Generalized stability of monetary unions under regime switching in monetary and fiscal policies

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    (Fiscal Theory of the Price Level, FTPL; Sims, 1994; Woodford, 1998)
- Bergin (2000): Leeper/FTPL result applies to monetary union
  - Single CB ensures determinacy by targeting union-wide inflation
  - Fiscal authorities of *all* member states must ensure fiscal solvency
  - Failure to do so by *one* fiscal authority already leads to instability
  - Under FTPL, only *one* budget constraint determines price level

These stability requirements have some issues

- Policy-mix assumed to be time invariant
  - But, broad empirical support for changes in policy regimes
    (Favero and Monacelli, 2005; Davig and Leeper, 2006, 2011; Chen et al., 2015; Bianchi and Ilut, 2017)
  - Also, regime switching may expand feasible set of policies
    (Davig and Leeper, 2007; Ascari et al., 2017)
- If member states abandon debt target, monetary union unstable
  - But, under monetary union, no national control over monetary policy
  - Must rely on national fiscal policy to absorb country-specific shocks
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- Consider simple model for two-country monetary union
- Allow for regime switching in monetary and fiscal policies
- Focus particularly on temporary visits to 'unstable' regime
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- Future austerity allows for occasional loosening of debt target
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  - Similar to results from Fiscal Theory of the Price Level
  - Dynamically, entail greater bouts of union-wide inflation
- Bailouts by partner states also support such visits
  - Necessarily entail transfer of wealth across member states

The model

Overview of the model

- Two-country monetary union
- Endowment economy
- Supranational central bank (inflation target)
- Each country:
  - Fiscal authority (debt target)
  - Households (maximize utility)
- Regime switching in monetary and fiscal policy

Characterizing monetary policy

- Monetary policy rule:

$$\frac{R_t}{R} = \left(\frac{\pi_t}{\pi}\right)^{\phi_{\pi,s_t}} \tag{1}$$

with R_t gross nominal interest rate, π_t union-wide gross inflation

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- Passive monetary policy: $\phi_{\pi,s_t} \leq 1$
- Policy parameters may vary across regimes, indexed by s_t

Characterizing fiscal policy

- Fiscal policy rule in country $i \in \{1, 2\}$:

$$\tau_{i,t} = \phi_{b_i, s_t} \left(b_{i,t-1} - b_i \right) + z_{\tau_i, t} \tag{2}$$

with $\tau_{i,t}$ lump-sum taxes, $b_{i,t}$ real debt, $z_{\tau_i,t}$ fiscal policy shock

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- Passive fiscal policy: $\phi_{b_i,s_t} > r$, with r real interest rate
- Active fiscal policy: $\phi_{b_i,s_t} \leq r$
- Fiscal policy in country 2 always passive ($\phi_{b_2,s_t} > r$, $\forall s_t$)

Government budget constraints and bailouts

- Evolution of government debt in country 1:

$$b_{1,t} = (1 - \gamma_{s_t}) \frac{R_{t-1}}{\pi_t} b_{1,t-1} - (\tau_{1,t} - g_{1,t}) \tag{3}$$

with $g_{1,t}$ real government consumption

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- State-dependent bailout fraction, γ_{s_t}, determined by

$$\gamma_{s_t} = \left(\frac{b_{1,t-1}}{b_1} \right)^{\phi_{\gamma,s_t}} - 1 \tag{4}$$

  with ϕ_{γ,s_t} bailout elasticity

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- Evolution of government debt in country 2:

$$b_{2,t} = \frac{R_{t-1}}{\pi_t} b_{2,t-1} - \left(\tau_{2,t} - g_{2,t} - \gamma_{s_t} \frac{R_{t-1}}{\pi_t} B_{1,t-1} \right) \tag{5}$$

Households

- Infinitely-lived households choose consumption, $c_{i,t}$, to maximize

$$E_t \sum_{t=0}^{\infty} \beta^t \log c_{i,t} \tag{6}$$

with $\beta \in (0,1)$ discount factor, subject to

$$c_{i,t} + b_{i,t} + \tau_{i,t} = \frac{R_{t-1}}{\pi_t} b_{i,t-1} + y_i \tag{7}$$

with y_i constant endowment

- Consumption Euler equation:

$$\frac{1}{c_{i,t}} = \beta R_t E_t \left[\frac{1}{\pi_{t+1}} \frac{1}{c_{i,t+1}} \right] \tag{8}$$

