Government Debt, Interest Rates, and Optimal Policy

Hylton Hollander

Stellenbosch University

hylton@sun.ac.za

November 26, 2020

Overview

1. Motivation & Contribution
2. Main findings
3. The relationship between government debt and interest rates
4. Two measures for fiscal sustainability
5. Results
   - Debt-financed fiscal stimulus
   - Fiscal sustainability and monetary policy
   - Optimal policy
   - Counterfactual simulations
   - Debt stabilisation after COVID-19
6. Concluding remarks
   - Modelling issues

Motivation for the study

Fiscal sustainability and sovereign debt risk

- Academia: Calitz et al. (2014); Burger and Calitz (2019); Calitz (2020)
- Markets: 11% probability of default within next 5 years (Bloomberg, 2020)
- Policymakers: sovereign debt crisis by 2024 (Mboweni, 2020)

The effect of debt-financed fiscal stimulus (DFFS) on interest rates

- expenditure or tax cuts (revenue shortfalls)
- a key transmission mechanism for fiscal multipliers (Ganelli and Rankin, 2020) and fiscal sustainability (Fourie and Burger, 2003; Calitz et al., 2013)

Contribution to the literature I

I. The effect of DFFS on interest rates in a DSGE model

- Difficulty in identifying fiscal policy shocks is well-documented in the literature (Engen and Hubbard, 2004; Ramey, 2019; Gamber and Seliski, 2019; Kemp, 2020)
- Empirical evidence on the effect of government debt on interest rates in South Africa is very limited (Fedderke, 2020)
- SA literature predominantly focused on:
  - the effect of government debt on growth,
  - the effect of interest rates on the macroeconomy, and
  - the spillover effects of credit ratings or sovereign risk.

  (e.g., Peter and Grandes, 2005; Fedderke, 2020; Mothibi, 2019; Mhlaba and Phiri, 2019; Soobyah and Steenkamp, 2020b,a)

Contribution to the literature II

II. Optimal policy for fiscal sustainability

- There is a substantial literature on fiscal sustainability
- But not much on optimal policy in a DSGE model. A big reason for this follows from **I**

The new-Keynesian open-economy fiscal DSGE model based on Kemp and Hollander (2020) is well-suited to answer the above questions:

- Includes a non-trivial role for fiscal policy: consumption, investment, transfers, labour income tax, capital tax, consumption tax.
- Sticky prices for all goods: domestic, foreign, imports, exports
- Sticky wages for Ricardian and non-Ricardian households
- Rational, forward-looking, and optimizing households and firms
- Estimate with SA data and run counterfactual simulations.

Main findings I

I. The effect of debt-financed fiscal stimulus on interest rates in a DSGE Model

- Reduced-form estimates provide quantitatively similar results to the net effect of DFFS on real yields
- But for fiscal policy analysis, there are non-negligible differences in the responses of households, firms, and the monetary authority (and the risk premium) to each disaggregated fiscal policy shock.
- Notably, an investment-driven DFFS, as opposed to government consumption, produces far more favourable fiscal sustainability outcomes.
- Fiscal revenue shortfalls are unambiguously contractionary.[1]
- "Monetary policy" shocks contribute 10-13% of the variance of fiscal sustainability measures

  The risk premium in the long-term rate contributes $\approx 10\%$

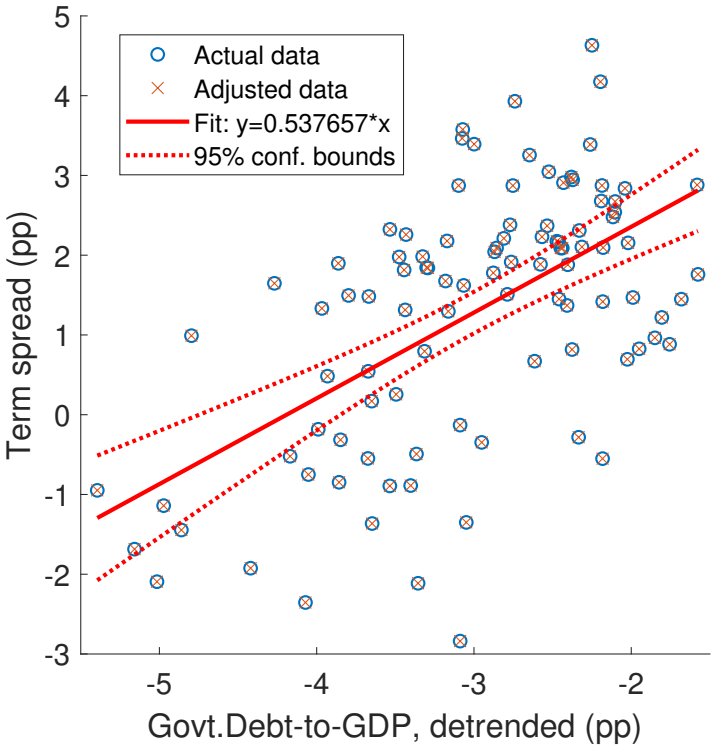
[1] To ensure a stable and predictable stream of tax revenue over the business cycle, the accuracy and credibility of official projections is crucial (e.g., Calitz et al., 2016).

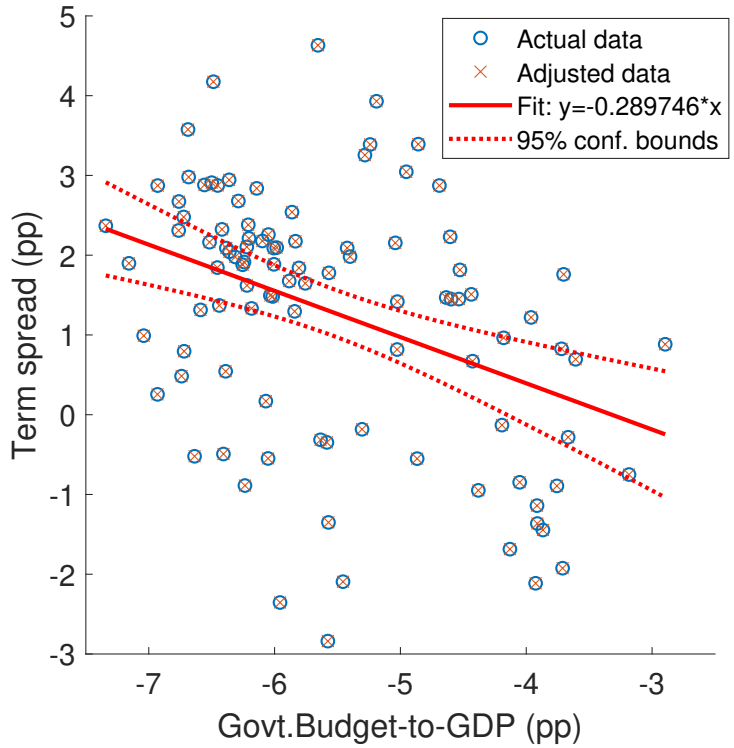
Main findings II

II. Optimal policy for fiscal sustainability

- Government expenditure need not be counter-cyclical, but it must be subordinate to fiscal sustainability (debt level)
- Monetary policy is sub-optimal because of a preference for interest rate smoothing
- Independent optimal fiscal policy and optimal monetary policy coincides with optimal policy coordination.
- There is a trade-off between long-run debt stabilization (hard) and short-term fiscal sustainability (soft)

The relationship between government debt and interest rates





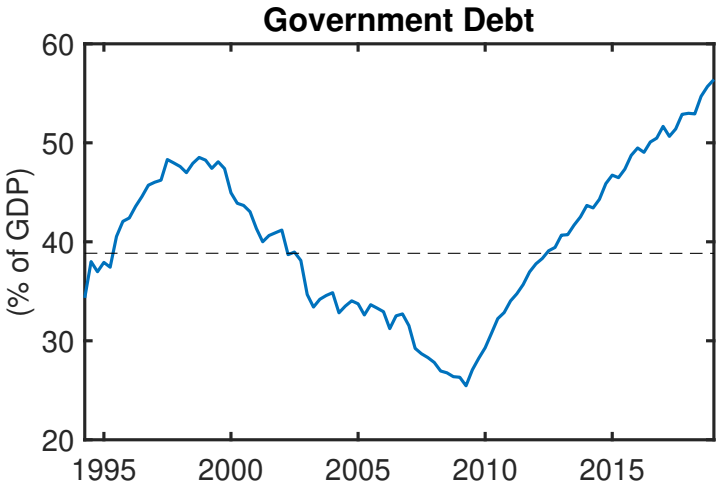
Reduced-form measures estimate the average effect of changes in debt or deficits—a proxy for DFFS.

