Monetary-fiscal policy interactions when price stability occasionally takes a back seat

Sebastian Schmidt

June 2023

The views expressed here are solely my own.

Question and motivation

Can a central bank *occasionally* subordinate its price stability objective to the goal of fiscal sustainability without jeopardizing price stability more generally?

- After a decade of low inflation and low interest rates, the global economy experienced a strong surge in inflation, and central banks embarked on a path of rising policy rates.
- The prospect of rising interest rates, in turn, has sparked concerns about fiscal policy and the sustainability of elevated government debt levels.
- "*[P]olitical pressures could arise and grow to keep interest rates lower than the rationale of price stability would call for.*" (Weidmann, 2020)

What I do

- Using a model with sticky prices, I study a monetary-fiscal policy configuration where
  - the fiscal authority's efforts to stabilize government debt only go so far,
  - and the central bank accommodates its interest-rate policy to the fiscal conditions.
- Consistent with Sargent (1982)'s notion of fiscal dominance: "[T]he fiscal authority select[s] a path or policy for government expenditures and explicit taxes implying growth rates of total government indebtendness to which the monetary authority must adjust."
- The policy configuration gives rise to *endogenous* policy regime shifts.
- An *occasional* subordination of the goal of price stability to the goal of fiscal sustainability may result in a *systematic* failure to achieve the price stability goal.

Fiscal authority and policy regimes

The **fiscal authority** issues nominal bonds B_t at price $1/R_t$ that pay one unit of currency in period $t+1$, and sets the real primary budget surplus s_t. Let $b_t \equiv B_t/P_t$.

$$\tilde{b}_t = \frac{1}{\beta}\left(\tilde{b}_{t-1} - \frac{b}{y}\hat{\pi}_t - \tilde{s}_t\right) + \frac{b}{y}\hat{R}_t \quad \text{(flow budget constraint)} \tag{1}$$

$$\tilde{s}_t = \min\left(\phi\tilde{b}_{t-1}, \bar{s}\right) \quad \text{(fiscal rule)} \tag{2}$$

where $\hat{x}_t \equiv (x_t - x)/x$, and $\tilde{x}_t = (x_t - x)/y$. Parameters satisfy $\beta \in (0,1)$, $\phi > \beta^{-1} - 1$, $\bar{s} > 0$. ▸ Appendix

Fiscal authority and policy regimes

The **fiscal authority** issues nominal bonds B_t at price $1/R_t$ that pay one unit of currency in period $t+1$, and sets the real primary budget surplus s_t. Let $b_t \equiv B_t/P_t$.

$$\tilde{b}_t = \frac{1}{\beta}\left(\tilde{b}_{t-1} - \frac{b}{y}\hat{\pi}_t - \tilde{s}_t\right) + \frac{b}{y}\hat{R}_t \quad \text{(flow budget constraint)} \tag{1}$$

$$\tilde{s}_t = \min\left(\phi\tilde{b}_{t-1}, \bar{s}\right) \quad \text{(fiscal rule)} \tag{2}$$

where $\hat{x}_t \equiv (x_t - x)/x$, and $\tilde{x}_t = (x_t - x)/y$. Parameters satisfy $\beta \in (0,1)$, $\phi > \beta^{-1} - 1$, $\bar{s} > 0$. ▸ Appendix

Two policy regimes:

- *Orthodox* policy regime: $\tilde{s}_t < \bar{s}$
- *Fiscally-dominant* policy regime: $\tilde{s}_t = \bar{s}$

Central bank

The **central bank** sets the one-period nominal interest rate R_t

$$\hat{R}_t = \begin{cases} \alpha \hat{\pi}_t & \text{if } \tilde{s}_t < \bar{s} \\ \min(\alpha \hat{\pi}_t, \bar{R}) & \text{else} \end{cases} \tag{3}$$

where $\bar{R} > 0$, and $\alpha > 1/\beta$.

Central bank

The **central bank** sets the one-period nominal interest rate R_t

$$\hat{R}_t = \begin{cases} \alpha \hat{\pi}_t & \text{if } \tilde{s}_t < \bar{s} \\ \min(\alpha \hat{\pi}_t, \bar{R}) & \text{else} \end{cases} \tag{3}$$

where $\bar{R} > 0$, and $\alpha > 1/\beta$.