Resource constraint

- For simplicity, assume $g_{i,t} = g_i$ for all t
- Perfect substitutability and tradability of y_i then implies

$$c_{1,t} + c_{2,t} + g_1 + g_2 = y_1 + y_2 \tag{9}$$

- Aggregate consumption constant: increase in consumption in one country comes at cost of lower consumption in other country

Policy regimes and regime switches

The four regimes we consider

1. **U**nstable:
   - Active monetary policy ($\phi_{\pi,U} > 1$), active fiscal policy ($\phi_{b_1,U} \leq r$)
2. Ricardian:
   - Active monetary policy ($\phi_{\pi,R} > 1$), passive fiscal policy ($\phi_{b_1,R} > r$)
3. Fiscal Theory of the Price Level:
   - Passive monetary policy ($\phi_{\pi,F} \leq 1$), active fiscal policy ($\phi_{b_1,F} \leq r$)
4. Bailout:
   - Active monetary policy ($\phi_{\pi,B} > 1$), active fiscal policy ($\phi_{b_1,B} \leq r$), positive bailouts ($\phi_{\gamma,B} > 0$)

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Regime transitions

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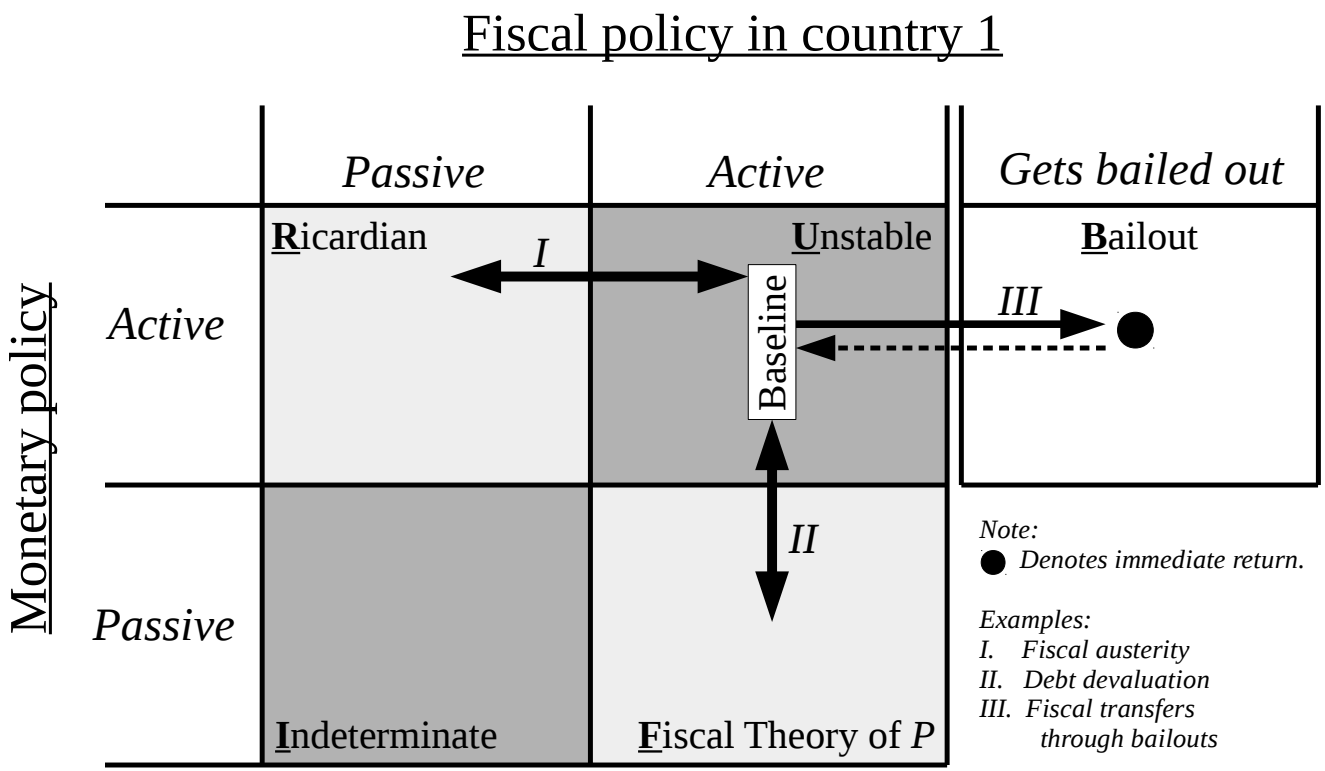
- Transition matrix given by

