
Deflator: household consumption deflator	Deflator: household consumption deflator (+); CPI index: total (+)
Deflator: imports (total)	Deflator: imports (total) (+); oil price per barrel (rand) (+); world PPI (rand) (+); taxes: total customs rate (national government) (+)
Effective lending rate	JSE All-Share Index (-); effective lending rate (+); SA repo rate (nominal) (+); SA risk premium (+)
Emerging markets risk premium	Emerging markets risk premium (+)
Employment: private	Employment: private (+); wage rate (average): private (real) (-); real GDP (private sector proxy) (+)

Dependent variable	Explanatory variables
Exchange rate: rand per US$ (real)	US$/euro exchange rate (real) (-); balance on the current account (% of GDP) (-); balance on the current account – equilibrium (% of GDP) (+); interest rate differential (SA minus US) (-); exchange rate: rand per US$ (real) (+); SA risk premium (+)
Exports (real)	Exports (real) (+); deflator: exports (total) (+); deflator: GDP (-); world GDP (US$) (+)
Fixed-capital formation: private (real)	SA government long-bond yield (real) (-); fixed-capital formation: private (real) (+); exchange rate: rand per US$ (real) (+); real GDP (+); output gap (+)
Fuel price: basic price component	Fuel price: basic price component (+); oil price per barrel (rand) (+)
Imports (real)	Government consumption expenditure – other (real) (+); deflator: imports (total) (-); deflator: GDP (+); output gap (+); real gross domestic expenditure (GDE) (+)
JSE All-Share Index	JSE All-Share Index (+); SA repo rate (real) (-); deflator: GDP (-); real GDP (+)
Petrol price (pump price)	Fuel price: basic price component (+); petrol price (margins and taxes) (+); petrol price (pump price) (+)
PPI index (total)	CPI index: fuel (+); deflator: imports (total) (+); PPI index: (total) (+); unit labour cost (total) (+); output gap (+)
Real household consumption	Real household consumption (+); effective lending rate (-); CPI index: total (% change y-o-y) (-); real disposable income (+)
SA government long-bond yield (real)	SA government long-bond yield (real) (+); SA repo rate (real) (+); national government: fiscal balance (% of GDP) (-); SA risk premium (+)
SA risk premium	Emerging markets risk premium (+); national government: debt (+); SA risk premium (+); US: Fed balance sheet: liabilities (-)
Wage rate (average): private (real)	BER inflation expectations: current year (+); labour productivity: private (+); CPI index: total (% change y-o-y) (-); wage rate (average): private (real) (+)