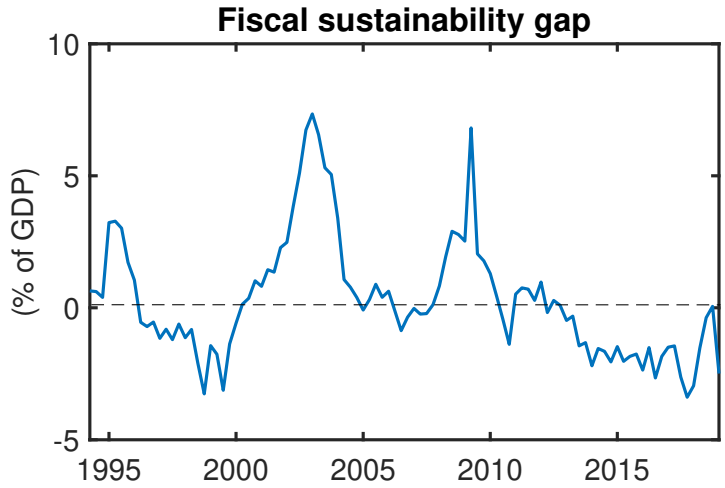
The relationship between government debt and interest rates

Theoretically, DFFS programs directly stimulate aggregate demand through government expenditure or tax cuts, but their effectiveness is highly dependent on:

- direct crowding-out of private sector expenditure (Afonso and Sousa, 2012; Traum and Yang, 2015; Kemp, 2020; Kemp and Hollander, 2020),
- spillover effects to the private sector through higher interest rates (risk premium) (Peter and Grandes, 2005; De Bruyckere et al., 2013; Augustin et al., 2018), and
- the interaction between fiscal policy and monetary policy (Ascari and Rankin, 2013; Ramey, 2019; Ganelli and Rankin, 2020).

Two measures for fiscal sustainability





Sustainable fiscal policy:[2]

1. the public debt-to-GDP ratio remains stable over the medium to long run.
2. If the real interest rate exceeds the real economic growth rate, fiscal sustainability requires government to maintain a primary surplus.

$$pb^{sus} = (r - g) \cdot b_{-1} \quad | \quad pb^{sus*} = (r^* - g^*) \cdot b_0$$
$$pb^{gap} = pb - pb^{sus} \quad \Rightarrow \quad \Delta b = 0$$

[2] Buiter et al. (1985), Blanchard et al. (1991),Fourie and Burger (2003)

Results: debt-financed fiscal expenditure

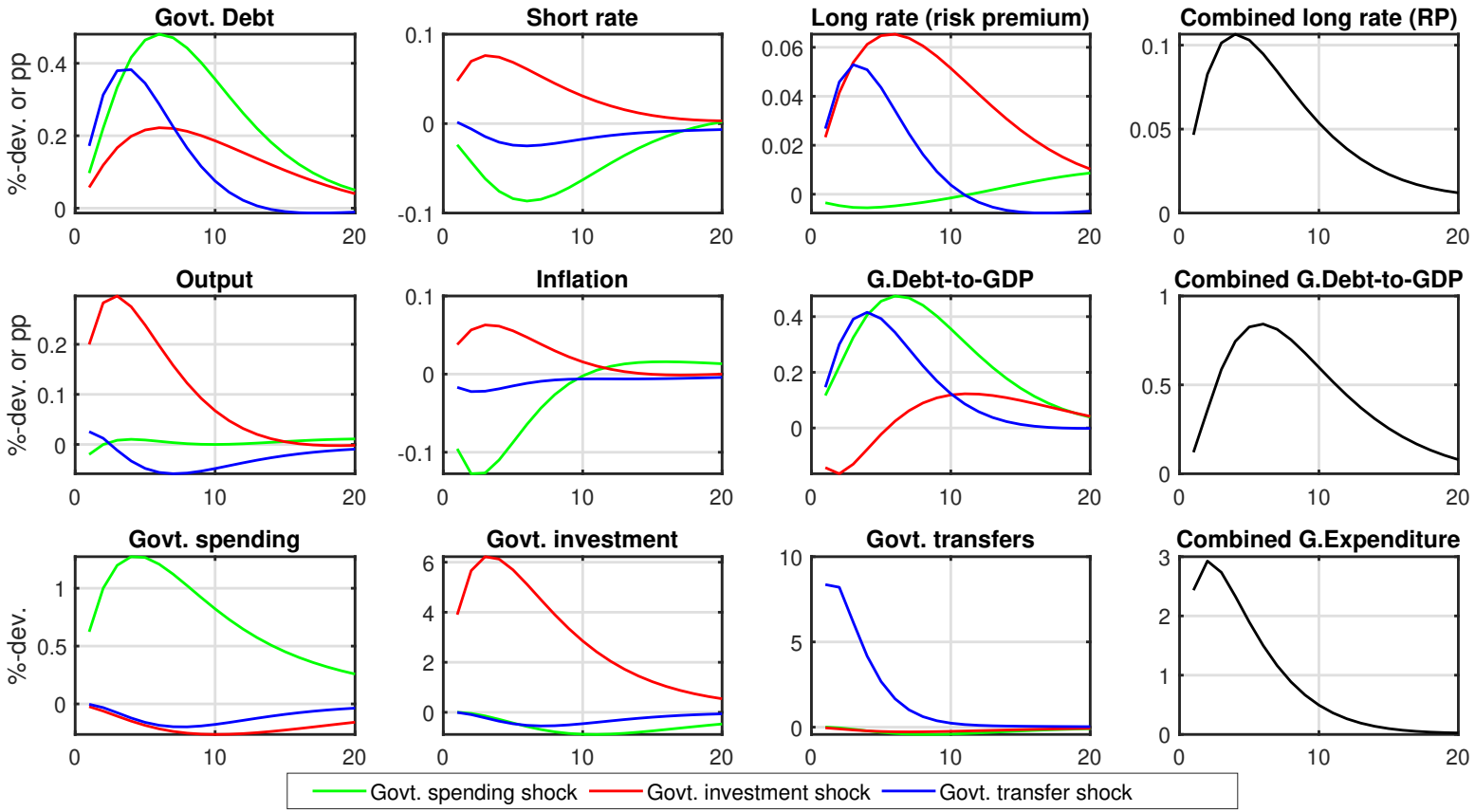


Figure: IRFs for government expenditure shocks.

Sensitivity of interest rates to government debt-to-GDP

Table: Sensitivity of interest rates to government debt-to-GDP

	Combined basis points	G.Spending basis points	G.Investment basis points	G.Transfers basis points
$SIGD_0$				
$i^{(10y)}$	88	7	-46	36
$i^{(3m)}$	21	2	-53	1
$r^{(10y)}$	155	105	-25	51
RP	120	70	-15	49
$SIGD_{max}$				
$i^{(10y)}$	13	2	53	13
$i^{(3m)}$	3	0.4	62	0.4
$r^{(10y)}$	22	26	29	18
RP	17	17	17	17

Note: $i^{(10y)}$ is the implied long rate based on the short-term interest rate response and the endogenous response of the risk premium to the debt-to-GDP ratio. $r^{(10y)}$ is the inflation-adjusted long rate. RP is the risk premium.