$$P = \begin{bmatrix} p_{UU} & p_{Us_t} \\ p_{s_{t-1}U} & p_{s_{t-1}s_t} \end{bmatrix}, \qquad s_t \in \{R, F, B\}$$

  with $p_{UU} + p_{Us_t} = p_{s_{t-1}U} + p_{s_{t-1}s_t} = 1$
- We consider various fractions of time spent at **U**, denoted by

$$f_U = \frac{1}{1 + \frac{p_{Us_t}}{p_{s_{t-1}U}}}$$

Three illustrative examples



Results

Strategy

- Keep **U**nstable regime as our baseline, for different $\phi_{b_1,U} \in [0, r]$
- Consider various fractions of time spent at **U**, f_U
- What policies in other regimes (**R**, **F**, **B**) can support visits to **U**?

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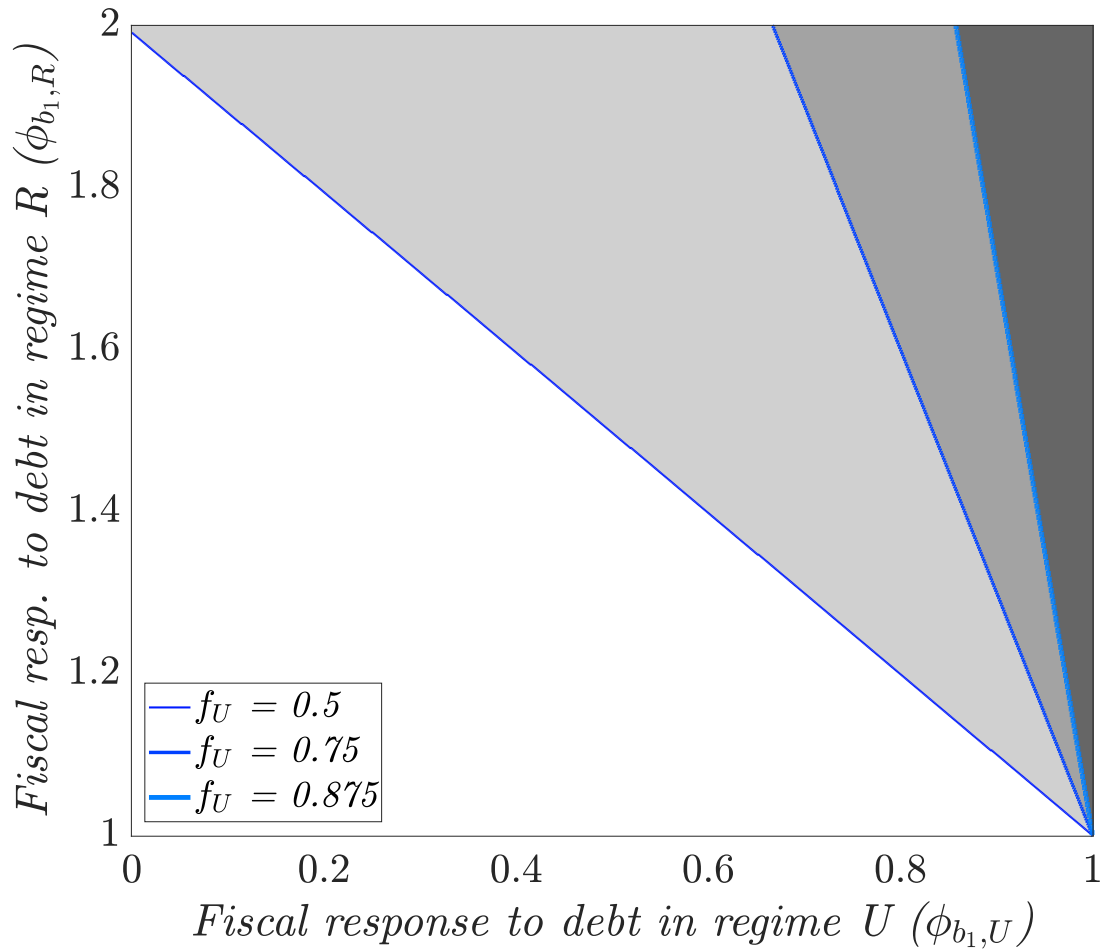
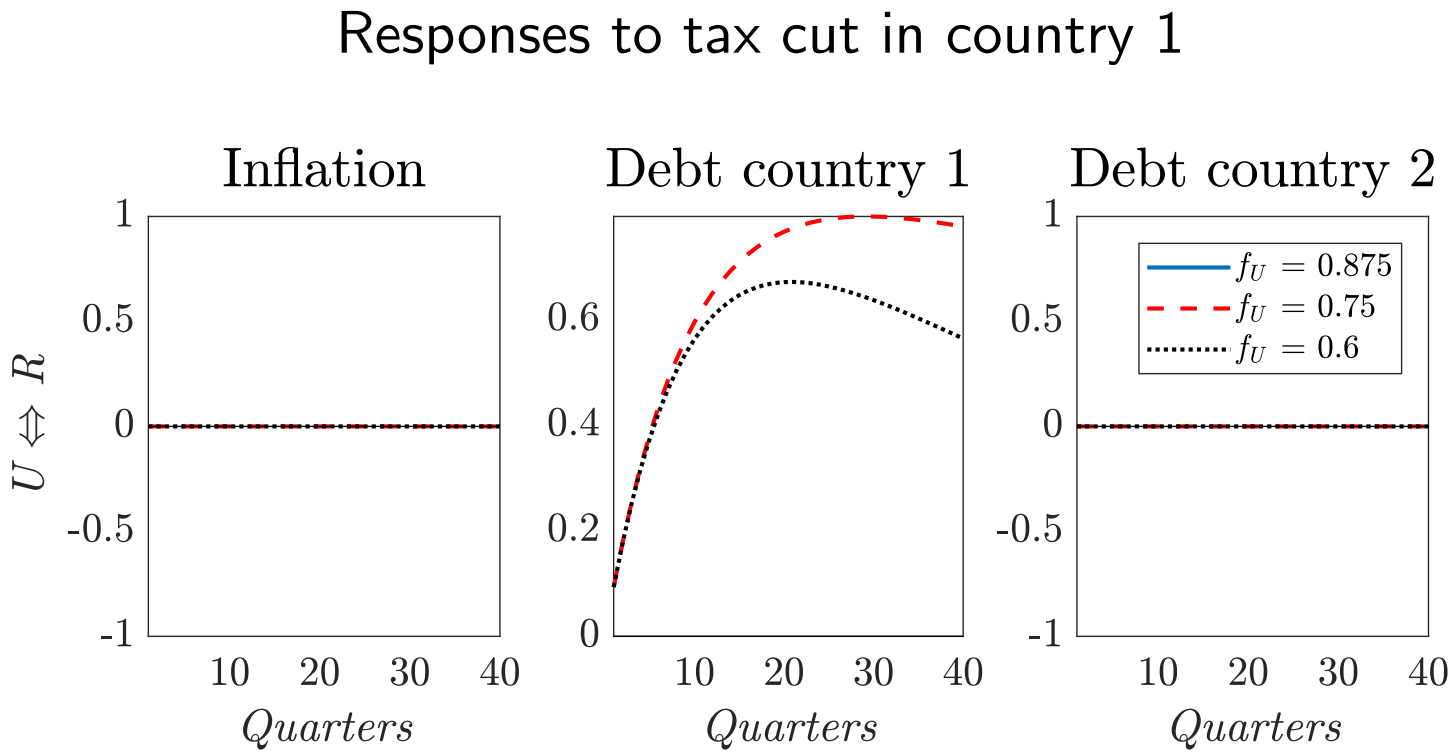
▸ See benchmark calibration