The central bank's interest rate policy has fiscal effects, both, directly and indirectly through its effect on inflation

$$\tilde{b}_t = \frac{1}{\beta}\left(\tilde{b}_{t-1} - \frac{b}{y}\hat{\pi}_t - \tilde{s}_t\right) + \frac{b}{y}\hat{R}_t$$

Private sector and equilibrium

Standard **private-sector block** with sticky prices:

$$\hat{y}_t = \mathsf{E}_t \hat{y}_{t+1} - \sigma \left(\hat{R}_t - \mathsf{E}_t \hat{\pi}_{t+1} \right) \tag{4}$$

$$\hat{\pi}_t = \beta \mathsf{E}_t \hat{\pi}_{t+1} + \kappa \hat{y}_t + \mu_t, \tag{5}$$

where μ_t is an exogenous cost-push shock that follows a stationary AR(1) process.

Private sector and equilibrium

Standard **private-sector block** with sticky prices:

$$\hat{y}_t = \mathsf{E}_t \hat{y}_{t+1} - \sigma \left(\hat{R}_t - \mathsf{E}_t \hat{\pi}_{t+1} \right) \tag{4}$$

$$\hat{\pi}_t = \beta \mathsf{E}_t \hat{\pi}_{t+1} + \kappa \hat{y}_t + \mu_t, \tag{5}$$

where μ_t is an exogenous cost-push shock that follows a stationary AR(1) process.

Equilibrium:

A rational expectations equilibrium consists of sequences of allocations $\{\hat{y}_t\}_{t=0}^{\infty}$, prices $\{\hat{\pi}_t\}_{t=0}^{\infty}$ and policies $\{\hat{R}_t, \tilde{s}_t, \tilde{b}_t\}_{t=0}^{\infty}$ such that for a given initial level of government debt $\tilde{b}_{-1}$ and a process $\{\mu_t\}_{t=0}^{\infty}$, equations (1)-(5) and the household transversality condition hold for all $t \geq 0$.

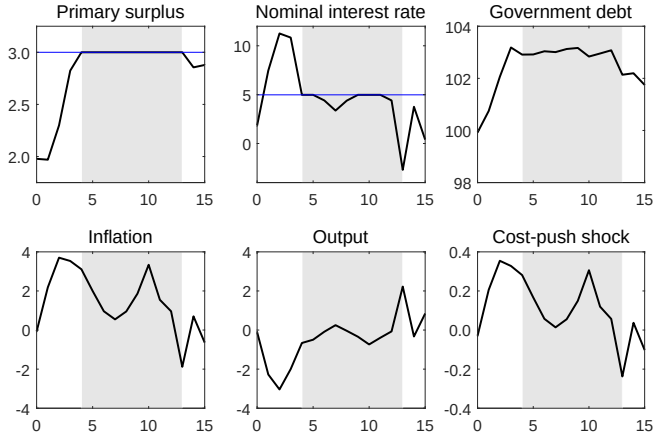
Parameterization and model solution

Parameter	Value	Economic interpretation
β	0.995	Subjective discount factor
σ	1	Intertemporal elasticity of substitution in consumption
η	1	Inverse labor supply elasticity
θ	10	Price elasticity of demand
ω	0.8	Share of firms per period keeping prices unchanged
$b/(4y)$	1	Government debt to output ratio in deterministic steady state
ϕ	0.1	Fiscal policy rule coefficient
$\bar{s}$	0.01	Surplus limit (in deviation from steady state)
α	2.5	Monetary policy rule coefficient
$\bar{R}$	0.0074	Conditional upper bound on policy rate (in % dev. from steady state)
ρ	0.6	AR coefficient cost-push shock
σ_μ	$\frac{0.16}{100}$	Standard deviation cost-push shock

Note: PC slope $\kappa = 0.0093$; s.s. primary surplus 2% of output, limit 3%; s.s. interest rate 2% (annualized), upper bound 5%.

I solve the model globally using the collocation method.