Results: debt-financed fiscal revenue shortfalls

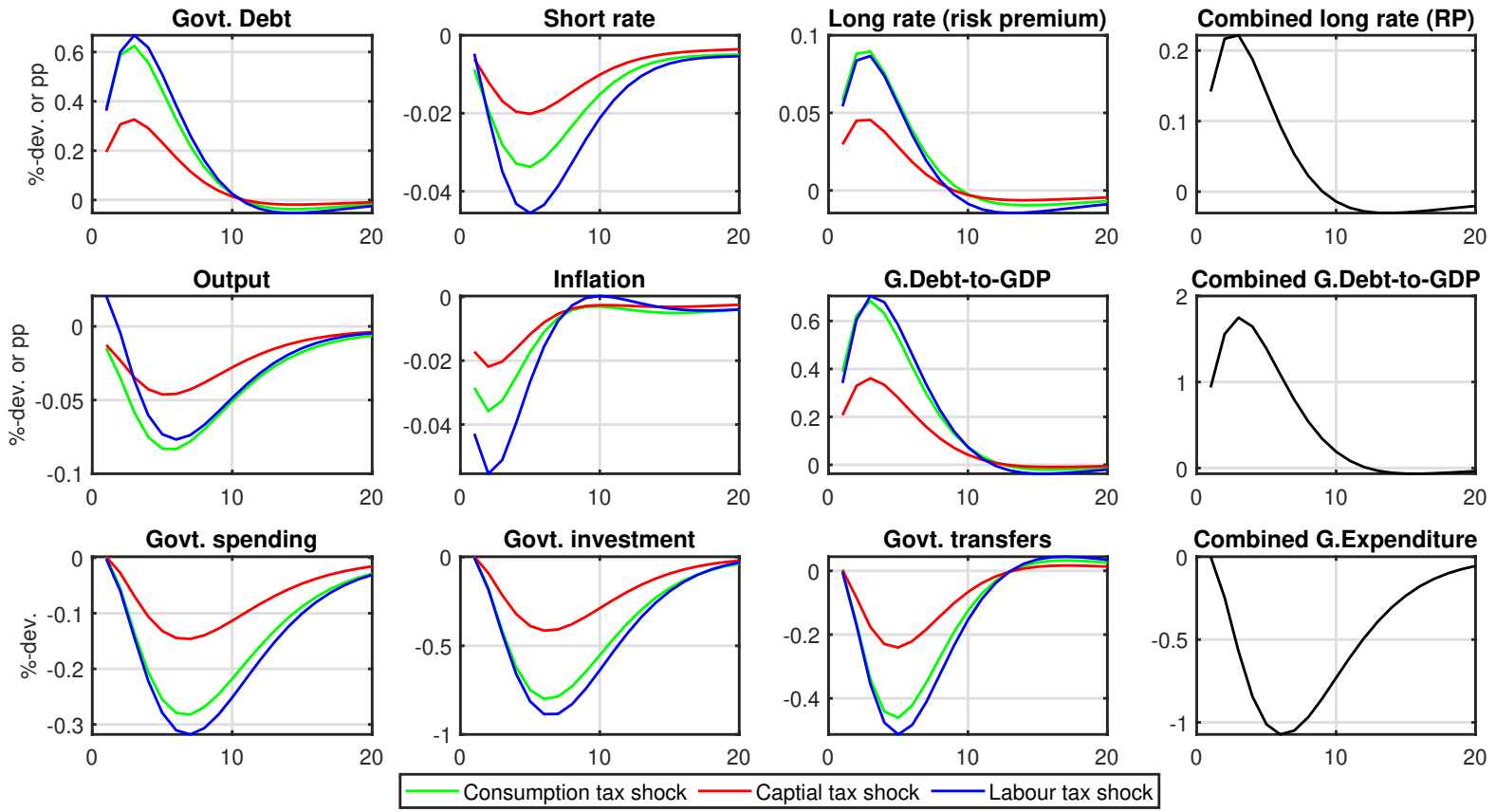


Figure: IRFs for government tax revenue shocks.

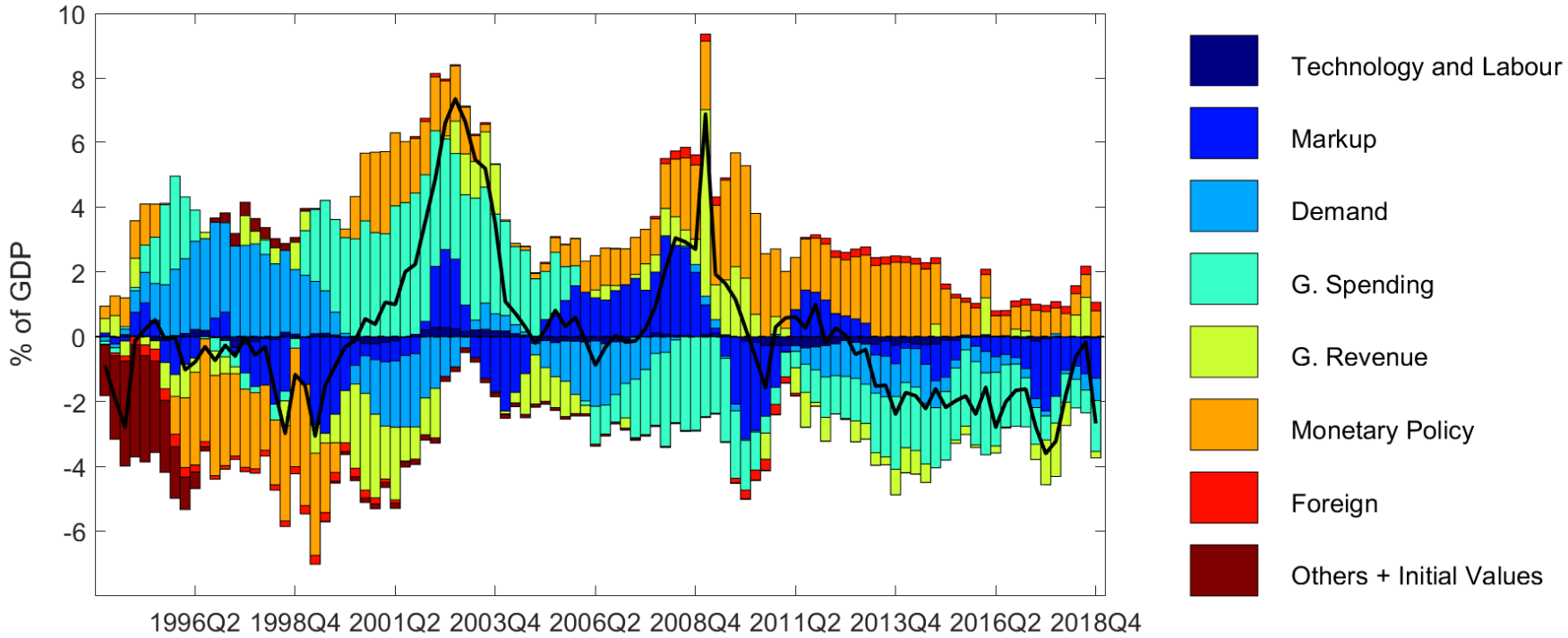
Sensitivity of interest rates to government debt-to-GDP

Table: Sensitivity of interest rates to government debt-to-GDP

	Combined basis points	VAT basis points	CIT basis points	PIT basis points
$SIGD_0$				
$i^{(10y)}$	24	23	22	25
$i^{(3m)}$	-1	-1	-2	-1
$r^{(10y)}$	35	32	32	41
RP	32	30	30	36
$SIGD_{max}$				
$i^{(10y)}$	13	13	13	12
$i^{(3m)}$	-1	-1	-1	-1
$r^{(10y)}$	19	18	19	20
RP	17	17	17	17

Note: $i^{(10y)}$ is the implied long rate based on the short-term interest rate response and the endogenous response of the risk premium to the debt-to-GDP ratio. $r^{(10y)}$ is the inflation-adjusted long rate. RP is the risk premium.