Example 1: regime-switching fiscal policy



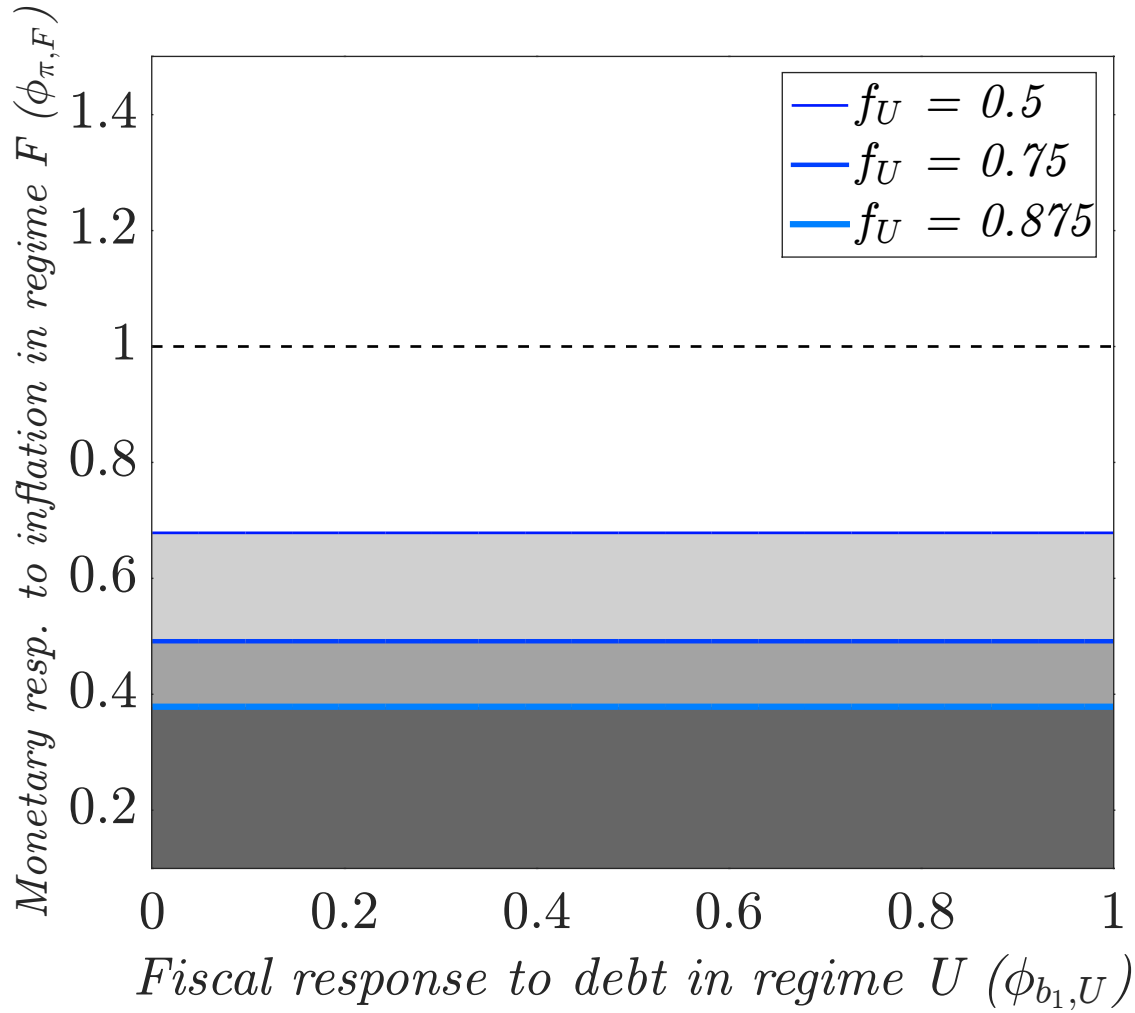
Note: white = no stable equilibrium; gray: stable equilibrium.