Endogenous policy regime shifts



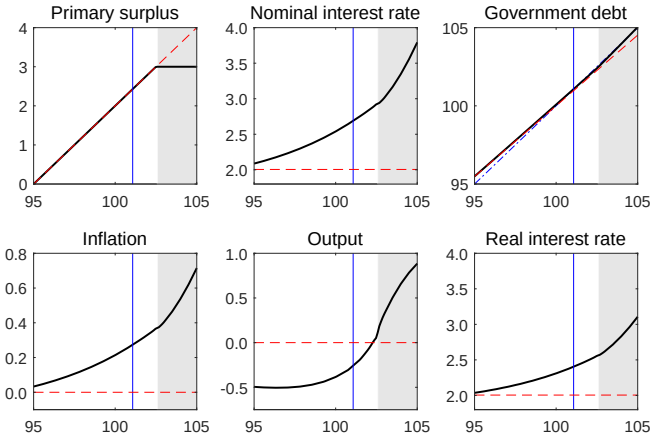
The surplus is expressed as percent of steady state output. The interest rate and inflation are expressed in annualized percent. Government debt is expressed as percent of annualized steady state output. Output and the cost-push shock are expressed in percentage deviations from steady state. The blue dashed horizontal line in the first (second) panel indicates the surplus limit (interest rate bound).

Frequency and duration of fiscally-dominant regime

	$\tilde{s}_t = \bar{s}$	$\tilde{s}_t = \bar{s}$ and $\hat{R}_t = \bar{R}$
Frequency in %	20	10
Average duration in quarters	3.6	1.8

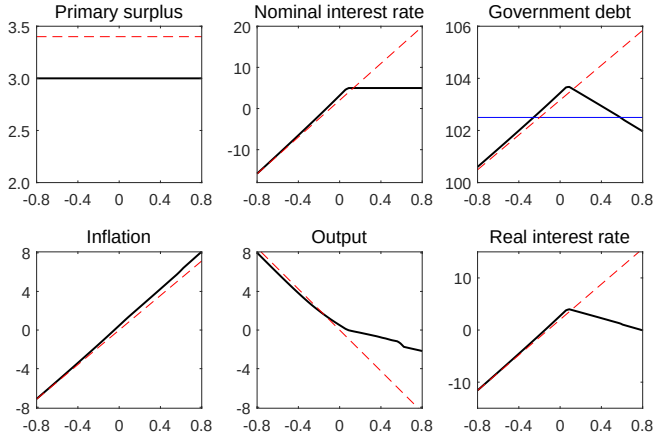
Based on 3000 simulations over 1100 quarters. For each simulation the observations corresponding to the first 100 quarters are discarded.

Regime change risk and inflation bias



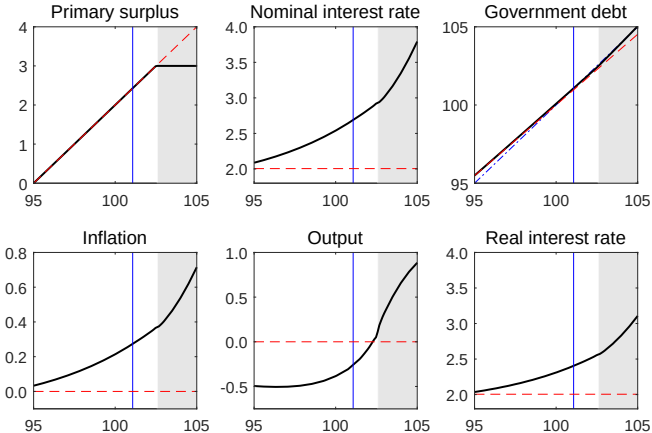
Equilibrium responses to beginning-of-period government debt. Solid black lines: policy configuration with regime shifts. Red dashed lines: benchmark configuration. The thin blue vertical line indicates the risky steady state. The contemporaneous cost-push shock is set equal to zero.

Equilibrium responses to cost-push shock in the fiscally-dominant regime



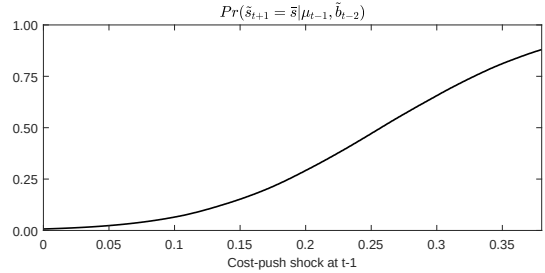
Solid black lines: policy configuration with regime shifts. Dashed red lines: benchmark configuration. Beginning-of-period government debt amounts to 103.5% of annualized steady-state output, implying that in case of the policy configuration with regime shifts the economy is in the fiscally-dominant regime. For debt levels below (above) the horizontal solid blue line the economy will be in the orthodox regime (fiscally-dominant) regime in the next period.