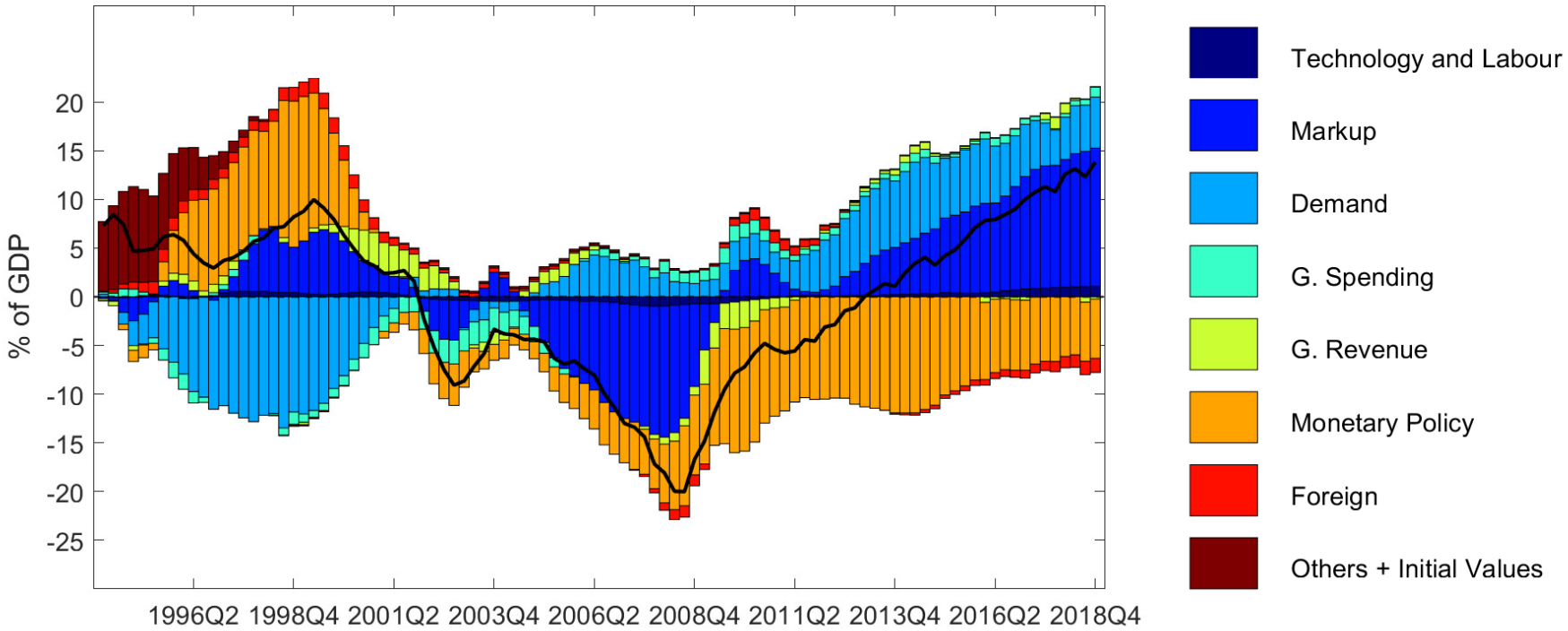
Fiscal sustainability and monetary policy



FEVD:

- Monetary policy shocks contribute 10%
- Risk premium shocks contribute 10%

Government debt-to-GDP and monetary policy



FEVD:

- Monetary policy shocks contribute 13%
- Risk premium shocks contribute 10%

Optimal policy: the loss function

The success of policy can be measured by its ability to minimize instability in the target variables—a loss function:

$$\min \mathcal{L}_t = y_t^2 + \Theta_{\mathbb{X}}.\mathbb{X}_t^2 \ ,$$

where the welfare loss ($\mathcal{L}$) is an increasing function of deviations to output (y_t) and one or more variables in the vector $\mathbb{X}$. $\Theta_{\mathbb{X}}$ is a vector of weights corresponding to the policy target variables.

- Fiscal policy: output and debt (b) or output and the fiscal sustainability gap (pb^{gap})
- Monetary policy: output and inflation (π)
- $\Theta_{\mathbb{X}}$ also controls for instability in the policy instrument.

Optimal policy: optimal simple rules

The fiscal instruments (government consumption and investment expenditure) follow simple feedback rules:

$$g_t = \phi_G g_{t-1} - \theta_{g,y} y_t - \theta_{g,b} b_t + \varepsilon_t^g$$

$$i_{g,t} = \phi_{i_g} i_{g,t-1} - \theta_{i_g,y} y_t - \theta_{i_g,b} b_t + \varepsilon_t^{i_g}$$

And monetary policy follows a Taylor-type reaction function:

$$r_t = \phi_r r_{t-1} + (1-\phi_r)\left(\pi_t^* + \phi_\pi \left(\pi_t - \pi_t^*\right) + \phi_{\Delta y}(y_t - y_{t-1})\right) + \varepsilon_t^r \quad (1)$$

Policymakers must choose θ's and ϕ's to minimize $\mathcal{L}_t \to 0$

Optimal fiscal policy.

Weights on policy variables: $y, pb^{sus} = 1$

	Weights on policy instruments			
	$g, iG = 1$	$g, iG = 0.5$	$g, iG = 0$	
Parameters	*Optimal values*			*Estimated*
$\theta_{g,y}$	0.11	0.10	0.03	0.11
$\theta_{g,b}$	0.09	0.11	0.32	0.18
$\theta_{iG,y}$	0.45	0.44	0.19	0.20
$\theta_{iG,b}$	0.19	0.20	0.58	0.57
Obj.Func:	2.79	1.59	0.30	
$\theta_{iG,y}$	0.42	0.42	0.19	0.20
$\theta_{iG,b}$	0.20	0.20	1.00	0.57
Obj.Func:	2.53	1.44	0.32	

Optimal monetary policy.

Weights on policy variables: y, $\pi^C = 1$ (top); y, $pb^{sus} = 1$ (bottom)

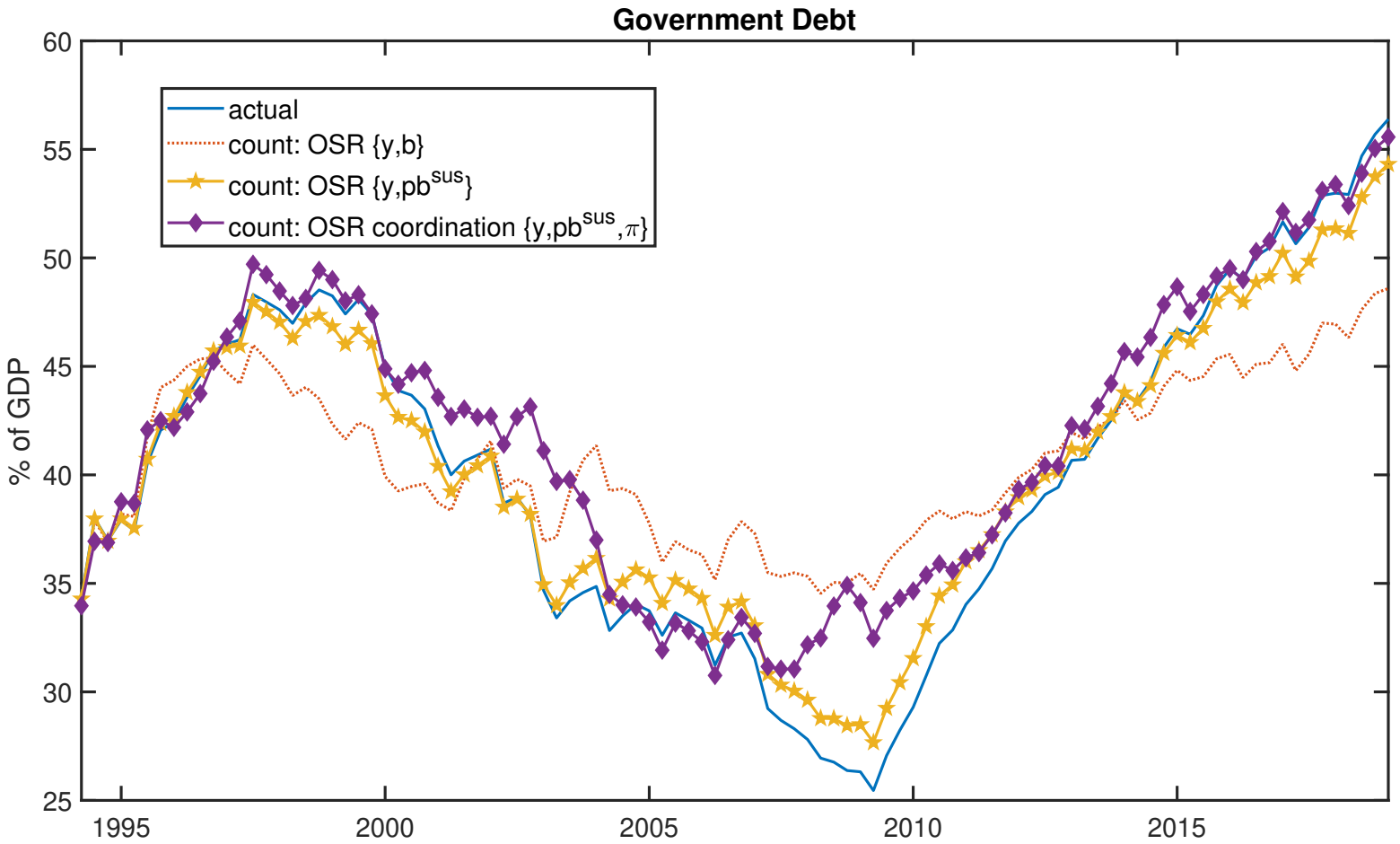
	Weights on policy instrument			
	$r = 1$	$r = 0.5$	$r = 0$	
Parameters	*Optimal values*			*Estimated*
ϕ_π	3.15	3.33	3.59	1.57
$\phi_{\Delta y}$	0.98	1.06	1.18	0.39
Obj.Func:	0.13	0.13	0.12	
	Weights on policy goal			
	$\pi^C = 1$	$\pi^C = 0.5$	$\pi^C = 0$	
ϕ_π	2.97	3.04	3.13	1.57
$\phi_{\Delta y}$	1.01	1.05	1.10	0.39
Obj.Func:	0.29	0.28	0.28	