Ricardian Equivalence holds



Notes: Shock occurs in regime **U**; switching between regimes **U** and **R**; IRFs show log-deviations from steady state.

Example 2: regime-switching monetary policy



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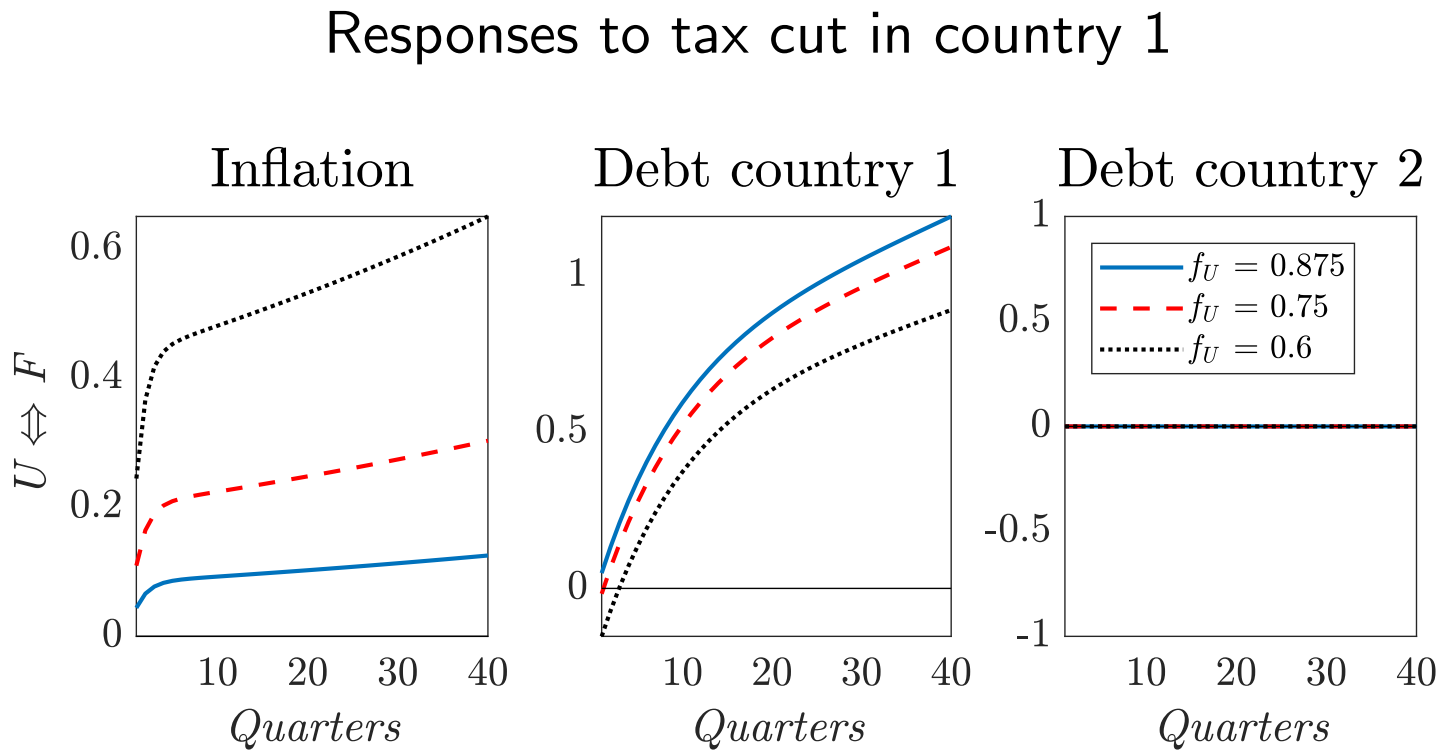
Debt devaluation in country 1