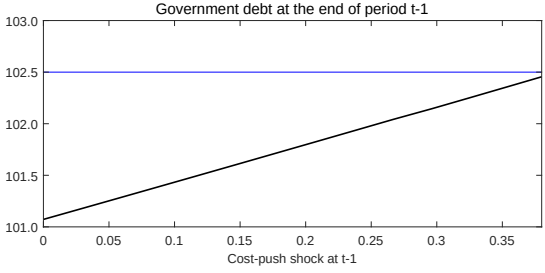
Regime change risk and inflation bias: $\hat{\pi}_t = \beta \mathrm{E}_t \hat{\pi}_{t+1} + \kappa \hat{y}_t$



Why does the inflation bias increase with the debt level?

- The economy switches from the orthodox regime to the fiscally-dominant regime when the real value of government debt crosses $\bar{b} \equiv \bar{s}/\phi$ from below.
- While at period $t-1$ agents know with certainty the policy regime in period t, they are uncertain about the policy regime in periods $t+1, t+2, ...$
- Let $Pr\left(\tilde{s}_{t+1} = \bar{s} | \mu_{t-1}, h^{\tilde{b}}(\mu_{t-1}, \tilde{b}_{t-2} < \bar{b}) < \bar{b}\right)$ be the probability of a shift to the fiscally-dominant regime in period $t+1$ given information available in period $t-1$, and conditional on the economy being in the orthodox policy regime in periods $t-1$ and t, i.e. $\tilde{b}_{t-1}, \tilde{b}_{t-2} < \bar{b}$.





The real value of end-of-period $t-2$ government debt is at the risky steady state. Bottom panel: The horizontal solid blue line indicates the debt threshold $\bar{b}$.

From inflation bias to debt bias

Table: **Deterministic and risky steady states**

	Inflation	Output	Real interest rate	Government debt
Deterministic steady state	0	0	2	100
Risky steady state	0.27	−0.26	2.41	101.07

Inflation and the real interest rate are expressed in annualized percent. Output is expressed in percentage deviations from the deterministic steady state. Government debt is expressed in percent of annualized steady state output.

- Monetary policy helps to stabilize government debt in the fiscally-dominant regime. ▸ Figure
- In the orthodox regime, the inflation bias results in higher real interest rates which put *upward* pressure on government debt.

Can the central bank alleviate the inflation bias?

- The central bank is in a tricky spot; sticking to a conventional Taylor rule risks public debt sustainability, if fiscal policy does not adjust primary surpluses.
- The central bank can, however, lower the probability of a shift to the fiscally-dominant regime by responding sufficiently moderately to inflation.
- When $\alpha = 1.5$, the frequency of the fiscally-dominant regime is close to zero, and, hence, inflation at the risky steady state is close to zero.
- The attenuation of the inflation bias resulting from a more measured interest rate policy does not come at the cost of higher inflation volatility.

Extensions

- Passive monetary policy in the fiscally-dominant regime
- Distortionary taxation
- To be done: Long-term government bonds and highly-persistent shocks

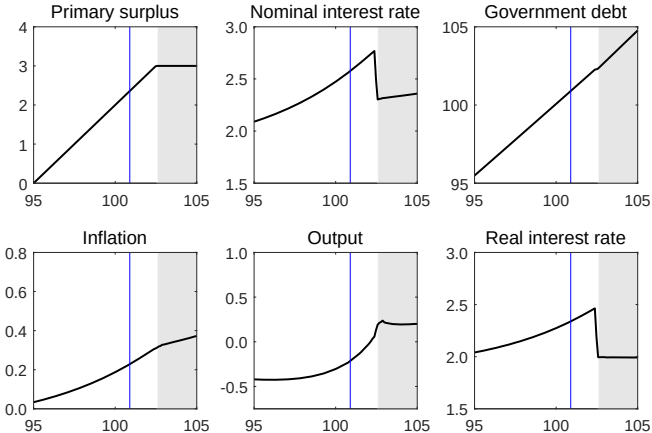
Passive monetary policy in the fiscally-dominant regime