Optimal policy coordination

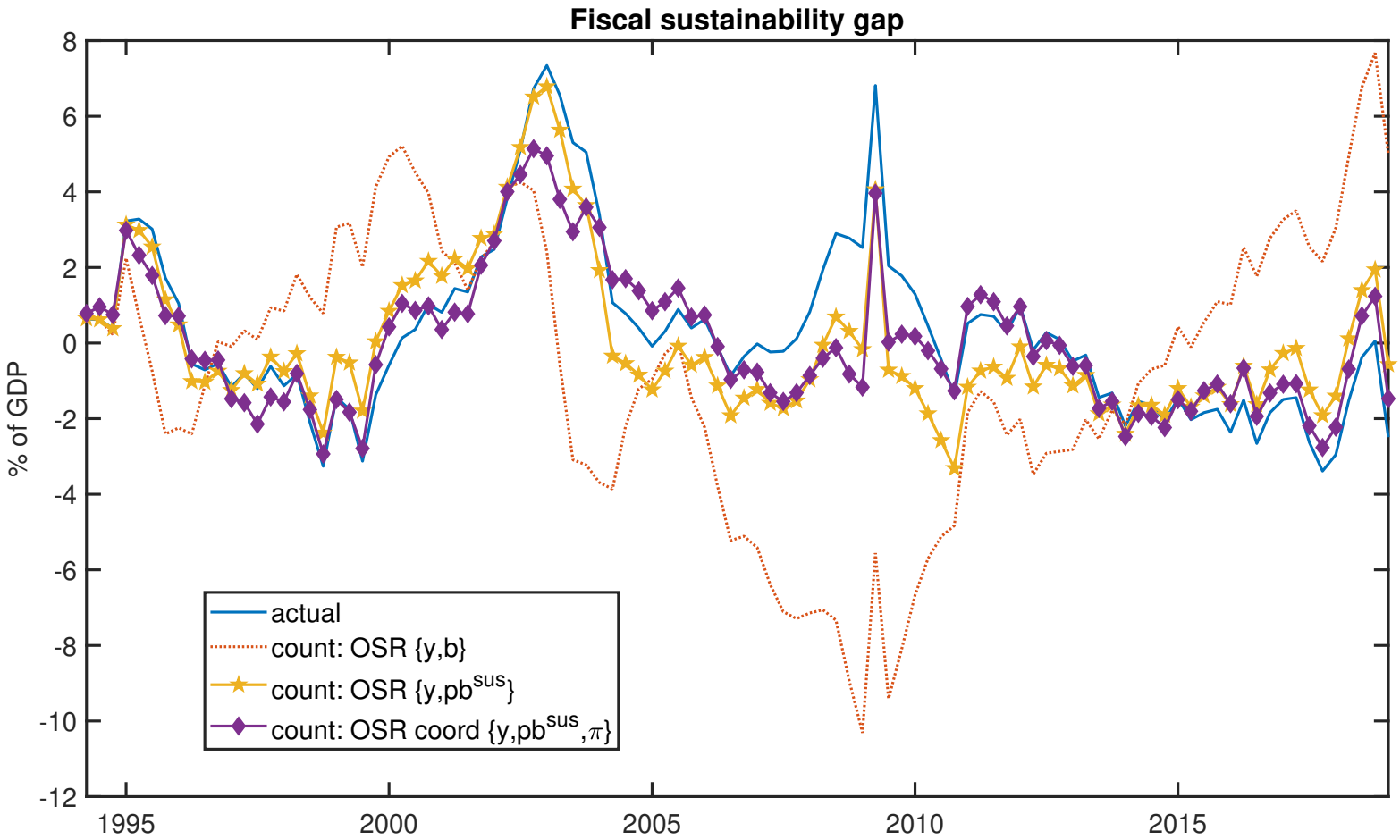
Weights on policy variables: y, pb^{sus}, $\pi^C = 1$

	Weights on policy instrument(s)				
	$iG,\ r = 1$	$iG,\ r = 0.5$	$iG,\ r = 0$	$iG = 0$	
Parameters		*Optimal values*			*Est.*
$\theta_{iG,y}$	0.42	0.42	0.19	-0.41	0.20
$\theta_{iG,b}$	0.20	0.20	1.03	1.85	0.57
ϕ_π	1.62	1.63	3.35	-	1.57
$\phi_{\Delta y}$	0.42	0.43	1.21	-	0.39
Obj.Func:	2.54	1.44	0.27	0.76	