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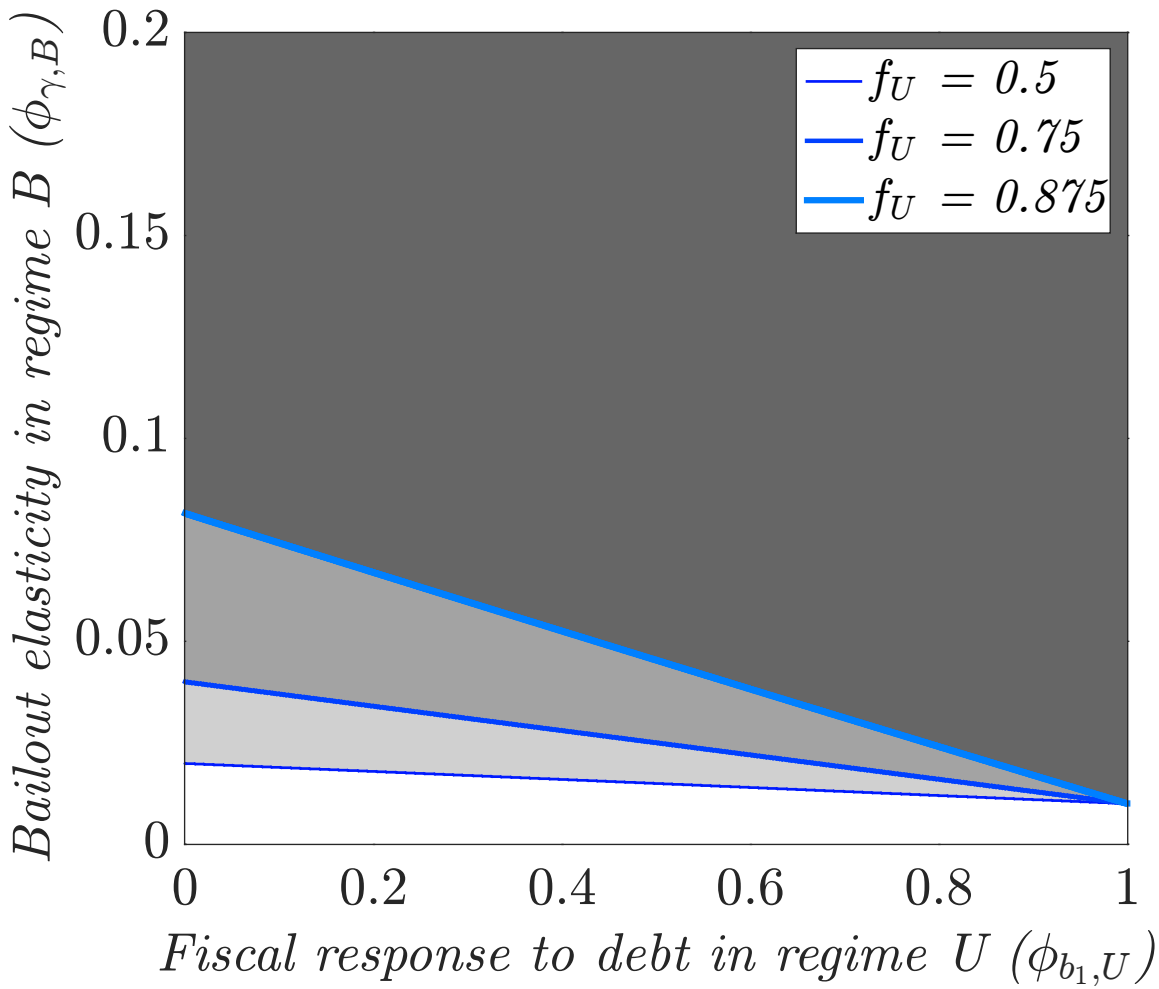
Example 3: regime-switching fiscal bailouts