- Suppose that, instead of imposing an upper bound on the nominal interest rate, the central bank switches to a passive interest-rate rule when the economy is in the fiscally-dominant regime.
- We replace monetary policy rule (3) with

$$\hat{r}_t = \begin{cases} \alpha \hat{\pi}_t & \text{if } \tilde{s}_t < \bar{s} \\ \alpha_F \hat{\pi}_t & \text{else,} \end{cases} \tag{6}$$

where $\alpha > 1/\beta$, as before, and $\alpha_F < 1$. I set $\alpha_F = 0.95$.

Equilibrium responses to lagged government debt - passive monetary policy



Distortionary taxation

- Suppose that households pay taxes on their labor income. The Phillips Curve then becomes

$$\hat{\pi}_t = \beta \mathsf{E}_t \hat{\pi}_{t+1} + \kappa \left(\hat{y}_t + \frac{Y}{(1-\tau^L)(\sigma^{-1}+\eta)} \tilde{\tau}_t^L \right) + \mu_t \tag{7}$$

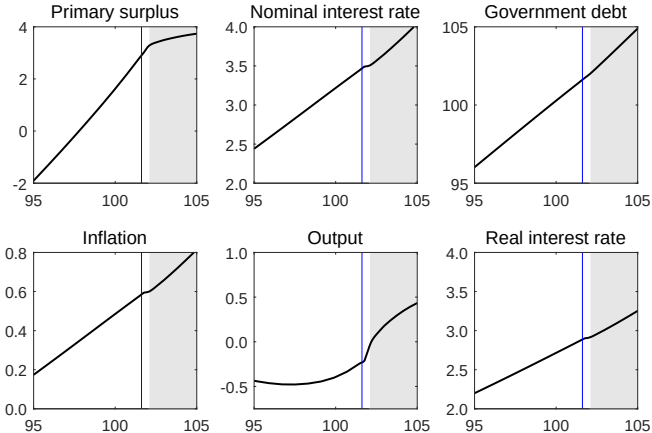
- The fiscal authority adjusts the labor income tax rate in response to fluctuations in gov. debt

$$\tilde{\tau}_t^L = \min\left(\phi \tilde{b}_{t-1}, \bar{\tau}^L\right), \quad \text{where } \bar{\tau}^L > 0 \tag{8}$$

- The primary surplus is then given by

$$\tilde{s}_t = \frac{Y}{(1-\tau^L)^2} \tilde{\tau}_t^L + \frac{\tau^L}{1-\tau^L} \left(1 + \sigma^{-1} + \eta\right) \hat{Y}_t \tag{9}$$

Equilibrium responses to lagged government debt - distortionary taxation



Conclusion

- Monetary and fiscal policy are intricately interlinked.
- If the fiscal authority is limited in its willing or ability to raise primary surpluses, the central bank may be forced to occasionally subordinate the goal of price stability to the goal of fiscal stability.
- I show that such a policy configuration may jeopardize price stability more generally.

The flow budget constraint of the fiscal authority

$$\frac{B_t}{R_t} = B_{t-1} - S_t \tag{10}$$

Dividing both sides by the period t price level:

$$\frac{b_t}{R_t} = b_{t-1}\pi_t^{-1} - s_t \tag{11}$$

where $b_t \equiv B_t/P_t$ and $s_t = S_t/P_t$.

back

Related literature on monetary-fiscal policy interactions

- Sargent and Wallace (1981) show that if a central bank is forced to finance government budget deficits by providing sufficient seigniorage it will loose control over inflation.
- This paper emphasizes that the mere possibility of a (temporary) subordination of price stability to the goal of fiscal sustainability can give rise to inflationary pressures.
- Several studies allow for occasional shifts in monetary and fiscal policy regimes (e.g. Davig and Leeper 2006, 2007; Bianchi and Melosi 2017; Bianchi and Ilut 2017).
- This paper differs from these studies in that regime changes, and the probability of their occurrence, are determined endogenously whereas regime changes are exogenous in the aforementioned studies (exception: Davig, Leeper and Walker 2010).
- Endogenizing policy regime shifts allows me to study the *interactions* between government debt, regime change risk and inflation bias.