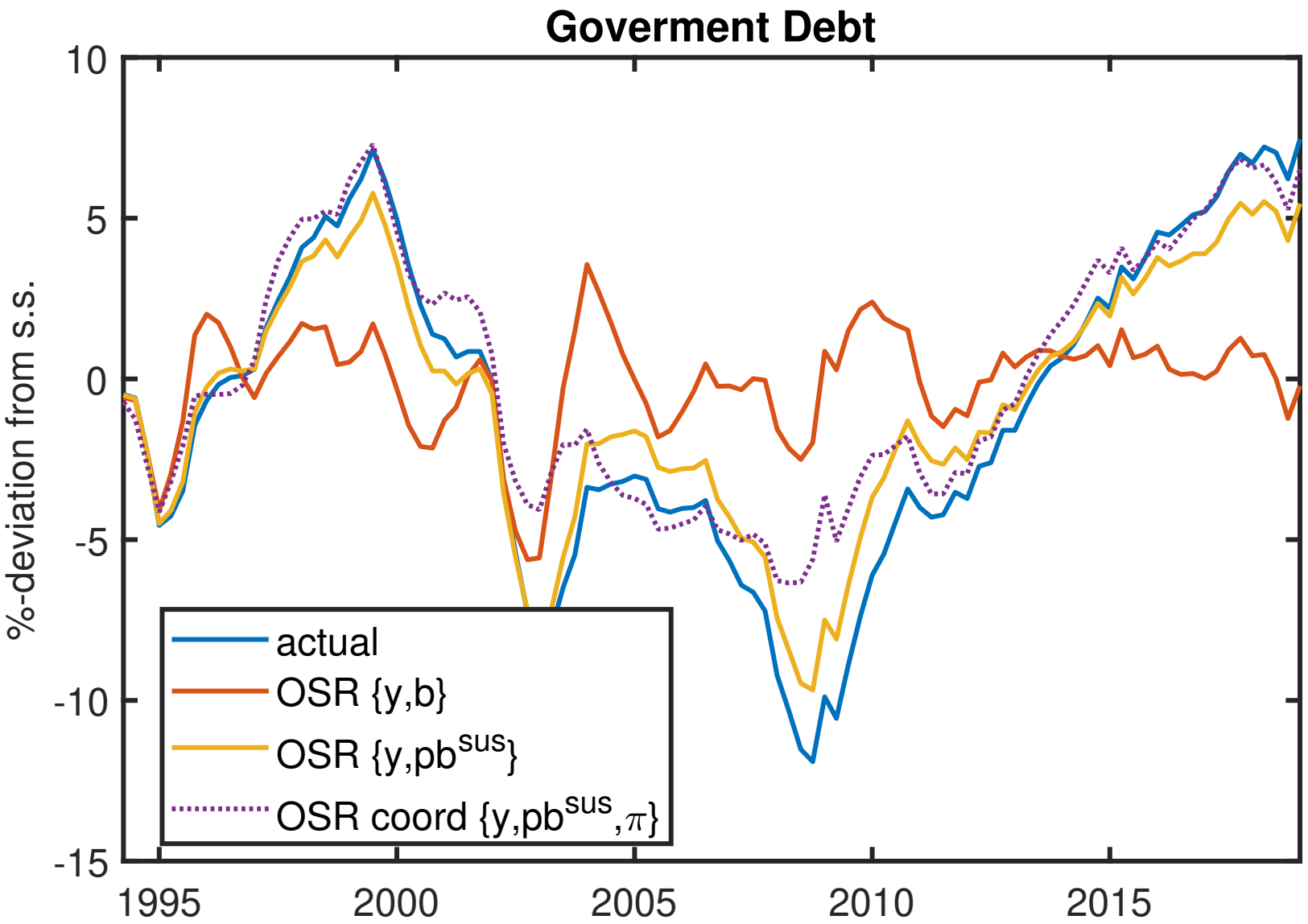
Debt stabilization



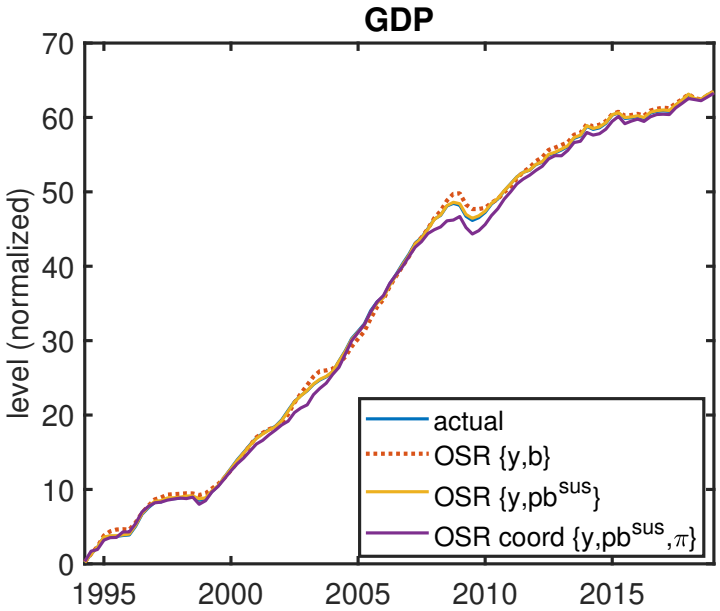
Fiscal sustainability

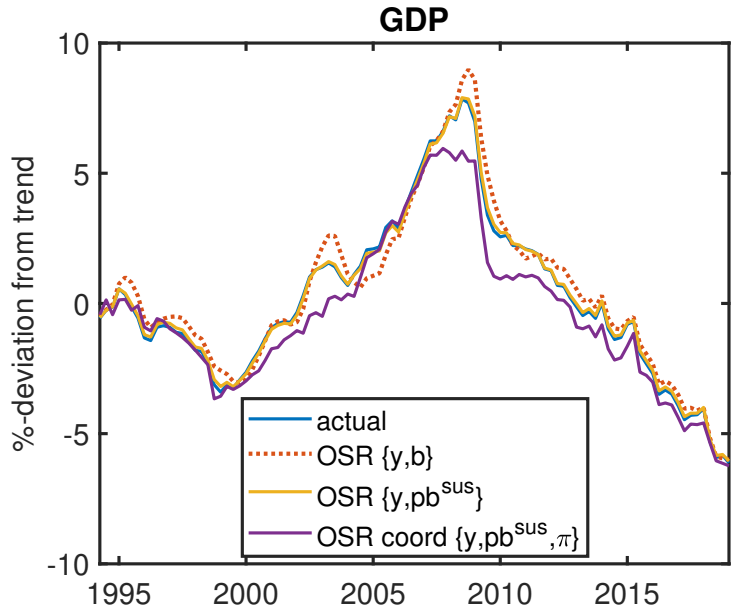


Government debt

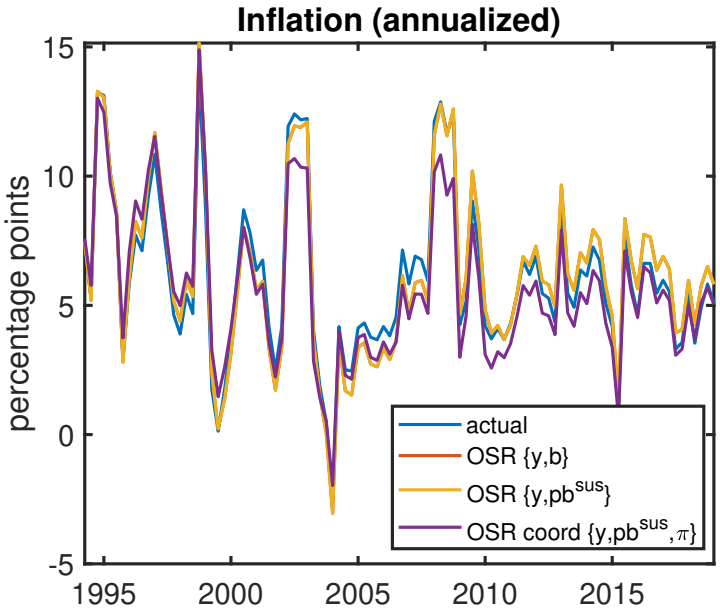


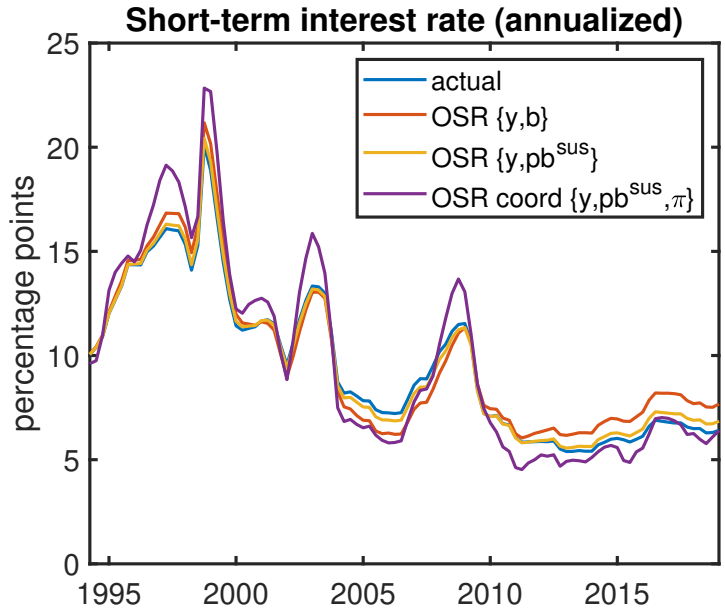
Output (GDP)