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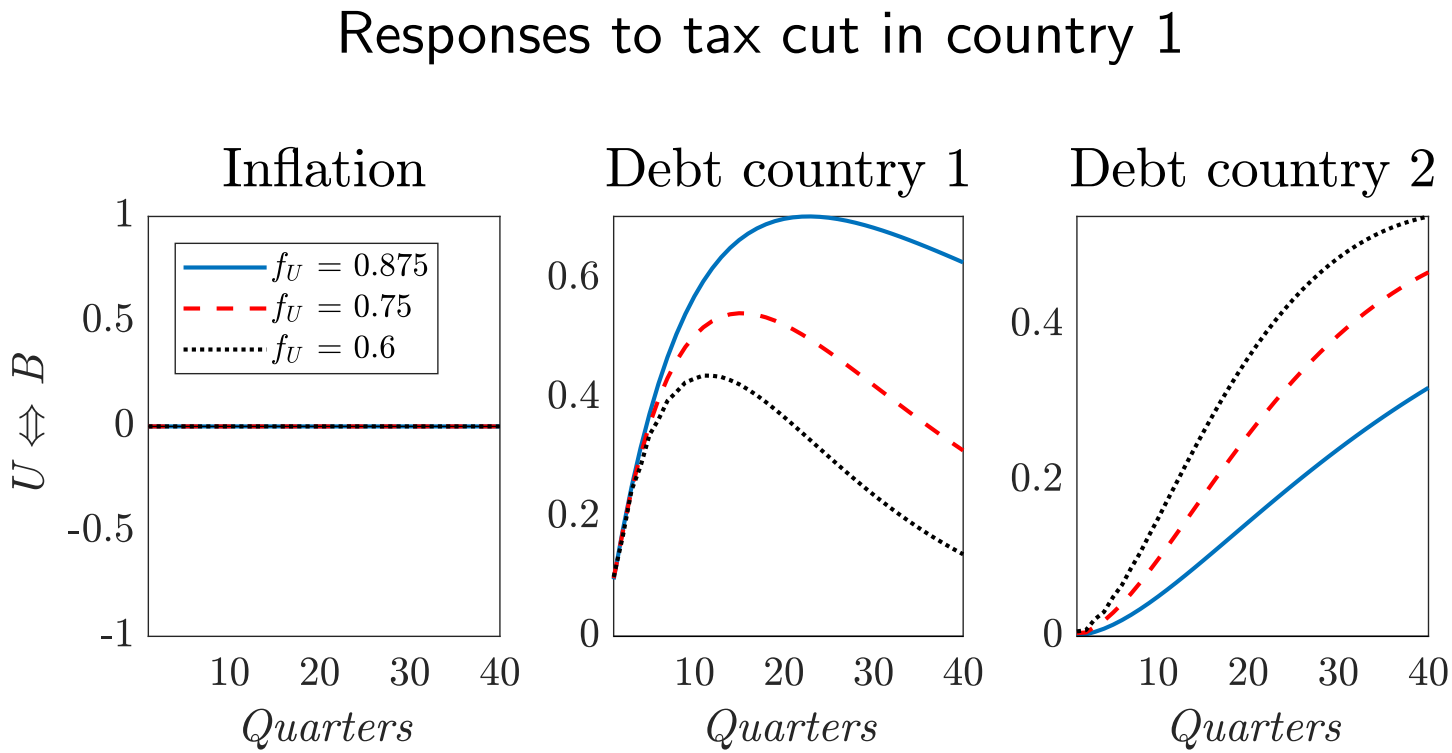
Fiscal transfers to country 1



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Conclusions

- Monetary unions with active monetary and fiscal policies can be stable
- Two fiscal relieve valves: pay off debt of country 1 by...
  - ...taxpayers in country 1 through fiscal austerity
  - ...taxpayers in other member states through fiscal bailout
- Monetary relieve valve:
  - Required monetary passiveness independent of fiscal activeness
  - Only regime transition probability matters
- Results allow for dynamic analysis when shocks occur in $\underline{\mathbf{U}}$
  - Dynamic responses of economy sensitive to expected future regimes

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Reference slides

Benchmark calibration

	Description	Value	Interpretation
β	Discount factor	0.99	4 percent annual real interest rate
ρ_τ	Tax-smoothing parameter	0.9	High persistence of tax shocks
b_i	Steady-state debt ratio	2.4	60 percent annualized debt ratio
y_i	Output levels	0.5	Monetary union of "equals"
g_i	Steady-state public spending ratio	0.2	Long-run OECD average
ϕ_{π,s_t}	Monetary policy stance ($s_t \neq F$)	1.5	Ensures active monetary policy
ϕ_{b_2}	Fiscal policy stance country 2	0.02	Ensures passive fiscal policy

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