GDP
level (normalized)
70
60
50
40
30
20
10
0
1995
2000
2005
2010
2015
actual
OSR {y,b}
OSR {y,pb^sus}
OSR coord {y,pb^sus,π}

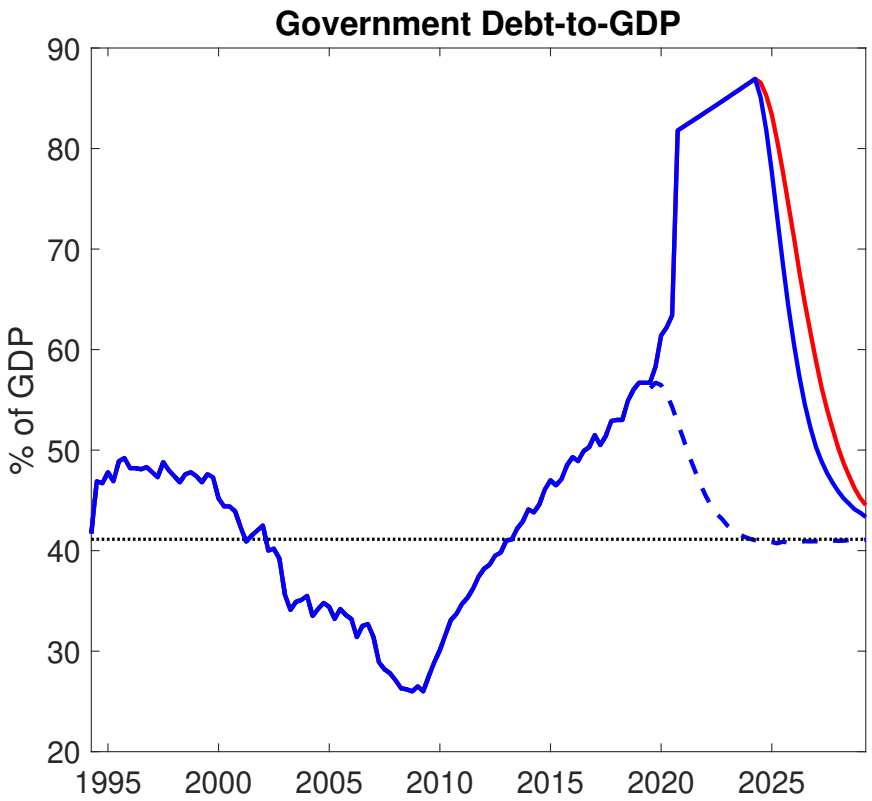

GDP
%-deviation from trend
10
5
0
-5
-10
1995
2000
2005
2010
2015
actual
OSR {y,b}
OSR {y,pb^sus}
OSR coord {y,pb^sus,π}

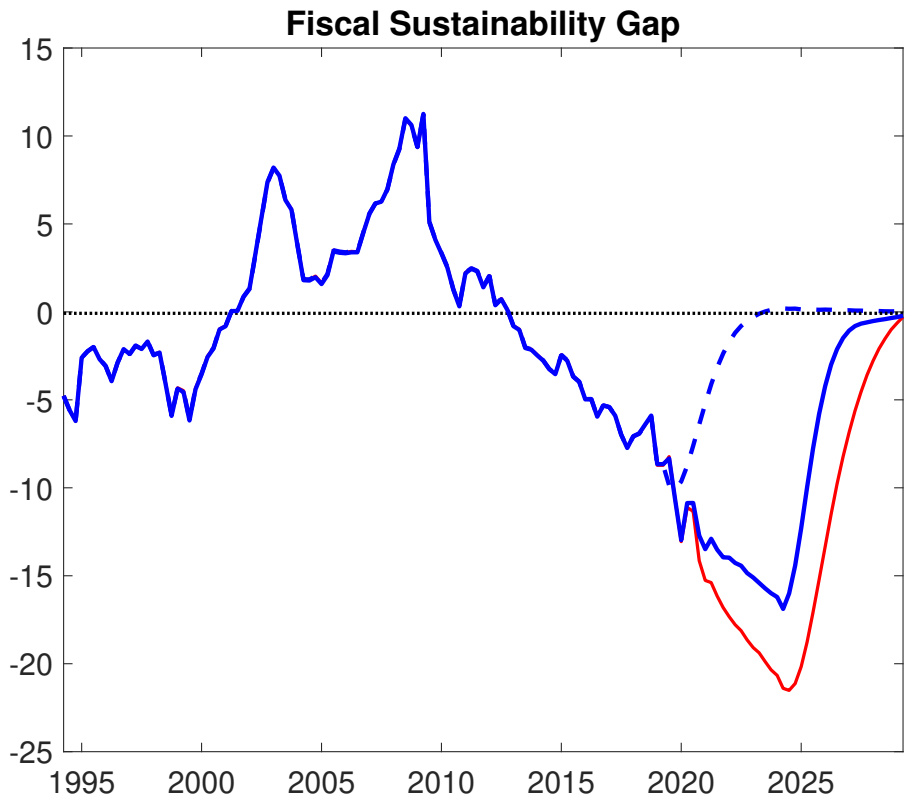
Inflation and the short-term (policy) rate





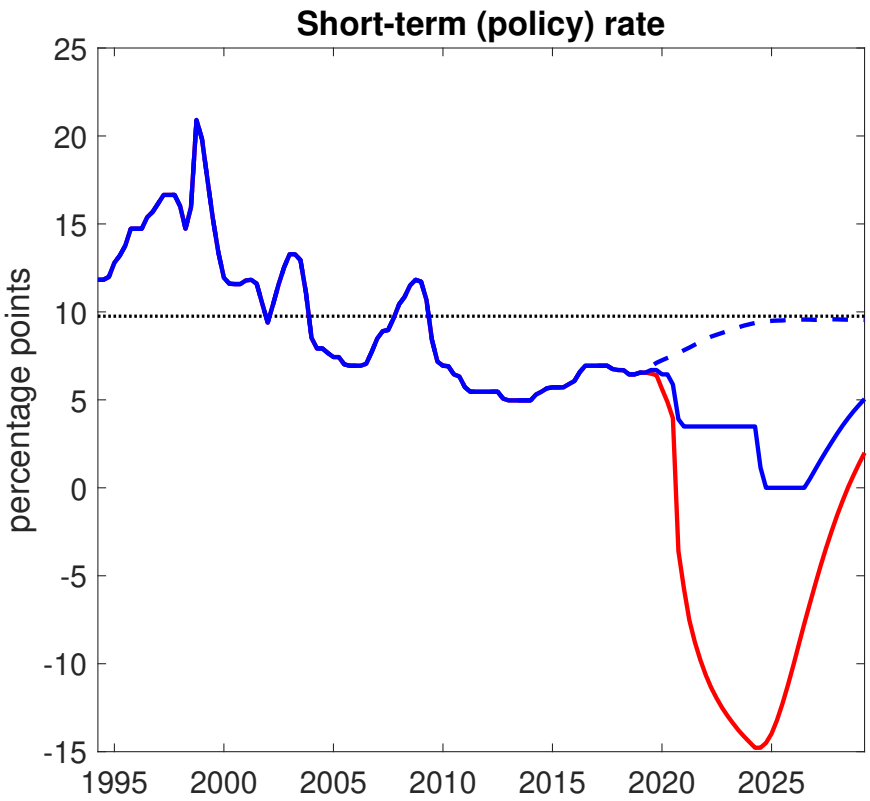
COVID-19, monetary policy, and debt stabilisation

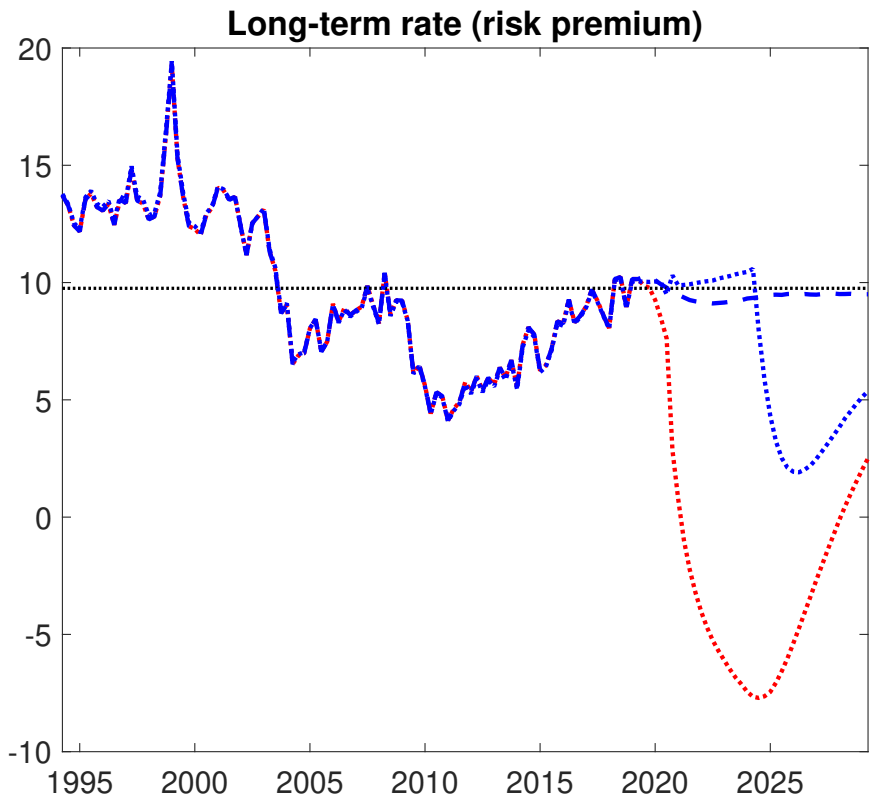




- Conditional forecast paths (observables): G.debt-to-GDP, output growth, employment, and policy rate.
- Controlled exogenous variables (shocks): G.consumption, preference, employment, MP
- Red line excludes policy rate control.

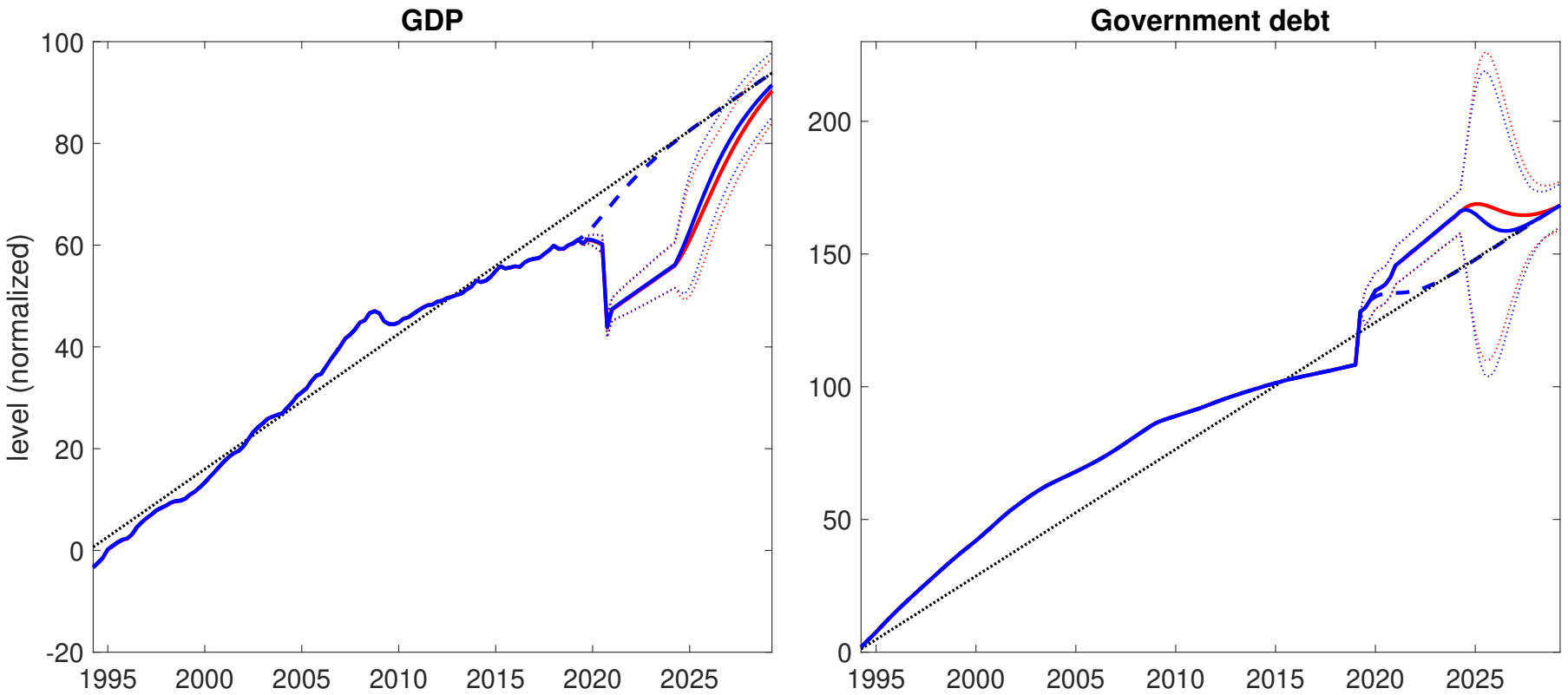
COVID-19, monetary policy, and debt stabilisation





- Conditional forecast paths (observables): G.debt-to-GDP, output growth, employment, and policy rate.
- Controlled exogenous variables (shocks): G.consumption, preference, employment, MP
- Red line excludes policy rate control.

COVID-19, monetary policy, and debt stabilisation



- Conditional forecast paths (observables): G.debt-to-GDP, output growth, employment, and policy rate.
- Controlled exogenous variables (shocks): G.consumption, preference, employment, MP
- Red line excludes policy rate control.

Implications?

- As in the current environment, an investment-driven DFFS could reduce the government debt-to-GDP ratio in periods of economic slack, when monetary policy would typically be more accommodative.
- Policy coordination is achievable without loss of credibility or a mandate change.
- A strong preference for policy rate smoothing means that MP is "sub-optimal", but the potential gains for inflation stability appear marginal.
- Fiscal policy needs to balance short- versus long-term fiscal sustainability.
- The extent of forecast (e.g., "fiscal projection") errors and the "assumed" long-run steady-state are crucially important for policy decision-making and credibility. (Applies to monetary policy as well)

Modelling issues

- Identification sensitivity: data, shocks, and model specification
- Identification of foreign shocks and monetary policy shocks
- The zero lower bound (ZLB)
- Measurement errors in the model and bringing the data to the model
- Fit-for-purpose: forecasting vs. policy analysis

References

Afonso, A. and R. M. Sousa (2012). The macroeconomic effects of fiscal policy. *Applied Economics 44*(34), 4439–4454.

Ascari, G. and N. Rankin (2013). The effectiveness of government debt for demand management: Sensitivity to monetary policy rules. *Journal of Economic Dynamics and Control 37*(8), 1544 – 1566. Rethinking Economic Policies in a Landscape of Heterogeneous Agents.

Augustin, P., H. Boustanifar, J. Breckenfelder, and J. Schnitzler (2018). Sovereign to corporate risk spillovers. *Journal of Money, Credit and Banking 50*(5), 857–891.

Blanchard, O., J.-C. Chouraqui, R. Hagemann, and N. Sartor (1991, 04). The sustainability of fiscal policy: New answers to an old question. *OECD Economic Studies 15*.

Buiter, W. H., T. Persson, and P. Minford (1985). A guide to public sector debt and deficits. *Economic Policy 1*(1), 14–79.

Burger, P. and E. Calitz (2019). Sustainable fiscal policy and economic growth in South Africa. Technical report.

Calitz, E. (2020). Reflections on Aspects of Public Finance and Fiscal